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EDITORIAL

Dear Members of Indian Orthopaedic Association MP Chapter,

I feel previlaged while writing this editorial for you. Orthopaedics has grown to great details and enormous volumes of researches are being written world wide. Each author is informing his work as original and of importance and our members working in peripheries with not even basic infrastructure, anaesthesia facilities or X-rays are feeling discouraged as they feel lagging behind in work.

Basics of trauma and orthopaedics is simple and the research in truama is going towards fragment specific implants and fixation modalities. Efforts are being done for minimal incisions, stable fixations and early mobilisation. Research is putting efforts to reduce union time and make it strong, to bring about a complete anatomic reconstruct after union and full function too. Our orthopaedic surgeons with this understanding are to think ways and means to fulfil these needs and at the same time ensure availability of these techniques at a cheaper cost to the man standing last in the row so that he also gets appropriate treatment.

Orthopaedic Journal of MP Chapter has been serving you all by bringing to you these cheep, innovative and effective ideas and has been encouraging authors to share their views through this medium and the journal is appreciated not only in our state but in the whole country and abroad also.

I thank all the authors who have contributed to this journal and in this way spread not only information but new and effective ideas with you.

Thank you

Yours truly

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ORTHOPAEDIC JOURNAL OF M.P. CHAPTER
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Dr. B. Das Silver Jubilee Oration 2014

SURVEY OF ANTIBIOTIC USE BY ORTHOPAEDIC SURGEONS

Agrawal A.C.* **Kalia R.B.**** **Agrawal M.*****

ABSTRACT

A preliminary survey by a questionnaire was done on antibiotic use by Orthopaedic surgeons in various clinical situations to 58 surgeons. The responses were tabulated and studied to find the current clinical practice among surgeons. The current literature was extensively searched for ideal answers. The purpose of the study was to act as a preliminary survey to guide a larger study and to validate the correctness of the questions formulated in this study.

INTRODUCTION

Antibiotic prophylaxis and use is recognized widely as a method to decrease infection rates among patients undergoing orthopaedic treatment for various indications. The antibiotic use in various clinical situations is often empirical and is based on regional prejudices and usually without evidence. Costlier is better is not always true in the use of antibiotics. Often antibiotics are used on personal preferences for prolonged periods without reason. We undertook a survey to study the antibiotic use for varying clinical situations among orthopaedic surgeons. A questionnaire of ten questions was given to 58 Orthopaedic surgeons and the responses were tabulated and studied.

MATERIAL AND METHODS

A questionnaire of subjective ten questions was given to 58 Orthopaedic Surgeons during national and regional conferenceswho filled the responses which was subsequently tabulated and studied. One surgeon answered only one question and was not included in the study. 7 surgeons only answered 5 or less questions but were included in the study. 50 respondents answered at least 8 questions which attests to the clinical relevance of the questionnaire and the enthusiastic response of the respondents.

RESULTS

Question 1 - What is the antimicrobial agent of your choice for peri-operative prophylaxis and why ?

A wide variety of responses was obtained. Overwhelming majority 44 out of 57 (77.2%) surgeons choose Cephalosporins for peri-operative prophylaxis. The commonest choice was 3rd generation Cephalosporins by 31 respondents out of the 44 (70.5%) who use Cephalosporins as their drug of choice for peri-operative prophylaxis. Among 3rd generation Cephalosporins -ceftriaxone alone or in combination with sulbactum or other antibacterials was the choice of 19/44 respondents (43.2%). Cefoperazone alone or in combination with other antibacterials was the choice of 11/44 (25%) respondents. One respondent uses Cefotaxime for peri-operative prophylaxis (2.3%).

11 of 44 (25%) respondents who use Cephalosporins prefer 2nd generation Cephalosporin Cefuroxime alone as their preferred antibacterial for peri-operative prophylaxis. 2 of 44 (4.6%) use 1st generation Cephalosporin -

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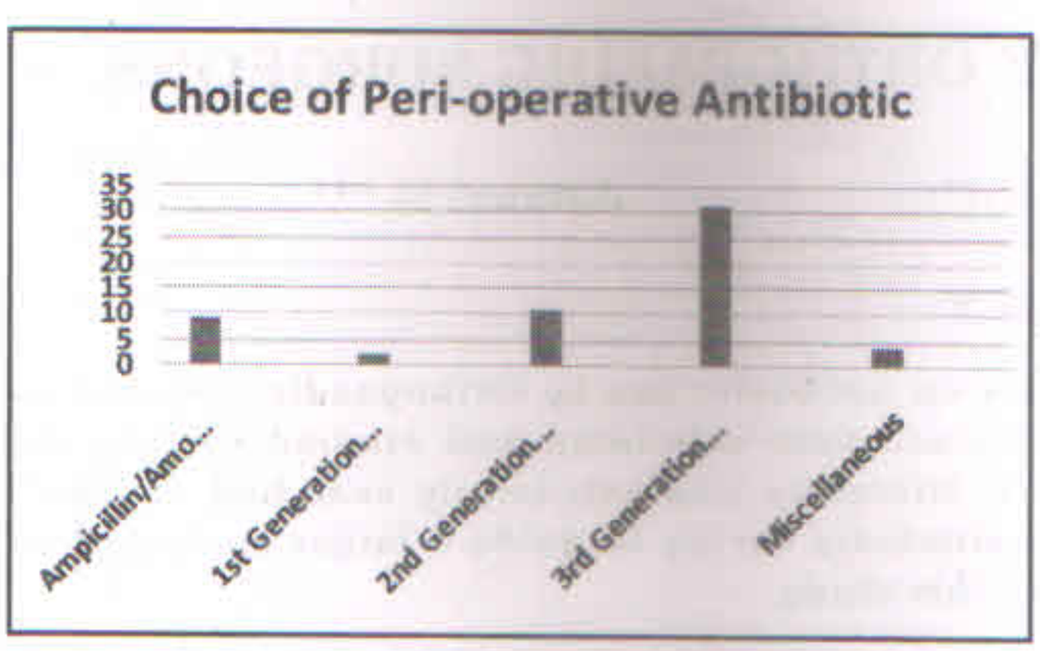
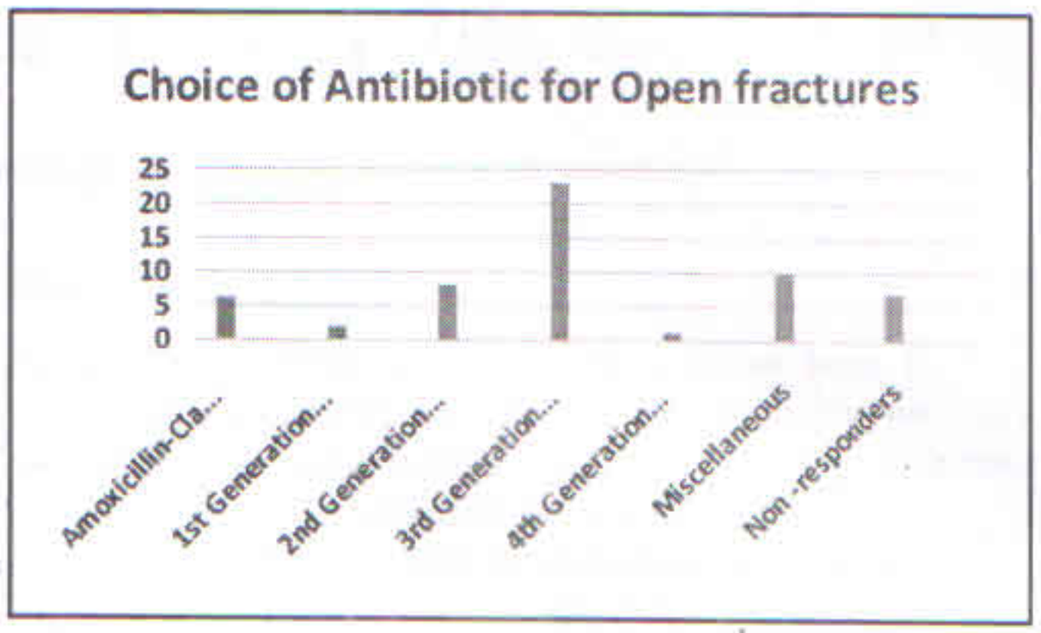




Cefazolin as their preferred antibacterial for peri-operative prophylaxis.

In the group of surgeons not using Cephalosporins, Ampicillin, Amoxicillin and Cloxacillin were the preferred antibacterial for peri-operative prophylaxis of 9/13 respondents (69.2%). Miscellaneous antibacterial like quinolones and linezolid were choice of 2/13 respondents (15.4%). Two respondents were noncommittal in their response.

Question 2 - Which antimicrobial agent do you prefer prophylactically in open fractures of long bones and for what duration?

A bewildering array of different responses were elicited from the 57 respondents. Amoxicillin-Clavulinic acid in combination with other antibacterials was preferred by 6/57 respondents (10.5%). Cephalosporins in combination with other antibacterials was preferred by 34/57 respondents (59.6%).The commonest choice was again 3rd generation Cephalosporins by 23 respondents out of the 34 (67.6.5%) who use Cephalosporins as their drug of choice for open fracture prophylaxis.8 of 34 (23.5%) respondents who use Cephalosporins prefer 2nd generation Cephalosporins as their preferred antibacterial for open fracture prophylaxis. 2 of 34 (5.8%) use 1st generation Cephalosporin - Cefazolin as their preferred antibacterial for open fracture prophylaxis.

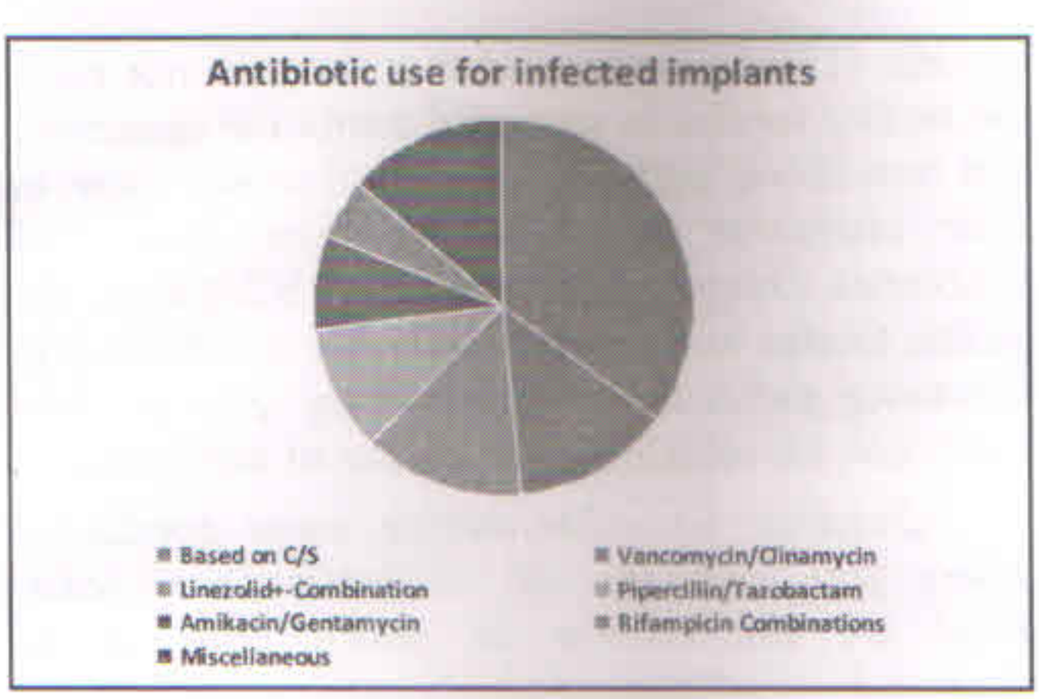
One respondent uses 4th generation cephalosporin -Cefepime as his preferred agent for prophylaxis in open fractures (2.9%). Miscellaneous combinations of 3-5 antibiotics or single agents were the preference of 10/57 respondents. Non-committal response was submitted by 7/57 respondents.

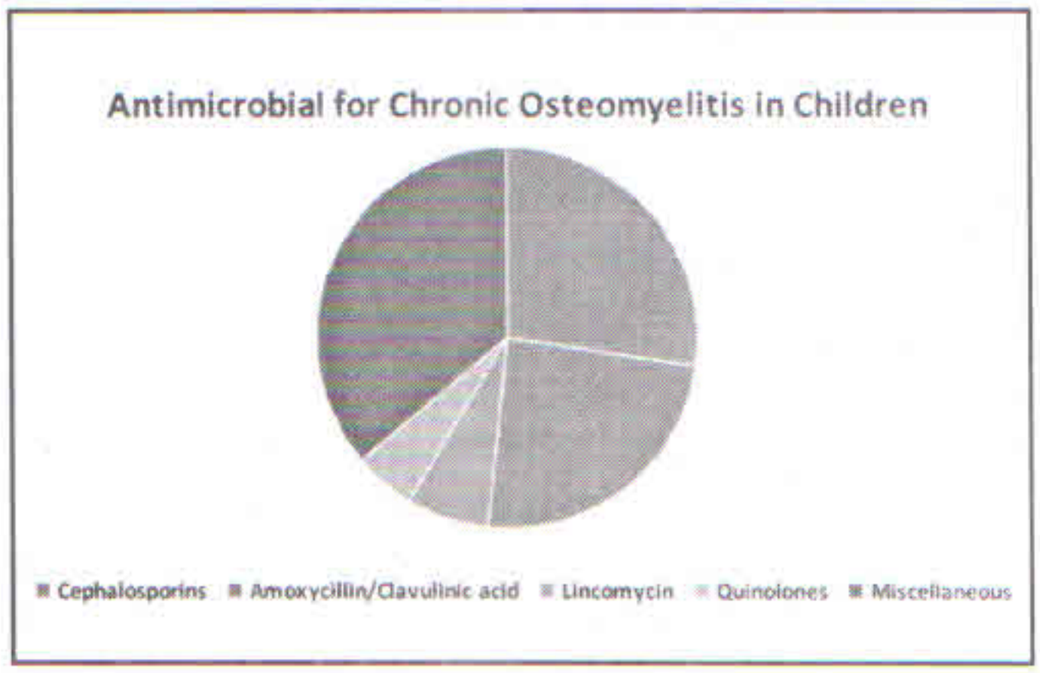
Interestingly the same drug as preferred for peri-operative prophylaxis was the choice of 9/57 respondents (15.8%). Metronidazole or Ornidazole was the additional preferred antimicrobial with the one used for closed fractures (19.3%) probably for coverage against anaerobic organisms. A new antimicrobial or a combination of antibiotics was the overwhelming preference of 33/57 respondents while 4/57 respondents were noncommittal.

The next significant part of the question was the duration of antibacterial prophylaxis. Overwhelming majority of responders 35/57 were non-committal in their response due to unknown reasons (61.4%). Only 1/57 respondents uses antibiotics for 2 days for open fracture prophylaxis (1.75%) while 7/57 use them for 3-5 days (12.3%). 11/57 respondents use antibiotics for prolonged periods like 5-10 days and 3/57 use them for 10-21 days.

Question 3 - What antimicrobial agent usage protocol do you adopt for infected implants?

Majority of responders 26/53 (49%) reserve antibiotics according to culture and sensitivity reports. IV Vancomycin/Clindamycin was the empherical preferred antibacterial of 10/53 (18.8%) responders. IV Linezolid alone or in combination was the empherical preferred antibacterial of 10/53 (18.8%) respondents. IV Pipercilin and Tazobactum was the combination of





choice of 8/53 respondents (15%). Quinolones were the preferred antibiotics of 7/53 (13.2%) respondents and Amikacin/Gentamycin were the preferred antibiotics of 6/53 (11.3%) respondents. Four respondents were aware of the advantage of Rifampicin in combination with other antibiotics and use it in their patients.

The choice of one or two respondents was Ceftriaxone, Cefazolin, cefuroxime, ceftazidime, Teicoplanin, flucloxacilin and Vancomycin beads.

Question 4 - Which antimicrobial agent do you use for infected prosthesis?

Majority of the respondents (23/58) use antibiotics according to culture and sensitivity. 27/58 respondents use the same protocols as in question three. The choice of antibiotics with different protocols for infected implants and prosthesis varied widely with cefuroxime/Pipercilin-Tazobactam the most common choice (8/58) followed by Linezolid (5/58) and Rifampicin+ combinations (4/58). One or two respondents use Amoxycillin/Clavulinic acid, Gentamycin, Meropenam, Cefixime, Cefriaxone, Clindamycin, Teicoplanin, Quinolones, IV Vancomycinand Vancomycin beads.

Question 5 - Which antimicrobial agent do you prefer in children with chronic osteomyelitis and for how long do you continue it?

Wide variety of responses were generated. The most commonly used group was Cephalosporins (16/51) followed closely by Amoxycillin-Clavulinic acid (14/51). Lincomycin (4/51) and quinolones (3/51) were the choice of a small number of surgeons. One to two respondents chose Vancomycin, Tazobactam-Pipercilin, Amikacin, Gentamycin, Cloxacillin, clindamycin, quinolone, linezolid, ampicillin and interestingly ATT and Rifampicin. One respondent chose Septillin which is an ayurvedic preparation as his choice for treating chronic osteomyelitis in children.

The response to duration of treatment was interesting as majority of the respondents did not respond (33/58). Of the 25 respondents who mentioned the duration of treatment the overwhelming majority (16/25) use antibiotics for 4-6 weeks. A small number of respondents (3/25) treat their patients for less than three weeks. Only two respondents (2/25) treat their patients for 3-4 weeks of antibiotic therapy and four respondents (4/25) treat their patients with prolonged periods of 6-12 weeks of antibiotics.

Question 6 - Do you use prophylactic antimicrobial agent for soft tissue trauma. If yes then why?

The response to this question interestingly was yes by 31/58 and no for 14/58 respondents. There was no response or equivocal response from 13/58 respondents. Most of the respondents who answered yes believed that prophylactic antibiotics are useful for preventing infections in soft tissue trauma. 16 respondents mentioned the antibiotic that they use for preventing infections in soft tissue

trauma. 7/16 respondents use Cephalosporins as their agents of choice while one or two respondents chose Levofloxacin, Clindamycin, Amoxycillin, Gentamycin and quinolones.

Question 7 - Are you aware of antimicrobial agent loaded biomaterials?

The overwhelming majority is aware of antimicrobial loaded biomaterials with 36/58 respondents answering yes. Of the respondents who use biomaterials only 2/36 use biomaterials like collagen impregnated antibiotics in their patients. Seven respondents use bone cement as their preferred vehicle for delivery of antibiotics. Interestingly 12 respondents (12/58) are unaware of the availability of antimicrobial agent loaded biomaterials and 10 respondents (10/58) did not reply to the question.

Question 8 - How frequently do you get culture and sensitivity done? Do you essentially follow the culture reports?

The overwhelming majority of respondents 43/58 get culture and sensitivity tests done.A large number of respondents (16/58) regularly or frequently get culture and sensitivity done although the time frame is not mentioned. Only four (4/58) respondents mentioned that they repeat the culture and sensitivity tests every 7-14 days. The interesting part is that 38 /58 respondents were either non- committal in their response to the frequency of getting culture and sensitivity tests done or did not respond at all.

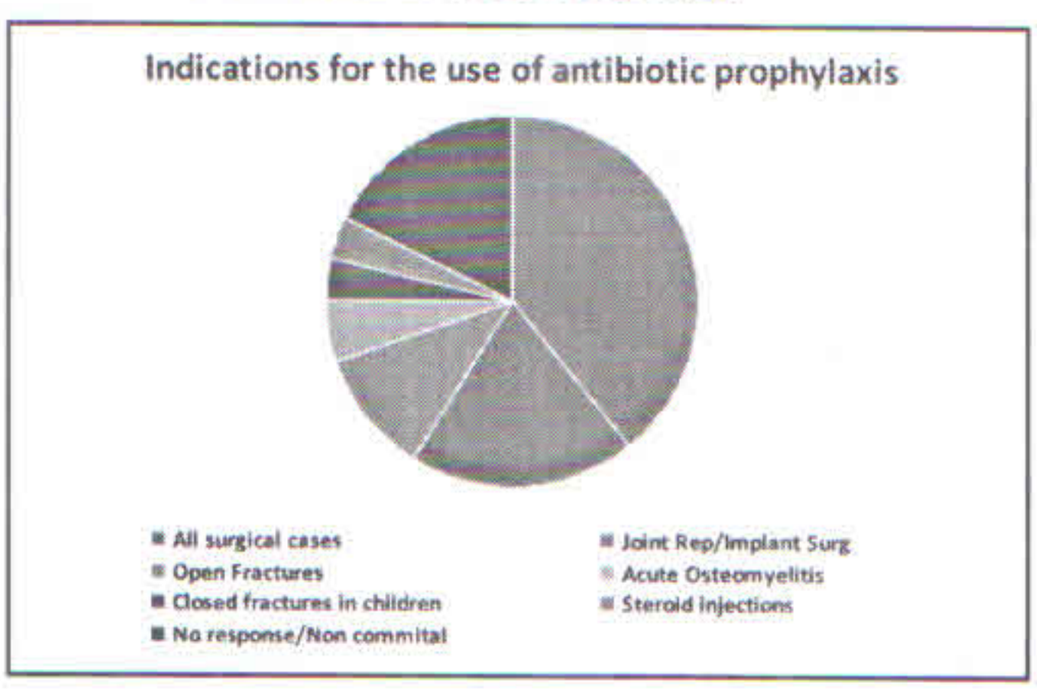
Question 9 - Do you try to assess the effective antibiotic levels in your critically ill patients? Do you refer to standard antibiotic sensitivity and resistance patterns published every year in selecting your choice of antibiotic?

Surprisingly a large number, 20/58 respondents answered yes and try to assess the effective antibiotic levels in their critically ill patients.A larger number of respondents 23/58 do not tryto assess the effective antibiotic levels in their critically ill patients, and 15/58 were noncommittal or did not respond at all.

To the second part of the question a large number (17/58) mentioned that they do not have the facility torefer to standard antibiotic sensitivity and resistance patterns published every year in their institution for selecting their choice of antibiotics. Only a few respondents (5/58) have the facility torefer to standard antibiotic sensitivity and resistance patterns published every year in their institution for selecting their choice of antibiotics.

Question 10 - Enumerate some conditions where you routinely use antibiotic prophylaxis. What are the criteria on which your choice depends?

The respondents have listed a number of conditions in which they use antibiotic prophylaxis. 22/58 respondents use antibiotics for prophylaxis for all surgical cases.11/58 respondents use antibiotics for joint replacement or implant surgeries while 6/58 use antibiotics for open fractures.Interestingly a small number of 3/58 respondents use antibiotics for acute osteomyelitis, 2/58 closed fractures in children, 2/58 use antibiotics for steroid injections and 1/58 use antibiotics for acute synovitis knee/transient synovitis hip. 10/58 respondents did not answer or were noncommittal in their response.



DISCUSSION

Cefazolin or cefuroxime is the recommended agent[1] for peri-operative prophylaxis. Clindamycin or Vancomycin is an alternative for patients with type 1 Hypersensitivity to penicillin or Cephalosporins and for patients colonized with MRSA.[2] Prophylactic antibiotics should be

administered within one hour prior to skin incision. Vancomycin due to its extended infusion time should be started within two hours prior to skin incision. Patients with weight above 80 kg dose needs to be doubled.[3] Peri-operative antibiotic is advised if duration of procedure exceeds one to two times the antibiotic's half-life or there is significant blood loss during surgery. The duration of antibiotic prophylaxis should not be more than 24 hours.[4]

It is a matter of concern that more than 70% of the respondents in our study who chose cephalosporins prefer III rd generation agents which are more active against gram negative organisms rather than Ist or 2nd generation cephalosporins which are more useful against commonly occurring gram positive organisms.

Concept of MRSA (Methicillin resistant Stapylococcus Aureus) is commonly lacking as evident from the responses. The first question also needs to find out the duration of antibiotic use which was lacking in the questionnaire. It is our conjecture that most surgeons use antibiotics for more than the recommended 24 hours period.

Open fractures are associated with a risk of infection that may be as high as 30% for severe injuries of the lower limb. Gustilo and Anderson in 1976 established a system of classification that predicted the risk for infection in open tibial fractures. This has been subsequently updated with a minor modification related to type III fractures. The Gustilo grading system remains ubiquitous and is often generalised to include all open fractures. When compared with the duration of pre-operative antibiotic prophylaxis in surgery for closed fractures where a single parenteral dose is sufficient open fractures remain one of the few surgical fields where antibiotics are often administered for several days, despite the fact that almost no evaluation of the ideal or minimal duration has been attempted.Generally the literature relies on historical controls or underpowered studies involving < 200 infectious episodes.

It is generally accepted that antibiotic prophylaxis in grade I and II fractures should not be administered for > 24 hours. However, the minimum duration for grade III fractures varies between one and ten days or even several weeks. Guidelines based on expert opinion and common senseadvocate a maximum of 48 to 72 hours for grade III fractures.

The choice of the antimicrobial agent for open fractures is also highly variable with usual recommendations for second-generation cephalosporins alone or in combination with aminoglycosides, quinolones or regimens targeting anaerobic pathogens. IV Cefazolin which is active against gram positive organisms is the preferred single agent for type I and II open fractures[5] and is given for 3-5 days and gentamycin or Tobramycin are added for type III for gram negative organism coverage.[6] For Clostridial infections prophylaxis especially in open fractures contaminated with anaerobic organisms as in many farm injuries, IV Penicillin or Ampicillin should be added to the antibiotic regimen.

Surprisingly a bewildering array of different responses were elicited from the 57 respondent'schoice of the antimicrobial agent for open fractures in our study. Cephalosporins in combination with other antibacterials was preferred by 34/57 respondents (59.6%). The commonest choice was again surprisingly 3rd generation Cephalosporins by 23 respondents out of the 34 (67.6.5%) who use Cephalosporins as their drug of choice for open fracture prophylaxis. Miscellaneous combinations of 3-5 antibiotics or single agents were the preference of 10/57 respondents. Non-committal response was submitted by 7/57 respondents. Many were concerned about anaerobic infections and use metronidazole or similar drugs in combination for prophylaxisdespite little current evidence for their use.

The protocol for infected implants is also highly variable. Typical oral antibiotics active against most micro-organisms are cephalexin and Dicloxacillin. Methicillin resistant staphylococcus aureus infection is seen in risk groups like athletes who share personal items, IV drug abusers, military recruits or prisoners living in overcrowded living

conditions or in patients with extensive history of broad spectrum antibiotic use.[7] IV Linezolid, Vancomycin, daptomycin and tigecycline are currently the agents of choice. Oral antibiotics active against MRSA are linezolid, trimethoprim-sulphamethoxazole and long acting tetracyclines.

In our study 49% of the respondents use antibiotics after culture and sensitivity. The emphirical choice of antibiotic used by our respondents for treatment of infected implants wereVancomycin, clindamycin, linezolid, Pipercillin-Tazobactum, Quinolones and Amikacin/ gentamycin probably based on their previous experience with these agents.

Infected prosthesis are extremely difficult to treat, however two stage revision is the standard of care currently. Successful treatment depends on the isolation of the offending organism from per-operative cultures or aspiration of purulent material. Culture yields can be improved by stopping antibiotics at least ten days before surgery and taking multiple tissue and fluid samples preoperatively. Superficial cultures from sinus tract are of little use. Deep cultures during debridement from multiple areas are essential to isolate the micro-organisms and direct effective treatment by susceptibility patterns.

Palacos PMMA is the preferred carrier agent due to its porosity and its superior release kinetics for antibiotics. Gentamycin 1gm/40 gm, tobramycin 2gm/40gms, Vancomycin 2gm/40 gms and Cefazolin can be used as they are thermo-stable9.

For Staphylococcus aureus and coagulase negative staphylococcus Nafcillin, Oxacillin or Cefazolin are the preferred antibiotics. For MRSA IV Vancomycin, daptomycin or Linezolid are effective. B-Haemolytic streptococcus, enterococcus, propionibacterium acnes are susceptible surprisingly to Penicillin G. Enterococci resistant to penicillin are usually susceptible to Vancomycin and Pseudomonas aeroginosa are susceptible to cefepime, meropenem plus aminoglycoside.

For Entero-bacteriaceae, cefepime of meropenem are often active. All drugs need to be given IV for 4-6 weeks with effective surgery for best results. Rifampicin has excellent in vitro activity against staphylococcus, including biofilm organisms but should be used in combination with quinolones as monotherapy often causes emergence of resistant organisms.[8]

There are no prospective, controlled clinical trials comparing the different surgical modalities and evaluating the appropriate length of antimicrobial therapy in patients with prosthetic joint infections.

Antibiotic preference in children with chronic osteomyelitis is debatable with consensus opinion suggestive of IV Clindamycin, Cefazolin and Vancomycin. Cultures should ideally be of deeper tissues removed during surgery to identify the causative organisms with superficial sinus tract cultures providing commensal organisms and mixed flora usually and are of little importance. The primary treatment of chronic osteomyelitis is surgery, however the exact timing and extent is debatable and varies from institution to institution.

Use of antibiotics in isolated closed soft tissue injuries in our opinion is debatable. However we recommend broad spectrum First or Second generation Cephalosporin in high risk groups ie HIV positive patients, immune-compromised patients, patients receiving cytotoxic drugs or IV drug addicts.

Antibiotic loaded biomaterial are advantageous as they do not require a repeat surgery for removal, however cost and availability are significant disadvantages. Collagen and calcium sulphate impregnated biomaterial are commonly used. Awareness among surgeons is a critical issue limiting their use in clinical situations.

Cultures and sensitivity test are routinely done by most Orthopaedic surgeons however protocols need to be evolved regarding the site and frequency of cultures.

The role of determining serum antibiotic levels in critically ill patients is debatable and little

consensus available to advice for or against getting levels done. Most surgeons do not have the facility of standard antibiotic sensitivity and resistance patterns in their Institutions and a concerted effort is required to rectify this.

The majority of Orthopaedic surgeons realize the importance of prophylactic antibiotic use in routine surgery and in treating bone and joint infections,however the choice is usually individual and with little evidence.

CONCLUSION

Antibiotic use in various conditions should be carefully thought as newer antibiotics are few and antibiotic resistance is posing serious problems which are expected to increase in the future. Appropriate use is highly recommended and surgeons need to detest from substituting lack of aseptic precautions by prolonged use of antibiotics. The best evidence currently available can be easily incorporated in a hospital protocol and can be revaluated for efficacy to suit the local conditions. A larger study with inputs from this study on a national scale with suitable questions preferably multiple choice can answer many unanswered problems and can probably lead to a national consensus on antibiotic use in various clinical situations.

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Review Article

ANTIBIOTICS USE IN ORTHOPAEDIC SURGERY; AN OVERVIEW

Choubey R.* Faruqui S.A.** Vyas G.S.*** Saraf K.K.****

ABSTRACT

The use of antibiotics in orthopaedic surgery is mainly prophylactic and therapeutic. Prophylactic antibiotic is effective in reducing surgical site infections in hip and knee arthroplasty, spine surgery, and open reduction and internal fixation of fractures. Theantibiotics treatment is an adjuvant to a complete surgical treatment of ostheoarticular infections. The most frequent orthopaedic implants surgery infections is staphylococcus, often occur with resistant staphylococcal species and they are a major public health problem. The characteristics of the implant material are also very important for the development of the infection, the surface of the implant influencing the bacterial colonization. To maximize the beneficial effect of prophylactic antibiotics while minimizing adverse effects, the correct antimicrobial agent must be selected, the drug must be administered just before incision, and the duration of administration should not exceed 24 hours. The antibiotic prophylaxis can be made according to the international protocols howeverdebate and confusion continue to surround the optimal use of antibiotics in the setting of closed and open fractures, but our opinion is that the antibiotic prophylaxis should be made considering the specific germs of each hospital and their antibiotic sensitivity. The purpose of this article is to provide a brief summary of recent literature on use of antibiotic in orthopaedic traumatology.

INTRODUCTION

Infection is a very important problem in the orthopaedic surgery because of its continuing incidence, clinical importance and serious sequelae, the treatment being very difficult and expensive (for example, the treatment of an infected hip prosthesis costs twice as much as an aseptic revision and six times as much as the primary replacement). Though rates of infection has been reduced by antibiotic prophylaxis, the problem of infection in orthopaedic trauma has been compounded by increasing use of implantsurgeries. Implants are avascular and therefore antibiotics can reach them only by diffusion from the surrounding tissues. Infection involving an implant cannot be cured simply with antibiotics and it often necessitates the surgical removal of the implant and debridement.

COMMON PATHOGENS CAUSING SURGICAL SITE INFECTION

Staphylococcus aureus produces a large number of enzymes (adhesines, haemolysines) and toxins. It becomes resistant to most of the antibiotics that were initially effective. Almost all the species produce beta-lactamase.[1] Staphylococcus epidermidis is frequent culprit in surgeryinvolving biomaterial surface as a polymer. Staphylococcus aureus is often the major pathogen in biometal, bone and joint and soft tissue infections. The staphylococcal infections of the orthopaedic implants are a major problem of public health, because they are chronic, difficult to treat by surgical and non-surgical methods and they have a very high social cost.[2] The most frequent cause of staphylococcal infections is the perioperative contamination, and the germs come

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from the patient or from the operating room. Ostheoarticular infections with resistant staphylococcus occur in patients with infected orthopaedic implants. The antibiotic treatment is an association of rifampicin and fluoroquinolones. It is the most effective antibiotic treatment (excellent bone diffusion of the antibiotics). In vitro studies demonstrated that staphylococcus are more sensitive to ofloxacin than to ciprofloxacin.[3]

Pseudomonas aeruginosa is a very resistant bacteria in external environment with a large number of virulence factors. Its natural capability of fast gaining antibiotic resistance makes it a very frequent nosocomial agent ininfections occurring in patients undergoing invasive procedures or those in the immunocompromised state. The ICU unit is affected with percentages of pseudomonas isolation up to 30%. The multiple antibiotic resistance is a very important challenge for the surgeon in the presence of pseudomonas infection in hospitalized patients.

Klebsiella spp. is a group of microorganisms transmitted either directly (airborne particles) or through personal objects or contaminated medical instruments during invasive or non-invasive procedures. A depressed immunity plays a very important role in the receptivity of the infection. There is a largely reported plasmid-mediated resistance to cephalosporin due to the inappropriate use of these antibiotics. Klebsiella osteomyelitis, frequently a nosocomial infection, has a very poor prognosis.

Escherichia Coli is a intestinal gram negative bacteria responsible for digestive diseases. Nosocomial infection with E.Coli depends mostly on the surgical discipline and on the nursing during the postoperative period, the most exposed site being the operated hip and pelvic ring.

Actinobacter baumani is transmitted through hands, clothing, contaminated surgical instruments, air conditioning or ventilation devices. The group is quite frequently involved in respiratory, meningeal infections or bacteriemia in patients that need ICU admission, regardless of the primary illness. The treatment usually involves cephalosporins and fluoroquinolones, but there are species that requires carbapenemes as antibiotic of choice.

BIOMATERIALS AND THE RISK OF INFECTION

Pathogenesis; The two main barriers to the extended use of implanted biomaterials is the possibility of biomaterial-centered infection and the lack of successful tissue integration of biomaterial surfaces. The fate of an available surface may be conceptualized as a race for the surface, a contest between tissue cell integration and bacteria adhesion to that same surface. Interaction of physical and biological factors then allows bacterial attachment and adhesion. In a liquid medium, germs reach the implant pores before the tissue cells, filling them quickly with colonies covered with glycocalyx. Proteinaceous adhesins (fimbriae in Gram negative bacteria), polysaccharide polymers, and surface and milieu substances interact to form an aggregate of bacteria, elemental substances, glycoproteins, and polysaccharides in a biofilm. Additional symbiotic species may join and present as a polymicrobial infection. Characteristically, these infections do not respond to treatment until the substratum is removed.[4] Glycoproteinaceous conditioning films, derived from fluid or matrix phases containing fibronectin, fibrinogen, collagen and other proteins, almost immediately coat a biomaterial substratum and provide receptor sites for tissue adhesion. Even in a theoretically antiadhesive system, colonization will probably be accomplished by a few pioneer bacteria that have optimal attachment abilities and use one of the several determinants of adhesion. Biomaterial surfaces must be modified to improve compatibility and tissue integration and to resist microbial colonization in the race for the surface.[5]

Type of metal in implant; Stainless steel becomes infected more easily than chromium-cobalt (CrCo) or Titanium (Ti) and CrCo is infected more easily than Ti. Ti which is more biocompatible, is colonized by tissue cells and therefore protected from bacteria earlier than CrCo

alloys. The tissue cells win the "race for the surface" more easily on titanium than on CrCo.[6]

The surface of the implant; Implants with a porous surface become infected with a smaller inoculum than those required for implants with a smooth surface. The multiple interstices of a porous surface facilitate the maintenance of infection and make access more difficult for antibiotics and immune system cells. Solid intramedullary nails are more difficult to infect than hollow nails, which have a larger surface for adhesion and an interior zone which is difficult to access.[7]

Bacterial adherence on biomaterials with antibiotics; Implantable materials such as PMMA, or biodegradable substances such (hydroxyapatite, calcium phosphate, polylactic and polyglycolic polymers or collagen etc), can be mixed with thermostable antibiotics such as gentamicin, tobramycin, vancomycin or ciprofloxacin, providing very high local concentrations, with minimal systemic toxicity. PMMA is waterproof, but the antibiotics are stored in microscopic splits and defects. Therefore, the preparation of cement by methods designed to reduce porosity (vacuum mixing, centrifugation) will reduce antibiotic release. PMMA with gentamycin requires the inoculation of 60 times more Staphyloccocus aureus than PMMA without antibiotic to become infected.[7]

ANTIBIOTIC PROPHYLAXIS

Antibiotic prophylaxis is justified at every surgical intervention involving an implant, because it reduces the rate of infection from 5% to 1%. Antibiotics can eliminate bacteria before they colonize implants or are established intracellularly in the macrophages.[7] The lowest rates of infection are obtained by the combination of intravenous antibiotics and the use of antibiotic-loaded cement. The rates of infection are also reduced by the use of laminar-flow operating rooms and the application of simple surgical discipline. At present most of the time antibiotic prophylaxis is not always administered in a manner that is supported by scientific evidence. Inappropriate use of antibiotics does not prevent post-operative infections, but contributes to antibiotic resistance, increases the risk of adverse reactions, predisposes the patient to infections, and increases healthcare costs.

The antibiotic prophylaxis is always indicated in immunosuppressed patients, using a second generation cephalosporin (Cephalexin) or amoxicillin-clavulanic acid.[7]

Antibiotic prophylaxis in closed fractures

Antimicrobial prophylaxis is a necessary adjunct to the management of fractures that require surgery. Two recent systematic reviews assessed the role of antibiotic prophylaxis in closed fracture.[8,9] One of these reviews prepared by the Cochrane Collaboration, comprised 8,447 patients from 23 randomized controlled trials. In a single study involving 452 patients, the oral administration of an antibiotic produced no significant difference in deep and superficial infection as compared with its parenteral administration,[8,9] so there is no evidence to support a common belief that parenteral administration of antibiotic is superior to oral administration of antibiotic.[8,9] In closed fractures, administration of a first-generation cephalosporin 30 minutes before surgery provides adequate coverage.10 One study of 3,856 patients with 180 infections found that antibiotic administration from 59 to 30 minutes of incision was more effective than administration within 30 minutes of incision.[11] It is not necessary to continue prophylaxis for more than 24 hours.[12]

Antibiotic prophylaxis in open fractures

Because open fractures are by definition contaminated, the use of antibiotic in their management is therapeutic rather than prophylactic. In this settings antibiotics act as adjuncts to debridement, with the latter being the main technique for preventing such infection by reducing the bacterial load in the remaining healthy tissue. In 1974, Patzakis et al, who demonstrated a marked reduction in the infection rate when cephalothin was administrated (2.4%)

compared with no antibiotic administration (13.9%). The antibiotics were administrated before wound debridement.13 The antibiotics used in the management of open fractures should be selected based on the wound microbiology. Wound contamination with both gram-positive and gram-negative microorganisms occurs; therefore, the antimicrobial treatment should be effective against both types of germs. Patzakis and Wilkins reported that the combination therapy (cephalosporin + aminoglycoside) was associated with a 4.6% infection rate, whereas administration of only cephalosporin was associated with a 13% infection rate.[13] Currently, systematic combination therapy using a first-generation cephalosporin, which is active against gram-positive germs, and an aminoglycoside, which is active against gram-negative germs, appears to be optimal, although other combinations may also be effective. Substitutes for aminoglycosides include quinolones, aztreonam and third-generation cephalosporines.[14] Ampicillin or penicillin should be added to the antibiotic regimen when there are conditions favoring the development of anaerobic infections, such as clostridial myonecrosis.14 However to our knowledge, no published evidence suggests a significant benefit of adding penicillin to the prophylactic regimen for grossly contaminated wounds, although the lack of such evidence may be a consequence of the relative rarity of such wounds and of postoperarive clostridial infections. The results of cultures obtained after debridement and of antibiotic-sensitivity testing may help in selecting the best agents for subsequent surgical procedures or in case of an early infection.16 Quinolones are a promising alternative to i.v. antibiotics because they offer broad-spectrum antimicrobial coverage, are bactericidal, can be administrated orally with less frequent dosing than i.v. antibiotics and are well tolerated clinically.[15] Ciprofloxacin (or cefamandole) and gentamicin is effective in the management of type I and II open fractures (infection rates were similar). In type II open fractures, ciprofloxacin should be used only in combination with a cephalosporin, as a substitute for an aminoglycoside.[13] The guidelines of the Surgical Infection Society recommend 24 to 48 hours of antibiotic coverage for Gustilo type I fractures and 48 hours of coverage for types II and III fractures, whereas the EAST practice management guidelines suggest only 24 hours of coverage for types I and II fractures and no more than 72 hours of coverage for type III fractures.[16,17]

Antibiotic prophylaxis in Joint Replacement Surgery

Following recommendation are made by American Academy of Orthopaedic Surgeon; Recommendation 1) The antibiotic used for prophylaxis should be carefully selected, consistent with current recommendations in the literature, taking into account the issues of resistance and patient allergies.

Antibiotic prophylaxis in primary total hip arthroplasty:[18]

Cefazolin 1g iv as a single dose or 1-2 doses every 8 hours, or Cefuroxime 1.5 g iv as a single dose or repeated doses every 12 hours for a total of 6g, or Vancomycin 1g iv as a single dose

Primary total joint replacement (other than hip):[18]

Cefazolin 1-2 g i.v. preoperative (± 2nd dose), or Vancomycin 1 g i.v

Currently, cefazolin or cefuroxime are the preferred antibiotics for patients undergoing orthopaedic procedures.[19,20] Clindamycin or vancomycin may be used for patients with a confirmed beta-lactam allergy. Vancomycin may be used in patients with known colonization with methicillin resistant Staphylococcus aureus (MRSA) or in facilities with recent MRSA outbreaks.18In multiple studies, exposure to vancomycin is reported as a risk factor in the development of vancomycin-resistant enterococcus (VRE) colonization and infection. Therefore, vancomycin should be reserved for the treatment of serious infection with beta-lactam-resistant organisms or for treatment of infection in patients with life-threatening allergy to beta-lactam antimicrobials.[18]

Recommendation 2) Timing and dosage of antibiotic administration should optimize the

efficacy of the therapy. Prophylactic antibiotics should be administered within one hour prior to skin incision.[21,22] Due to an extended infusion time, vancomycin should be started within two hours prior to incision. If a proximal tourniquet is used, the antibiotic must be completely infused prior to the inflation of the tourniquet. Dose amount should be proportional to patient weight; for patients >80 kg the doses of Cefazolin should be doubled.[23] Additional intraoperative doses of antibiotic are advised if: a) The duration of the procedure exceeds one to two times the antibiotic's half-life. b) There is significant blood loss during the procedure.[24,25] The general guidelines for frequency of intraoperative administration are as follows:[21] Cefazolin every 2-5 hours, Cefuroxime every 3-4 hours, Clindamycin every 3-6 hours, Vancomycin every 6-12 hours.

Recommendation 3) Duration of prophylactic antibiotic administration should not exceed the 24-hour post-operative period. Prophylactic antibiotics should be discontinued within 24 hours of the end of surgery.[19,20] Medical literature does not support the continuation of antibiotics until all drains or catheters are removed and provides no evidence of benefit when they are continued past 24 hours.[26-28]

Antibiotic use in orthopaedic surgery for treatment of infected implants

Treatment must be chosen according to the type of infection, its bacteriology, glycocalyx production, antibiotic sensitivity, the general state of the patient, implant stability, bone stock and technical capabilities of the surgeon.

Local administration

Vancomycin and tobramycin are the most commonly chosen antimicrobial agents for local use in open fractures, but other agents, such as colistin, have begun to be investigated for this because of concern about drug resistance. Also it is noteworthy that both clindamycin and trimethoprim-sulfamethoxazole are efficacious in treating many strains of MRSA, and their use in a prophylactic capacity may obviate the complication of prophylactic use of vancomycin. It should aiso be remembered that vancomycin is bacteriostatic, whereas cephalosporins and aminoglycosides are bactericidal. For this reason the independent use of vancomycin should be avoided for prophylaxisin open fractures with colonized wounds. Likewise, antibiotic impregnated cement beads are the most commonly used source of antibiotic agents in the management of open fractures. However, this methods requires a second surgical procedure to remove the beads. Ostermann et al demonstrated that the additional use of local aminoglycoside impregnated polymethylmethacrylate (PMMA) beads significantly reduced the overall infection rate to 3.7%, compared with 12% when only i.v. antibiotics were used (only for the treatment of type III open fractures). The advantages of the bead pouch technique include: high local concentration of antibiotics, often 10 to 20 times higher than concentration provided by systemic administration, a low systemic concentration, which protects from the adverse effects of aminoglycosides, a decreased need for the use of systemic aminoglycosides sealing of the wound from the external environment with film dressing.[13] Other methods currently being investigated for providing local antibiotic prophylaxis in open fractures include vancomycin powder sprinkled below the fascia before wound closure, which has been reported in a series of patients with spinal trauma, and implants covered with an antibiotic impregnated coating or sleeve.29,30 To our knowledge currently, no results of any prospective comparative trials of such methods are available. However, high dose local antibiotic delivery is likely to become more common in the future prevention and treatment of infections.

CONCLUSION

The antibiotics are a very important adjuvant treatment in the ostheoarticular pathology. The antibiotic treatment cannot replace the simple surgical discipline and asepsis rules. The use of antibiotics in orthopaedic surgery is mainly prophylactic and therapeutic. The antibiotic

treatment is not effective as long as the source of infection (infected implant, bone sequestrum) is not surgically removed. The antibiotic prophylaxis duration should be short. A longer duration of the antibiotic prophylaxis increases the risk of microbial resistance and the cost of the treatment. For the antibiotic prophylaxis one can use international protocols, but our opinion is that the antibiotic prophylaxis should be made according to the specific germs of the hospital and their antibiotic sensitivity.The antibiotic should be used judiciously weighing the benefits against the harm.

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GIANT CELL TUMOUR OF TALUS : A CASE REPORT

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ABSTRACT

Giant Cell Tumour is describe as neoplasm of undifferentiated mesenchymal stromal cells with presence of abundant, multinucleated giant cells. Giant Cell Tumour of talus is a rare entity. In contrast to Giant Cell Tumour of long bone, most cases occur in younger age group and commonly multicentric.

INTRODUCTION

Talus is a rare site for involvement by Giant Cell Tumour. The authors report Giant Cell Tumour which had led to destruction of the more than two third of talus in a 18 year girl. In view of extensive involvement, total talectomy along with tibio-calcaneal arthrodhesis was performed with the aim of achieving a stiff but painless joint.

CASE REPORT

A 18 yr old girl presented with chief complaint of insidious onset of pain in the right ankle since last two years. Pain was described as dull ache, poorly localized, initially only on walking, butincreased gradually to persistent pain even at rest and inability to bear weight since the last six months. There was no history of trauma or fever, loss of appetite, loss of weight, similar complaints in other joint, history of similar complaint in the past. The family, occupational, recreational and drug history were not significant. The general physical and systemic examinations were within normal limits. On local examination, the attitude of the limb was neutral, Mild swelling around the right ankle and the dorsum of foot. All movement of ankle joint were painful and restricted. There were no visible veins, sinus or discharge from the swelling. The local temperature was increased and the swelling was tender. Routine blood investigations were within normallimits including erythrocyte sedimentation rate andcreative reactive protein. AP and lateral radiographs of right ankle joint showed a radiolucent lesion occupying the most of talus with expansion and thinning of the cortex. (Fig. 1). CT scan revealed an expansile soft tissue mass in the talus causing cortical destruction and extension into soft tissues. Joint space between talus and calcaneum was well preserved (Fig. 2). A fine Needle Aspiration Cytology study of the swelling was done and a provisional diagnosis of Giant Cell Tumor was made.

The condition, its prognosis and various treatmentmodalities were discussed at length with the patient. Inview of the extensive involvement of talus, total talectomywith tibio - calcaneal arthrodesis was planned. Thepatient was a manual laborer and therefore chose the option of a stiff but painless joint.

Total talectomy was performed via the standard anteriorapproach. Fusion was achieved by autologous iliac crestgraft and stabilization with a Steinmann pin (Fig. 3). Histopathological examination of the talectomy materialconfirmed the diagnosis of Giant Cell Tumor. The patientwas advised not to bear weight on the affected limb for

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10 weeks. The Steinmann pin removed on 12 weeks and mobilized in a short leg walking cast thereafter cast were removed after one and half months. At 6 months of follow-up, the patient had a smoothhealed scar with a painless and well arthrosed anklewith no evidence of recurrence (Fig. 4). There was no evidence of recurrence at 10 months of followup.

Figure 1 : Lateral radiograph of ankle showing a radiolucent lesion occupying the talus with expansion and thinning of the cortex

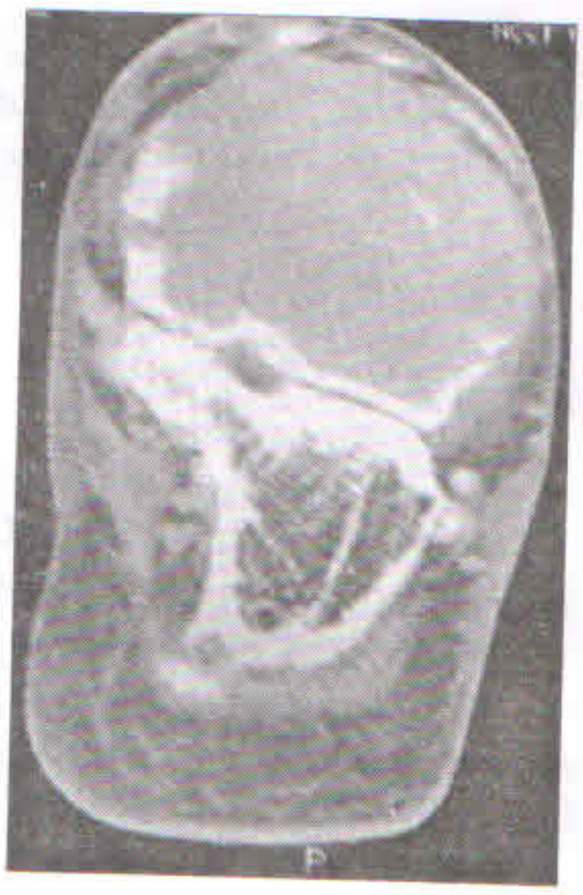

Figure 2 : CT scan of ankle showing an expansile lytic lesion inthe talus causing cortical destruction and extendinginto soft tissues.

Figure 3 : Immediate postoperative radiograph showing talectomy, bone grafting and stabilization with a Steinmann pin.

Figure 4 : Radiograph at 6 months follow-up showing a well arthrodesed ankle.

DISCUSSION

Giant cell tumor are very commonly encountered in clinical practice but lesion involving talus are uncommon. The talus is very unusual site for Giant cell tumour andis a rare entity. Giant cell tumour, also known as osteoclastoma, is a fairly common bone tumour accounting for 5% of all the primary bone tumours. It is a benign tumour with a tendency for local aggressiveness and high chances of recurrence. The most common sites are distal end of femur, upper end of tibia and lower end of radius.[1] The foot is an unusual site of presentation and giant cell tumor involving hand and foot bones appear to occur in a younger age group and tend to be multicentric.[2] The clinical picture is that of insidious onset pain, which in many cases may be mismanaged as ankle sprain. A history of preceding trivial trauma may be present. Other features are non specific. Radiologically, the tumor appears as an eccentric lytic lesion with cortical thinning and expansion. There is absence of reactive new bone formation. The tumour may erode the cortex and invade the joint. Pathological fracture may also be seen.[3] CT scanning permits accurate delineation of the tumour extent and helps in deciding the line of management i.e. Curettage Vs Talectomy.

Many authors have reported satisfactory results with intralesional curettage and bone grafting.[4] However, curettage alone has a high rate of recurrence and adjuvants like Methylmethacrylate (bone cement), Cryotherapv and Phenol have been suggested. Partial or total talectomy may be contemplated in caseswhere there is extensive involvement of the talus. Arthrodesismay or may not be done, but it is said that arthrodesis essential after resection of all tarsal bones except calcaneum.[5] Fresh frozen osteochondral allograft reconstruction has also been described for an aggressive Giant cell tumour of talus but there is paucity of literature on this particular modality of treatment.[6] The trend is towards limb salvage and amputation is reserved for recurrences and only rarely done. In this case report with extensive lesion in talus we performed total talectomy with tibio calcaneal arthodesis with end result of painless stiff joint at follow up of 10 month with no recurrence. Althogh patient need constant observation for any recurrence in future as literature shows, most recurrence of giant cell tumour of the bone can be expected within two year, some patients remain at risk for much longer period upto 19 to 30 year after curatage and bone grafting.[7] So this case is still in follow up.

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TO STUDY THE RESULTS OF ANTERIOR PLATING OF DIAPHYSEAL FRACTURE OF HUMERUS IN ADULTS

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ABSTRACT

Background and objective: During the study period, 16 diaphyseal fractures of humerus were treated by anterolateral approach and plate is placed on the anterior surface of the humeral shaft. The study was aimed to study the effectiveness of anterior plating in achieving anatomical reduction and stability of fixation, the advantage and disadvantage and to analyze the end result of surgery with respect to bony union, function of shoulder and elbow joints and the duration of post operative immobilization.

Methods: 16 cases were selected according to our decided criteria.

Results: In our study the average age of patients was 36 years with male (70%) predominantly affected and right humerus affected more commonly (58%). Most common cause of injury is road traffic accident (61%) with middle shaft (37.50%) was most common and transverse (50%) being the commonest fracture pattern. The fracture united well in time in 14 (87.50%) of patients with no delayed union and non-union cases. Good or full range range of motion of the shoulder and elbow joint was observed in 15(93.75%) patients. 1 (6.25%) patient had stiffness of the shoulder and elbow joint. According to the above results 93.75% patients (68.75% excellent, 25% good, 6.25% fair) had excellent to good results.

Conclusion: It was concluded from this study that with correct anatomical knowledge, good pre-operative planning, minimal soft tissue damage, aseptic precaution, post-operative physiotherapy, patients education and early mobilization, the anterolateral approach and plate placed on the anterior surface of the humeral shaft gives excellent results.

Key word: Diaphysealfracture; the anterolateral approach; plate osteosynthesis

INTRODUCTION

Diaphyseal humeral injuriesaccounts for 3-5% of all injuries and their pathology occur by higher energy mechanisms including road traffic accident, assaults,fall from height and throwing injuries.[1]

Treatment options for humeral fracture vary according to the type of fracture, age group, bone density, soft tissue status and associated complications. Treatment of diaphyseal humeral fracture has evolved from the conservative cast and brace[3] to internal fixation with plate and screw[8] and intramedullary nailing[8] each of these techniques has its own complications[8,13] and there is no definite data that shows the superiority of one over the other.

Majority of them are managed conservatively, there are specific operative indication that been shown to enhance the outcome of the fracture, such as failure after closed means, malunited, nonunion fractures, open fracture, poly-trauma

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patients, and fracture with associated neurovascular injuries.[2]

Intramedullary nail or Rush nail, has virtually no place in the treatment of humeral shaft fractures. Intermedullary nail or Rush nail or Küntscher nail easily lead to damage and stiffness of the shoulder joint because of interference with the rotator cuff, but they also fail to provide sufficient stability.[4] The treatment of choice for acute, uncomplicated diaphyseal humeral fractures remains non-operative.[5] When surgical treatment is contemplated, it is still generally believed that intramedullary nailing may not be the best choice.[6]

Plate Osteosynthesis remains the gold standard for the operative fixation of humeral shaft fractures, despite advances in implant technology.[7] It is associated with a high union rate, low complication rate, and rapid return to function.It has essentially no elbow or shoulder morbidity and is stable enough to allow early upper extremity weight bearing in the multiple injured patients.[1]

It is generally accepted that the best face of a long bone for plate placement is the tension face; theoretically, this is the posterior face of the Humerus.[7]

However, some authors have reported excellent results for plate osteosynthesis when using an anterolateral approach and placement of the plate on the lateral surface of the humeral shaft.[8]

The entire humeral shaft can be exposed through the anterolateral approach described by Henry,[19] without the need to visualize the radial nerve, the placement of a plate on the lateral face involves a potential risk to the nerve during the retraction of the soft tissues or by the implant itself, especially when it is placed over the middle to distal thirds of the shaft, where the radial nerve is in intimate contact with the bone. The reported global incidence of radial nerve injury is 12% when plates are placed on the lateral or posterior face of the humerus.[38] Plate on the lateral or posterior face both situations are technically demanding and require extensive surgical dissection with risk of injury to the radial nerve, which invariably crosses the surgical field.

In anterolateral approach and plate is placed on the anterior surface of the humeral shaftas this approach avoids radial nerve identification, there is also low risk of iatrogenic radial nerve palsy, making the procedure simpler, faster, and safe.[9]

MATERIAL AND METHODS

This prospective study was conducted at the Department of Orthopaedics of S.N. Medical College, Agra. Patient were selected from patients attending to emergency department and OPD of Orthopaedics.

Selection of Cases:

1. Patients with Diaphyseal fracture shaft of humerus.
2. Closed and open fracture grade 1

Inclusion Criteria:

1. Age group between 18-60 years.
2. There will be a random selection of cases
3. Closed fracture.
4. Compound fracture grade 1 and grade 2

Exclusion Criteria:

1. Compound fracture grade 3
2. Pt having age <15 yrs and > 60 years

Exposure:

Incise the skin in line with the anterior border of the deltoid muscle from a point midway between its origin and insertion, distally to the level of its insertion, and proceed in line with the lateral border of the biceps muscle to within 7.5 cm of the elbow joint

Divide the superficial and deep fasciae, and ligate the cephalic vein.

In the proximal part of the wound, retract the deltoid laterally and the biceps medially to expose the shaft of the humerus

Distal to the insertion of the deltoid, expose the brachialis muscle, split it longitudinally to the bone, and retract it subperiosteally, the lateral half to the lateral side and the medial half to the

medial. Retraction is easier when the tendon of the brachialis is relaxed by flexing the elbow to a right angle. The lateral half of the brachialis muscle protects the radial nerve as it winds around the humeral shaft.

POST-OPERATIVE TREATMENT & FOLLOW UP

The limb was elevated and IV antibiotics to be given for 5-6 days and then oral broad spectrum anti-biotics for next 5-6 days.Long arm cast for 4-7 weeks, but with gross osteoporosis POP cast was given for 6-8 weeks. Stitches was removed on 12th post operative day. Shoulder joint movements was started as soon as pain subside usually after 3-4 days, the POP cast was used to be removed at the time of exercises and reapplied after the exercises were over.

Patients were followed monthly for 1st 3 months and then 3 monthly. Assessment was done clinically and radiologically for movements at the elbow joint, range of motion at the shoulder joint, pain, any angulations and rotational deformity, any other complaints.

RESULTS

In our study 16 cases of fracture of the shaft humerus were treated by open reduction internal fixation with the anterolateral approach and plate is placed on the anterior surface of the humeral shaft. All patients were evaluated periodically, clinically and radiologically prior and after surgery. The average age of patients was 36 years with majority of the patients in 2nd and 4th decade of life. Male (70%) were predominantly affected with right humerus affected more commonly (58%). Mostcommon cause of injury is road traffic accident in 61% cases. There were12 (75%) closed fracture and 3 open fracture (type-1 Gustilo Anderson). Middle third shaft (37.50%) was most common and transverse or oblique (50%) being the commonest fracture pattern. The fracture united well in time in 14 (87.50%) of patients with no delayed union and non-union cases. Good or functional range of motion of the shoulder and elbow joint was observed in 15 (93.75%) patients. 1 (6.25%) patient had stiffness of the shoulder and elbow joints.

According to the above results 93.75% patients (68.75% excellent, 25% good, 6.25% fair) had excellent to good results. There were 2 cases who suffered from superficial infection which improved on regular dressing and antibiotics, and 1 case of joint stiffness which improved on regular physiotherapy.

DISCUSSION

The management of trauma is rapidly changing with ever changing severity and complexity of the fracture.[34]

The choice of operative treatment depends on many factors. McKee[34] divided the indications into three categories:

(1) Fracture indications (2) Associated injuries (3) Patient indications

While some of these indications are absolute, such as an associated vascular injury or an associated higher grade open wound, many are relative and both patient and fracture features must be considered before deciding on treatment.[34]

Operative treatment involves ORIF using plates and screws, external fixation, or minimally invasive methods, such as intermedullary nailing. Although the entire humeral shaft can be exposed through the anterolateral approach described by Henry,[36,37] without the need to visualize the radial nerve, the placement of a plate on the lateral face involves a potential risk to the nerve during the retraction of the soft tissues or by the implant itself, especially when it is placed over the middle to distal thirds of the shaft, where the radial nerve is in intimate contact with the bone. The reported global incidence of iatrogenic radial nerve injury is 12% when plates are placed on the lateral or posterior face of the humerus.[38,39,40]

As far as we know, Jupiter's[41] is the only report in the English literature in which the plate was placed on the anterior surface of the humerus via a medial approach. Although this approach is

appropriate when a vascularised bone graft is used, we believe that it places the humeral vasculature at risk, because the nutrient artery enters the humerus medially, as described by Laing[42] and when there is no need for a vascularised bone graft, a simpler, easier, and safer approach is advised.

All of our cases healed in about the same time as other methods classically used for treating humeral shaft fracture which leads us to believe that placing a plate over the tension face of the humerus is of little clinical significance. The biological benefits of less damage to the soft tissues via an approach that uses a plane between nerves certainly contributed to our good results. There was no infection and all cases achieved fracture union.

Anterior plating is a simple, safe, and effective treatment for humeral shaft fracture. It does not require radial nerve visualization or extensive soft tissue dissection, and the healing time is similar to that of other methods used for treating humeral shaft fracture. Given our results, we are confident in suggesting this alternative approach to osteosynthesis of humeral shaft fracture, in which the plate is placed on the anterior surface of the bone.

In 1982, P.V.A.Mohan das series of 30 cases of fresh humeral shaft fractures were treated by open reduction & internal fixation with compression plates. Patients varied in their ages from 15-60 yrs. The fractures occurred in 3 at upper third, 20 at the middle third & 6 at lower third of the Humerus.All the cases united,

4 patients has radial nerve involvement postoperatively but recovered completely within 6 months. Another study In 1998, Lin J. and Hou SM et al reported his study comprising locked humeral nail with plate and screw fixation in fracture shaft humerus, and concluded that nailing offered a less invasive technique and more favorable outcome than plate fixation. 55% patients were in range of 20-50 years and mean age 25 years.

In our study the commonest mode of injury was road traffic accident 61% were treated by open reduction & internal fixation with anterolateral approach and plate is placed on the anterior surface of the humeral shaft. This osteosynthesis method had no failures and no malunions cases were found. This observation is also better to the observation of other studies.

In our series Union of the fracture was considered when

1. Rotator/angulatory strain painless
2. Bridging callus present
3. No pain on full unsupported function of upper limb.

In our study16 humeral fracture were plated in 16 patients.

There were 11 men & 5 female with an average age of 36 years. Duration of follow-up in our series varies from 6-18 months. The maximum follow up in 26 (40%) cases ranged from 12-16 weeks. 2 fractures (12.50%) cases united within 12 weeks. 8 cases (50%) united within 12- 16 weeks, while 6 fractures (37.50%) united within 16-24 months. 2 cases had superficial wound infection, which was controlled, treated and healed with regular dressing and specific antibiotics after culture and sensitivity. The cases of infection were because of compound nature of the fracture. This observation is also similar to the observation of other studies. Hardware prominence, no any such problem was noticed in our study.

In our study movements at the shoulder and the elbow, joints were noticed at the end of follow-up. Majority of cases have a good range of movement at the shoulder joint. Full functional recovery was noticed in all the cases.

In elbow joint full functional recovery was noticed in almost all cases.

Other complications like chest infection, pulmonary embolism, fat embolism, deep vein thrombosis were not noticed in our series.

SUMMARY AND CONCLUSION

The results obtained in this study have shown that this technique is safe, convenient and

effective, since there was no obvious damage, nor major complications. In addition, 16 fractures healed within a similar healing time to other methods with both good alignment and function of shoulder and elbow joints.

Advantages of applying plate on the anterior surface of the humeral shafttechnique are as follows:

It is suitable for humeral shaft fractures middle and distal one third.

The radial nerve is not at risk as long as the forearm is kept in supination during the procedure

No screws are inserted into that part of the humeral shaft where the radial nerve runs along the spiral groove.

The advantages of this technique regarding safety and convenient, without requiring special tools and demanding implants or excessive radiographic control.

The plate stability allows a fast rehabilitation with superior functional results comparing with the conservative techniques.

The anterolateral approach and plate is placed on the anterior surface of the humeral shaft for shaft humeral fractures provided satisfactory clinical and radiological outcomes considering high union rate and minor complications and it is safe and effective surgical treatment method and an alternative option to open techniques.

The results obtained with this technique are encouraging. The technique was associated with no shoulder pain and an almost complete restitution of strength and articular range of motion. Within 6 months, 93% of the patients returned to their normal activities.

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A RANDOMIZED CONTROLLED TRAIL TO COMPARE THE MANAGEMENT OF GUSTILO ANDERSON TYPE I & II FRACTURE TIBIA & FIBULA BY PLASTER OF PARIS CAST METHOD AND EXTERNAL FIXATOR METHOD

Singh J.* **Singh G.K.****

ABSTRACT

Aim: The aim of the present study was to compare the effectiveness in terms of union of bone between external fixator method management with closed POP cast method management in Gustillo Anderson Type - I & Type - II open fracture of Leg.

Introduction: Management of open fracture of leg are the subject of on going controversy and discussion despite newer innovation in implant and External Fixator device.

Three main techniques were used earlier to treat for open fracture. 1. Dressing were done by Dakin's Solution. 2. The wound was merely exposed and allowed to granulated. 3. Managed by closed plaster.

These teachniques are practice in the developing country setting but to compare the management of Gustillo Anderson Type - I & Type - II open fracture of Leg by POP cast method and External Fixator Method and different and have not being compared using rigorous research methodology. This was the need of this study.

Methods: We study over forty consucative patient coming to emergency department of orthopaedics surgery csm medical university up after informed consent and allocated in two group i.e. closed plaster [cp]group and external fixator [Ef]group and followed on days day 1, 14, 28, 42, 12 weeks, 16 weeks and 20 weeks.

Result: In the study was seen that wound in Gustillo Anderson Type - I & Type - II open fracture of Tibia and Fibula are better managed in CP group in term of better rate of healing and union of bone rather than external fixator group.

Conclusion: After considering all result study proof that POP method is gives good result but also easy to apply in day to day practice rather that External Fixator Method.

INTRODUCTION

Earlier three main techniques were used to treat this open fractures.

1. The dressing were done by Dakin's Solution.
2. The sound was merely exposed and allowed to granulated.
3. Wound and fractures managed by closed Plaster and External Fixator.

India is a developing country and the leg bone particular Tibia is subcutaneous bone which fracture more commonly compound fracture grade I and grade II. The management of compound fracture of the Tibia by using External Fixator or

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Plating or Nailing which are very costly and people our country are low socio economy status are not capable of to afford these method. The past few year have seen a rapid increase in popularity for the of the External Fixator method in primary treated of complicated fractures. It is seen that 23.05% of these fracture open fractures.

These techniques are being practiced in the developing country setting but to compare the management of Gustillo Anderson type I & II fracture tibia and fibula by Plaster of Paris casts method and External Fixator method keeping in mind the above fracture the present study has been done to see the effectiveness of POP cast method and External method for management of compound fracture leg.

METHOD

The aim of randomized study to compare the effectiveness in the terms of union of bone between -

- External Fixtor method
- Plaster of Paris Casts Method

After wound debidement in the management of wounds of Gustilo Grade I and Gustilo Grade II of open fractures of tibia in terms of -

Wound healing which was defined as -

- Difference in the size of wound from the initial wound on 3 weeks, 6 weeks, 3 months, 6 months.
- Presence of healthy granulation tissue on 3 weeks, 6 weeks, 3 months, 6 months.
- Absence of purulent discharge on 3 weeks, 6 weeks, 3 months, 6 months.

Forty consecutive patient with Gustilo Grade I and Gustilo Grade II open Fracture of Tibia were included in the study after informed consent. They were allocated to groups. The patient were randomly allocated to one of the two groups namely Closed Plaster in (CP) group (group 1) and External Fixator (EF) group (group 2). After through wound debriment and reduction of Fracture CP group was treated with the application of above knee closed plaster as it is applied for any injury to the leg. In the EF group fracture were stabilized by external fixators as described.The patient's skin was prepared and trouniquet applied but not inflated. Washing and draping of the wound was done as for a normal surgical procedure but allowing for a wide exposure of the involved area. The debridement of tissue began at the skin. Devitalized skin was removed until bleeding was visible in the skin edge. In a similar fashion the subcutation tissue was removed, including all contaminated tissue.

The wound was enlarged sufficiently to allow adequate debridement and exposure of the fracture. After all dead tissue had been removed; irrigation of the wound could be closed, the surgically created wound was closed first. Thereafter according to the randomized group, the fracture was stabilized by the help of an above knee plaster of paris cast while for the external fixation was done.

External fixator was applied after sharply incising the skin with short longitudinal incisions along safe zones. Bone was reached along the subcutaneous border of the tibia. A drill sheath was used during low-speed power drilling tapping and pin insertion. Pins were inserted by hand through sheaths with a T-handle. The follow-up was done every 3 weeks, 6 weeks, 3 months, 6 months and the condition of the wound was noted. The wound in the plaster cost was inspected through a window and a Check X-ray was done to ascertain the alignment of reduction and if needed (i.e. loosening, lost reduction) the cost was changed. If no manipulation was needed or if the cost was not loose then the window was closed after dressing the wound with normal saline. Povidon-iodine and sterile gauze. For the External Fixator group, the patient was to get dressing done as per the condition of the wound and dressing was done mostly by normal saline, povidon-iodine and hydrogen peroxide (if needed). All the dressing were done mostly on OPD basis. Skin grafting was done as the wound healed and showed healthy red granulation tissue without any discharge.

STOP RULES

The allocated treatment was to stopped if -

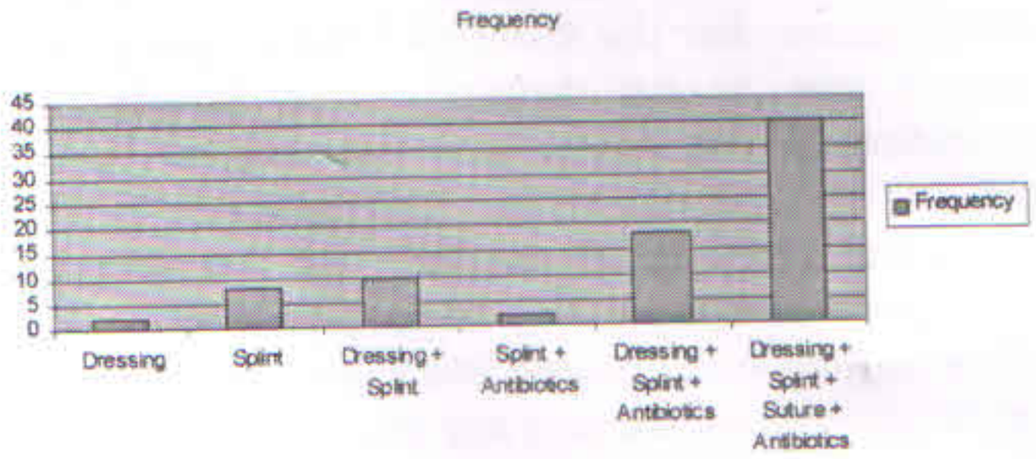
If in a smaller sample one group proved to better clinically and statistically then the trial wound have been stopped and all recruited patients were to receive the better treatment.

In the closed plaster group if there was -

1. High grade fiver above 103°F associated with tachycardia.
2. Excessive swelling and tenderness of regional lymph nodes.
3. Edema of distal part of the extremity.
4. Features of impending compartment syndrome.
5. Odour which was intolerable to the patient.
6. Pain to relieved by analgesics.
7. Vascular insufficiency suspected.
8. Gas gangrene suspected.

OBSERVATION AND RESULT

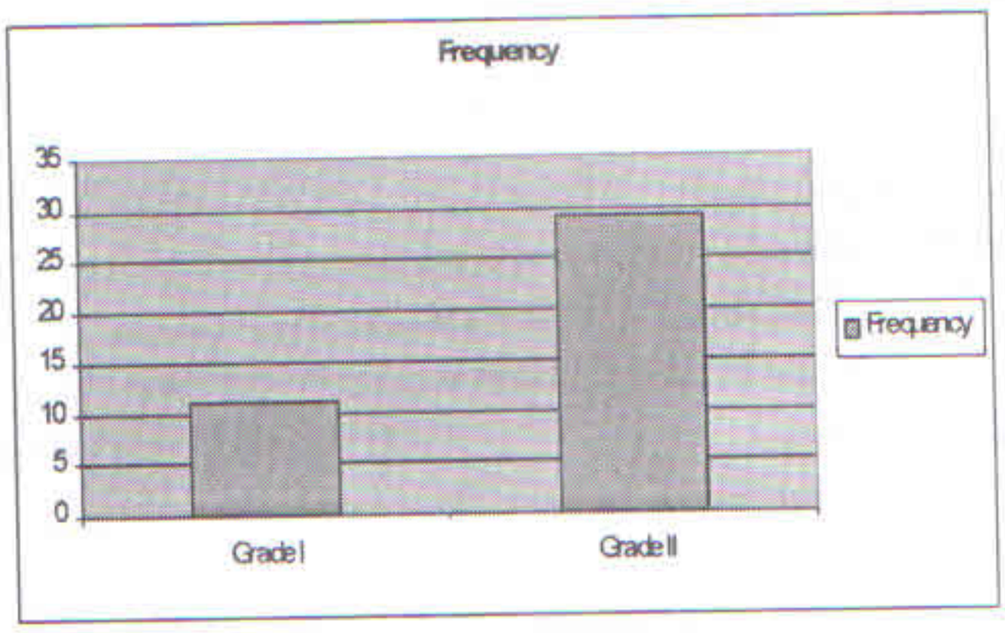
Received	Frequency	Percent
Dressing	2	5.0%
Splint	8	20.0%
Dressing + Splint	10	25.0%
Splint + Antibiotics	2	5.0%
Dressing + Splint + Antibiotics	18	45.0%
Dressing + Splint + Suture + Antibiotics	40	0.0%
Total	**40**	**100.0%**



- Maximum patient who received primary treatment before arriving in the hospital were give antibiotics, dressing and splintage of the fracture.
- Then the next amount of patient were giving dressing and splintage followed by only splintage.
- Thus splintage was the most common firstaid which was given to the patient followed by dressing and then antibiotics.

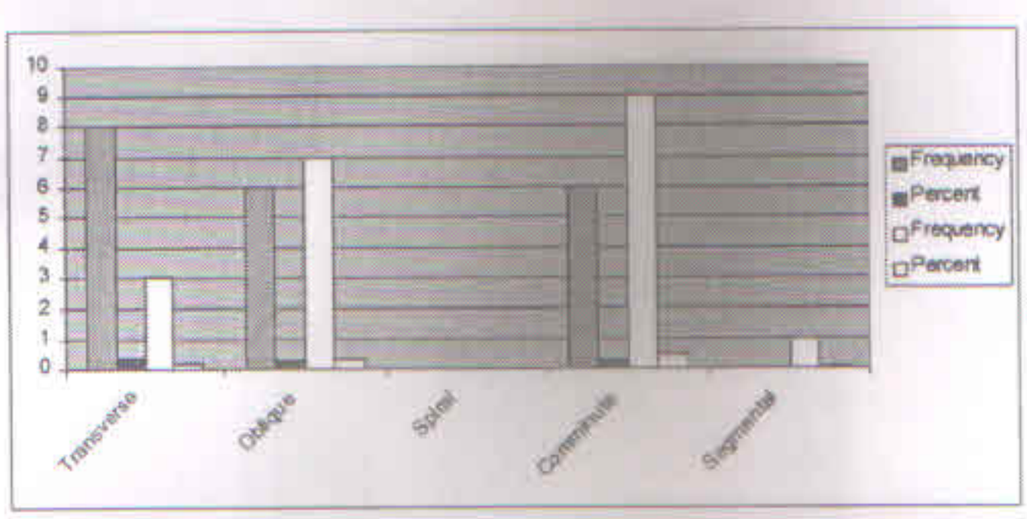
Frequency of the Diagnosis amongst the two group of treatment:

Diagnosis	Treatment - Cast Frequency	Treatment - Cast Percent	Treatment - Fixator Frequency	Treatment - Fixator Percent
Grade - I	9	45.0%	4	20.0%
Grade - II	11	55.0%	16	80.0%
Total	**20**	**100.0%**	**20**	**100.0%**



There were more patient of Gustilo grade II Fracture treated by both the methods :

Fracture Pattern	Treatment - Cast Frequency	Treatment - Cast Percent	Treatment - Fixator Frequency	Treatment - Fixator Percent
Transverse	8	40.0%	3	15.0%
Oblique	6	30.0%	7	35.0%
Spiral	0	0.0%	0	0.0%
Comminute	6	30.0%	9	45.0%
Segmental	0	0.0%	1	5.0%
Total	**20**	**100.0%**		**100%**

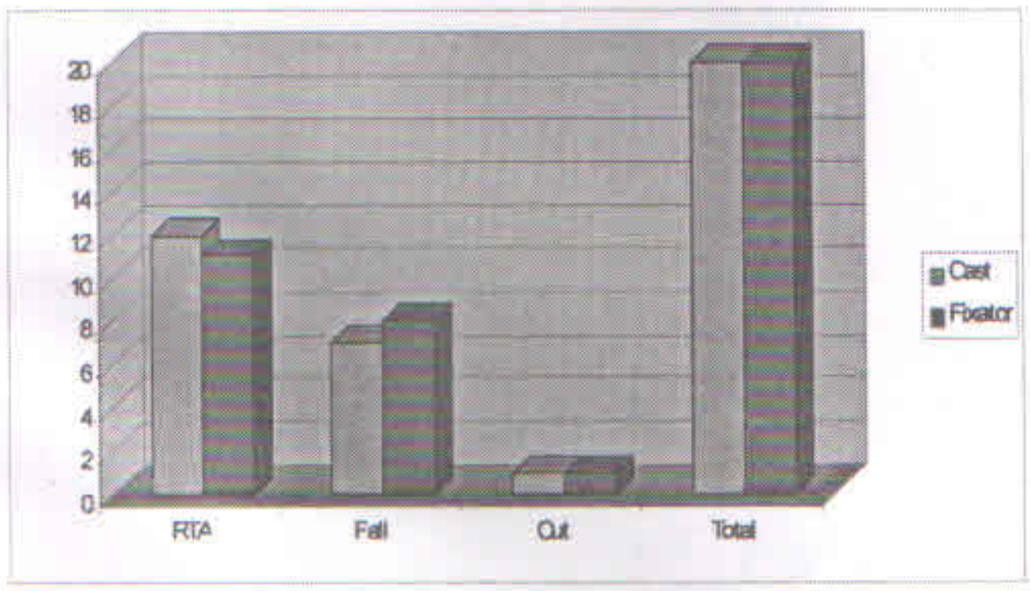


- Comminuted and oblique fracture accounted for nearly 80% patient in both the group.

Frequency of mode of injury among the two group of patients :

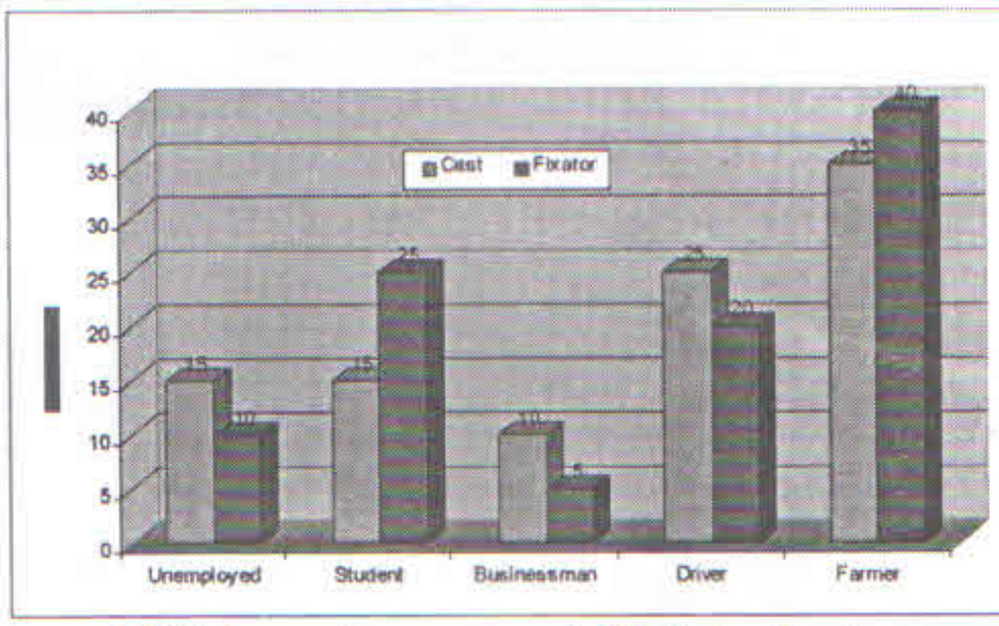
Mode	Treatment - Cast Frequency	Percent	Treatment - Fixator Frequency	Percent
RTA	12	60.0%	11	55.0%
Fall	7	35.0%	8	40.0%
Cut	1	5.0%	1	5.0%
Total	**20**	**100.0%**	**20**	**100.0%**

- Most injuries were sustained during either motor vehicular accident or during fall from heights accounting for nearly 90% of the fraction of both group of study.



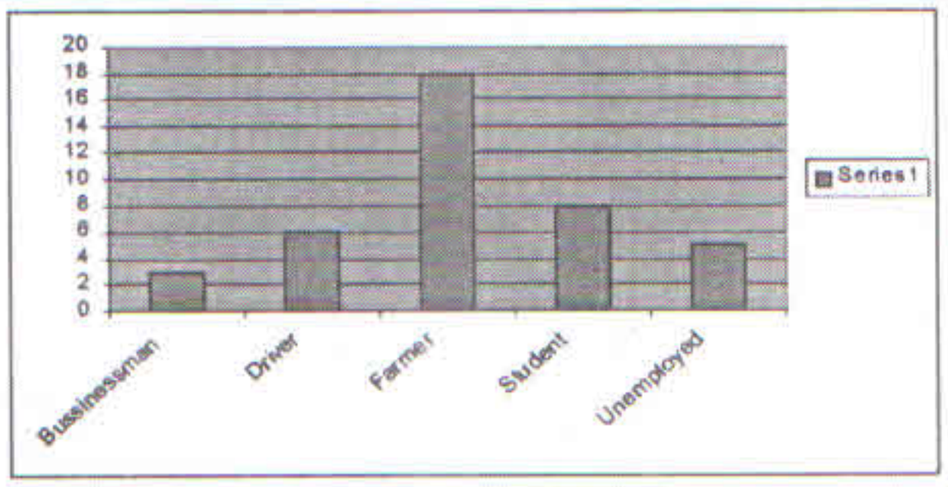
Frequency of occupation of injury among the two group of patients :

Occupation	Treatment - Cast Frequency	Percent	Treatment - Fixator Frequency	Percent
Unemployed	3	15.0%	2	10.0%
Student	3	15.0%	5	25.0%
Businessman	2	10.0%	1	5.0%
Driver	5	25.0%	4	20.0%
Farmer	7	35.0%	8	40.0%
Total	**20**	**100.0%**	**20**	**100.0%**

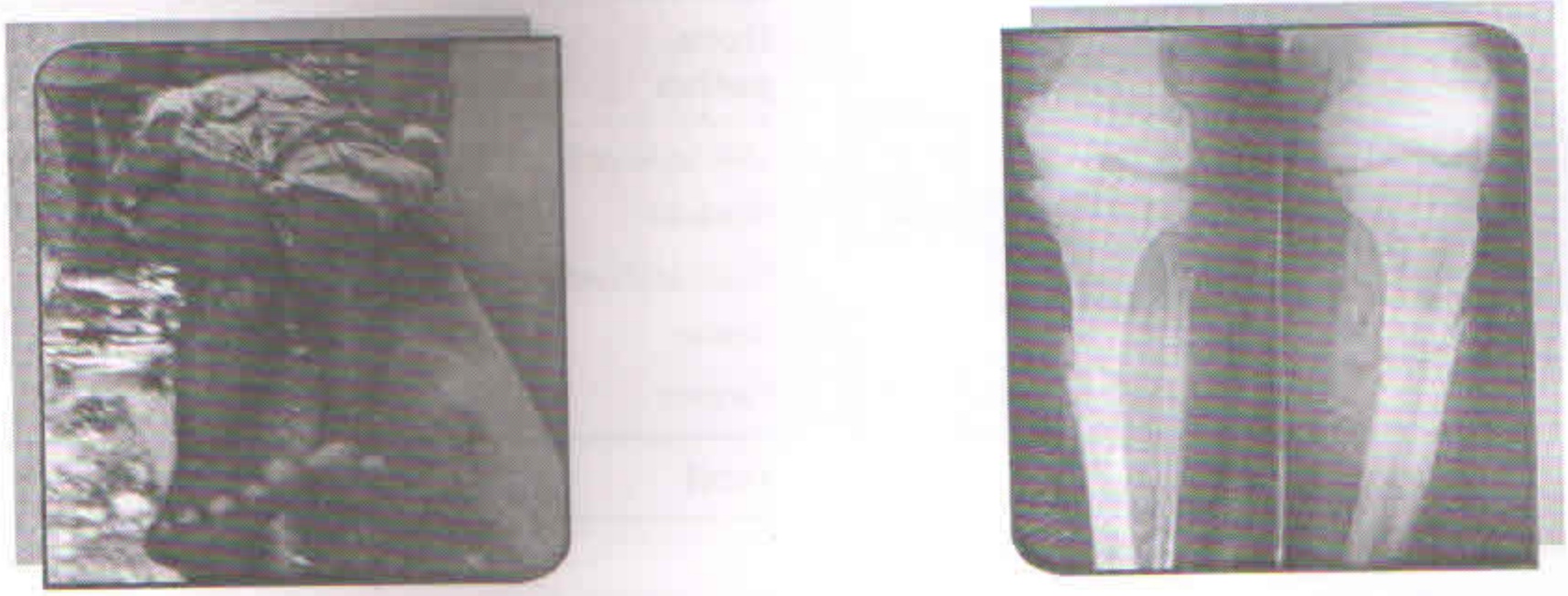


- 60% in cast group and 70% in fixator group were the patient who were economically productive to the society.

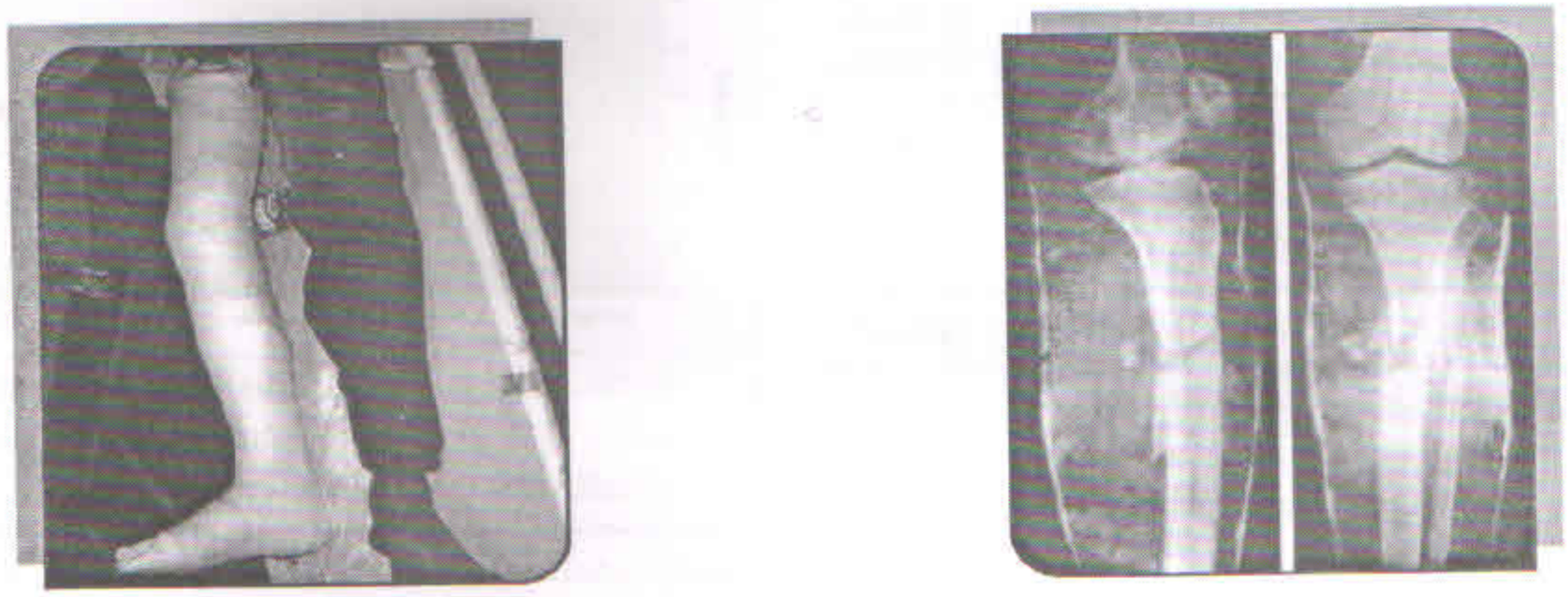
Occupation	Frequency	Percent
Businessman	3	7.5%
Driver	6	15.0%
Farmer	18	45.0%
Student	8	20.0%
Unemployed	5	12.5%
Total	**40**	**100.0%**



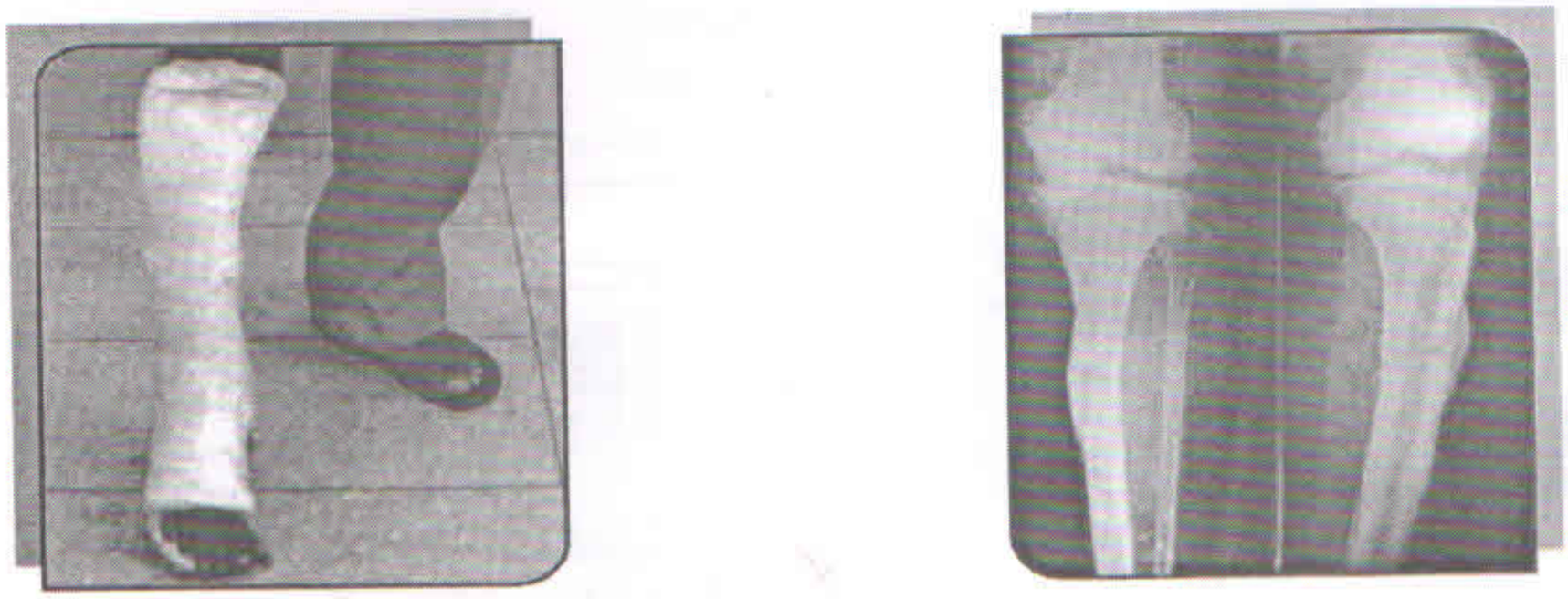
- Earning members of the family were injured in 67.5% of the patient.



PRE-OPERATIVE

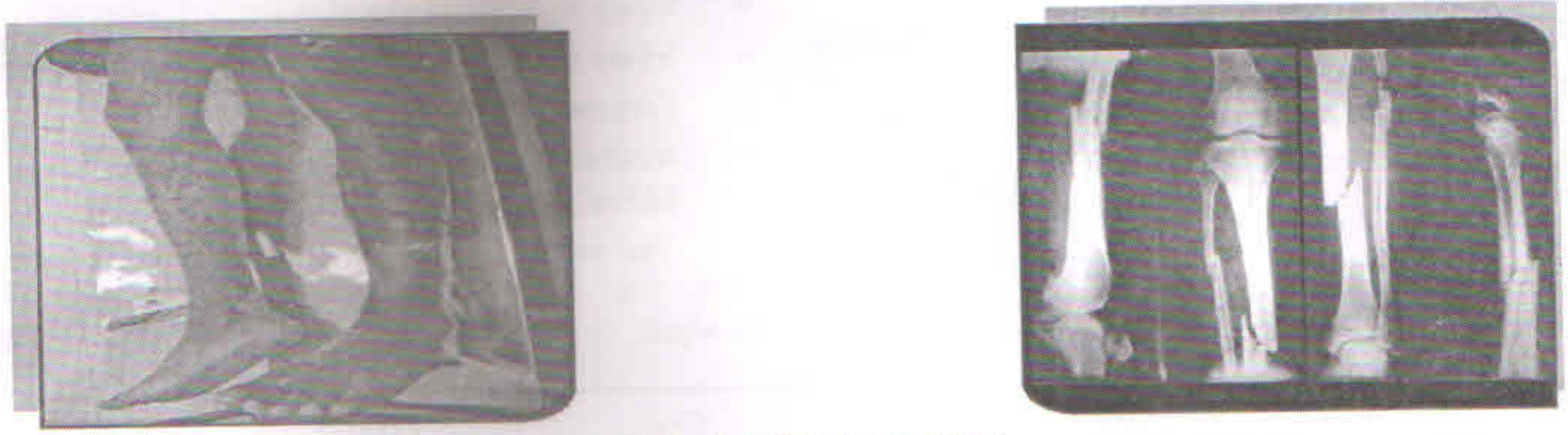


POST-OPERATIVE



AFTER 6 MONTHS

POP Cast Method



PRE-OPERATIVE

POST-OPERATIVE

AFTER 6 MONTHS

External Fixator Method

Test for successful randomization of the two groups

On univariate analysis, the two groups were found to be matched successfully as per the

- Age
- Sex
- Mode of injury
- Side of injured limb
- Site of the wound
- Injury to hospital duration
- Injury to intervention duration
- Facture pattern
- Availment of primary medical care before arrival in hospital

The table underneath show the two groups with the significance values after univariate analysis.

Variable	Means	Cast	Fixator	P values
Age in year	32.97±11.79	31.05±10.94	34.71±12.52	0.34
Sex	Male Female	18 2	17 3	0.31
Occupatin	Dependants Non de	6 14	7 7	1.6
Site of involvement	Anterior Posterior	16 4	15 5	0.71
Mode	RTA Non RTA	12 8	11 9	0.07
Gustilo grading	Grade I Grade II	9 11	4 16	0.17
Side	Right Left	14 6	12 8	0.53
Fracture patterns	Comminuted Non comminuted	6 14	9 11	0.51
Primary aid	Received Non-received	14 6	14 6	0.32
Injury hospital Duration in hours		7.71±2.86	3.57±1.01	0.00
Injury-intervention duration in hours		24.90±9.69	6.21±2.43	0.00

Thus the randomization of the two group was successful.

After testing successful randomization, the two groups were compared on the outcome variables being which were -

- Difference in the size of wound of days. 3 weeks, 6 weeks, 3 months, 6 months
- Appearance of granulation tissue on days: 3 weeks, 6 weeks, 3 months, 6 months
- Absence of discharge on days: 3 weeks, 6 weeks, 3 months, 6 months
- Duration of hospital stay of the patient

These variables were also passed through univariate analysis and they were found to the significantly deferent in two groups.

Variables/Groups	Cast mean	Fixator mean	P values
Difference in size of wound on 3 week in cm	3.48±3.27	1.37±0.93	0.03
Difference in size of wound on 3 month in cm	0.07±0.17	0.00±0.00	0.09
Difference in size of wound on 6 week in cm	1.19±1.69	0.42±0.34	0.06
Difference in size of wound on 6 month	0.00	0.00	0.00

The difference in healing of the wound by the two modalities was found to be non-significant. Implying that the rate of wound healing by the two treatment option is similar.

Variable/Groups	Means	Cast	Fixator	P values
Granulation on 3 weeks	Present	17	7	0.01
	Absent	3	10	
Granulation on 6 weeks	Present	12	10	0.26
	Absent	3	7	
Granulation on 3 months	Present	17	17	0.23
	Absent	3	0	
Granulation on 6 months	Present	20	20	0.0
	Absent	0	0	
Discharge on 3 weeks	Non-purulent	20	13	0.03
	Purulent	0	4	
Discharge on 6 weeks	Non-purulent	20	16	0.45
	Purulent	0	1	
Discharge on 3 months	Non-purulent	20	17	0.0
	Purulent	0	0	
Discharge on 6 months	Non-purulent	20	20	0.0
	Purulent	0	0	0.0

From the point of view of the quality of wound healing it was seen that the absence of the purulent discharge was significantly higher in the cast group thus suggesting a better wound heeling is cast group at three weeks of observation.After three weeks when the patient was again studied the two groups showed non-significant difference and at six weeks all the wound had not purulent discharge except one of fixator group after three months all the wound had not purulent discharge.For the granulation tissue there was very high significance in the appearance of red granulation tissue in cast at three weeks thus there was faster healing of wound in the cast group at three weeks. At the follow up six weeks and three months and six months the significance was not appreciable on univariate analysis.

FOLLOW-UP

Giving certain exception (mentioned below) patient sin both groups were followed up on days 3 weeks, 6 weeks, 3 months, 6 months of the treatment unless there are other reasons to fallow them up earlier and wound healing time and the condition of the wound at six weeks was noted other parameters were also noted for various result. The main out being studies was to the comparative the management of Gustillo Anderson type I and II

fracture tibia and fibula by plaster of paris casts method and external fixator method for a duration of 3 weeks, 6 weeks, 3 months, 6 months.

Outcome Measurement:

Measurements were taken as follows:

Size of wound in square centimeters was taken by taking an important of the wound on a sterile gauze piece and transferring the imprint into a graph paper and measuring the number of square centimeters covered.

Granulation tissue of the wound was graded as per the visual observation into 0= absent, pale = 1, pink = 2 and red = 3.

If the epithelization of the wound was completed before six weeks then that was noted else the condition of the wound was noted at each follow up and split skin grafting was done when the wound was fit for the same and that time was noted.

In the EF group dressing of wound was done as indicated by its condition.

The condition of the wound on 3 weeks, 6 weeks, 3 months, 6 months was recorded on the performa. Skin grafting was done when the wound became fir for the same.

DISCUSSION

Management of fracture shaft tibia and fibula are the subject of on going controversy and discussion despite of newer innovation in implant and external fixation device.Tibial diaphyseal fractures are the commonest long bone fracture faced by the Orthopaedic surgeon. Of these fractures, 23.5% are open fractures.Our hypothesis that the two studies treatment result in a similar rate of healing was proved in the observation that the rate the difference the size of the wound was found to be non significantly different in the two groups seen by the p - values of the means between the two group at. This is seen in our observation that there was healthy granulation tissue in 20 to 20 patients in cast group while in the fixator group, there was healthy granulation in 3 out of 17 patients.The duration of hospital stay was also seen to be significantly different because the patients in whom cast was applied were discharged the next days after checking for neurovascular assessment with explained instructions to follow up immediately in case of any explained stop rules of the treatment because no further intervention was required for the next three weeks. While in the fixator group, the patient was retained for wound inspection after two days. Regular dressings were done and they were discharged when the wound became healthy. These two different managements resulted in a statistically different durations of hospital stay in cast group at 2 days and in the fixator group at 7 days. This is seen in the significant p-value observation of 0.0005.Thus in the study it was seen that wound in the Gustilo grade-I and Gustilo grade-II open fracture of Tibia are better managed in closed plaster treatment in terms of better rate of healing of wound and union of bone to the patient. The lower duration of hospital stay effectively can result in a better turnover of patients.

CONCLUSION

There was relatively more patients with Gustilo grade II injury.There were more patients of Gustilo grade two fracture treated by both the methods.65% in cast group and 70% in the fixator group were the patients who were economically productive to the society.After successful randomization, the two group showed significant difference in rate of wound healing and lack of purulent discharge at three weeks.Rate of reduction of size of wound was not significant thus the healing was similar and no effect was seen by the size of the initial wound.Thus in the study it was seen that wound in the Gustilo Grade I and II A open fractures of Tibia are better managed in closed plaster treatment in terms of better rate of healing of wound.

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CONSERVATIVE MANAGEMENT OF KOHLER'S DISEASE: A CASE REPORT

Kumar D.* **Pal C.P.**** **Verma S.***** **Singh M.*****

ABSTRACT

Introduction: Kohler's disease is a rare, self-limiting, avascular necrosis of the navicular bone commonly seen male child 4-6yrs of age.

Case Report: A 7-year-old boy presented with intermittent right foot pain for 1 week. Pain worsened the previous day after playing outside following which he was unable to bear weight on the right foot. On examination, he had pain and tenderness over his right dorso-medial midfoot with no local skin changes. He walked with an antalgic gait with weight bearing on the lateral aspect of the foot. His right foot radiograph and CT showed a collapsed, flat, and radio-dense navicular bone. He was managed conservatively with short leg POP cast for 8 weeks in moderate varus (150) and equinus (200) and analgesics. After 8 weeks of POP cast patient was given arch support for 6 months. After a follow up of 14 months he had normal bone growth with no pain.

Conclussion: Osteonecrosis of navicular bone i.e. Kohler's disease is managed conservatively with short leg POP cast for 6 to 8 weeks in moderate varus (100-150) and equinus (100-200), analgesics and rest. Arch support can be prescribed following the cast period for 6 months. There is normal bone growth of navicular bone following this treatment.

Keywords: Kohler's disease; self-limiting; conservative.

INTRODUCTION

Köhler's disease is rarely seen idiopathic osteochondrosis of the tarsal navicular bone.[1] It was described in 1908 for the first time by Köhler.[2] Kohler's disease occurs predominantly in male children and mostly seen at ages of 4-6 yrs. The main symptoms of the disease are the localized pain in foot and limp on walking.[2] In this paper, we presented a-seven years old boy who had Kohler's disease of right foot.

CASE REPORT

A 7-year-old boy presented with intermittent right foot pain for 1 week. Pain worsened the previous day after playing outside following which he was unable to bear weight on the right foot. On examination, he had pain and tenderness over his right dorso-medial midfoot with no local skin changes. He walked with an antalgic gait with weight bearing on the lateral aspect of foot. His right foot radiograph showed a collapsed, flat, and radio-dense navicular bone (Fig. 1). CT of the right foot also shows avascular necrosis of navicular bone with soft tissue swelling (Fig. 2). He was managed conservatively with short leg POP cast in moderate varus (15°) and equinus (20°) for 8 weeks and analgesics. After 8 weeks of POP cast patient was given arch support for 6 months. After a follow up of 14 months he had normal bone growth with no pain.

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Figure 1 : Oblique and anteroposterior radiographs of right foot showing ostechondrosis of navicular bone at the time of presentation.

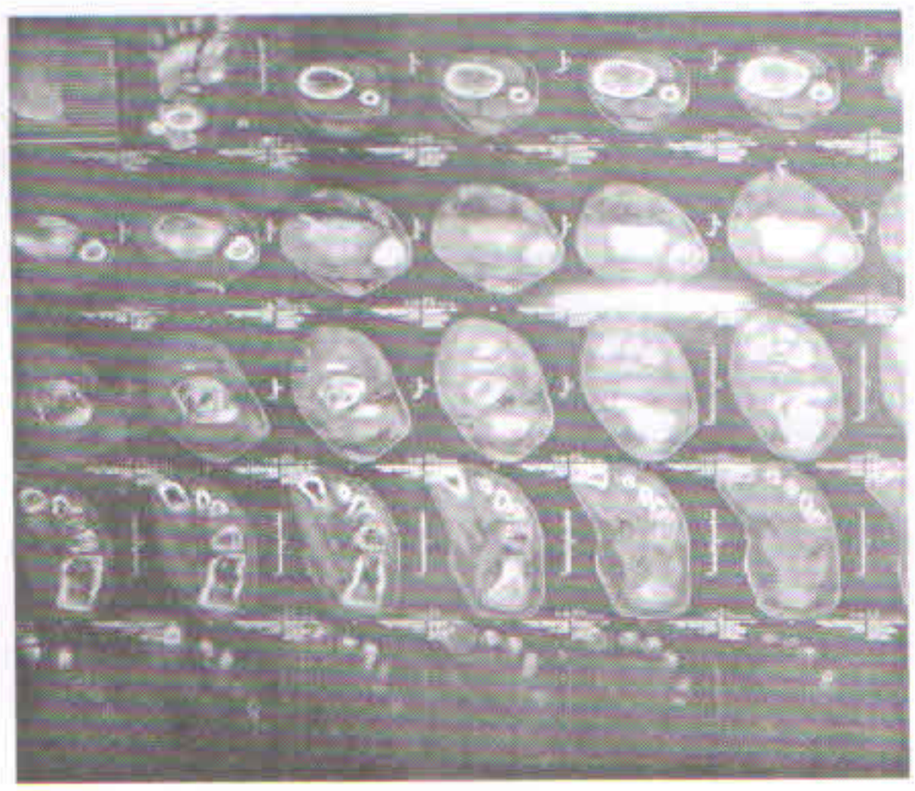

Figure 2 : CT of right foot

Figure 3 : Anteroposterior and Oblique radiographs of right foot showing navicular bone after 10 months.

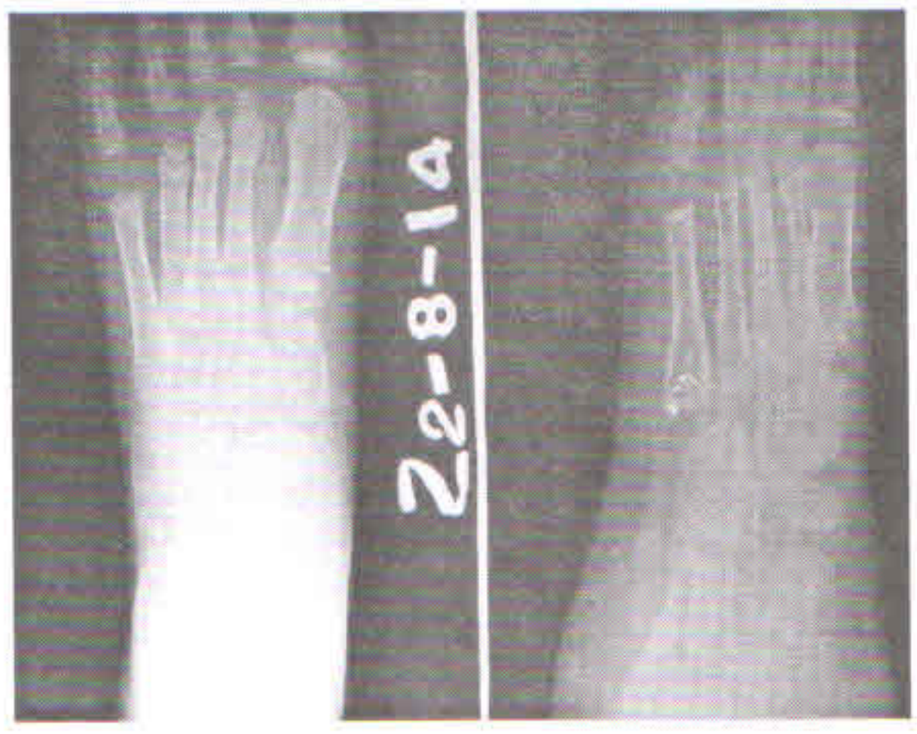

Figure 4 : Anteroposterior and Oblique radiographs of right foot showing navicular bone after 14 months.

DISCUSSION

Kohler's disease is a rare, self-limiting, avascular necrosis of the navicular bone, first described in 1908. It is usually unilateral and most often affects boys. Its usual onset is between 4 to 5 years of age but can present as early as 2 years of age. Girls with this condition are often younger than boys, probably owing to earlier onset of ossification.[1,2] The pathophysiology of this condition is best explained by a mechanical cause associated with a delayed ossification. Navicular is the last tarsal bone to ossify and can get compressed between the already ossified talus and cuneiforms when the child becomes heavier. This in turn compresses the navicular bone's perichondral ring of blood vessels, producing ischemia of the central spongy bone and avascular

necrosis. The prognosis remains excellent owing to this radial arrangement of blood supply.[3] Radiologic findings show patchy areas of sclerosis and rarefaction in navicularbone with loss of normal trabecular pattern. Sometimes the navicular may appear collapsed or may be normal in shape with a uniform increase in density and minimal fragmentation. Treatment includes pain control and using soft arch supports or medial heel wedge. Patients with worse symptoms may benefit from a short leg cast for 4 to 6 weeks. Symptoms in untreated patients last longer than in treated patients (15 months vs 3 months).[4,5] Patients with persistent pain should be examined for other conditions such as talar coalition. Radiographic findings may be normal 6 to 18 months after onset and almost all patients eventually recover excellent function. The type of treatment does not alter the radiographic course of the disease or the final result.[5]

CONCLUSSION

Osteonecrosis of navicular bone i.e. Kohler's disease is managed conservatively with short leg POP cast for 6 to 8 weeks in moderate varus (10°-15°) and equinus (10°-20°), analgesics and rest. Arch support can be prescribed following the cast period for 6 months. There was normal bone growth of navicular bone following this treatment.

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MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS (MIPO) FOR TREATMENT OF DISTAL TIBIAL METAPHYSEAL FRACTURES

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ABSTRACT

Key Words : MIPO, distal tibia fracture, biological plating

INTRODUCTION

Fractures of the distal tibial metaphysis have always been a problem for the orthopaedic surgeons. The subcutaneous location of tibia and precarious vascular supply lead to lower union rates for fractures in this region. Interlocking nails most of the times are not able to provide a secure fixation for the more distal fractures and are not an ideal option for fractures with intraarticular extension.[1,12] Open plate fixation has been associated with high rate of wound healing problems.[2]

Plate osteosynthesis is recognized as the treatment of choice for most articular, many metaphyseal and a few diaphyseal fractures. Biological plating techniques are those in which blood supply to the fractured fragments is maximally preserved. The objective of biologic fixation is to assist physiological process of bone healing wisely and optimally with minimal amount of operative intervention. Stress is laid on maintaining a precarious balance between devascularisation and mechanical perfection Minimally invasive plate osteosynthesis (MIPO) is a method in which percutaneously inserted plate is fixed at a distance proximal and distal to the fracture site through minimal exposure. It reduces iatrogenic soft tissue injury and damage to bone vascularity and preserve the osteogenic fracture hematoma.[13]

The new internal fixator systems LISS (less invasive stabilization system) and LCP (locking compression plates) offer new approaches to trauma surgery, especially for metaphyseal fractures.[3,4,5]

We tried to evaluate the role of biological plating using MIPO by sliding the plate along medial tibia subperiosteally and percutaenous fixation of shaft screws using C arm control. Fibula was fixed whenever there was a fracture in lower 1/3 before doing tibial fixation

MATERIAL AND METHODS

This prospective study was conducted at Department of Orthopaedics and Traumatology, Maharaja Yashwantrao Hospitaland M.G.M. Medical College, Indore from June 2009 to October 2013 and included 25 patients with metaphyseal fractures of the distal Tibia treated with biological plating. Of these 19 were males and 6 females.

Only precontoured locking plates of Indian make were used for fixation.

Inclusion Criteria

- Age group 20- 60 years

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- Either sex
- Closed metaphyseal fractures of distal Tibia with or without fracture fibula
- Compound fractures of distal end Tibia upto Gustilo Gr II with or without fibula fracture.

In both above AO types A and C were included for the study

Exclusion Criteria

- Pathological fractures
- Patients associated with other injuries in the same limb.
- A.O. type B fractures
- Congenital or acquired deformities of affected limb
- Associated neurovascular injuries
- Patients presenting more than 3 weeks after initial fracture.

Operative technique of Distal tibial locking plate fixation

The lower end of the tibia is slightly expanded and has five surfaces. The medial surface is subcutaneous and is continuous with the medial surface of the medial malleolus and was used for plate fixation in our study

The Distal tibial lockingplate is an internal fixator used as an extramedullary splint, fixed to the two main fragments, leaving the intermediate fracture zone untouched. Anatomical reduction of intermediate fragments is neither sought nor necessary. Indirect manipulation of intermediate fragments is done to get alignment without disturbing their blood supply.

Relative stability, provided by the bridging fixator, is adequate for gentle functional rehabilitation and the micromotion with this construct results in satisfactory indirect healing (callus formation).

Distal tibial locking plate is inserted using a small incision over the medial malleolus. Distal tibial locking plate is slided into a sub periosteal tunnel under image intensifier monitoring. The plate is advanced proximally in the periosteal tunnel, ensuring that its proximal end remains in constant contact with the medial surface of tibia. The distal end of the plate is positioned against the medial malleolus. To identify the correct position, the plate is moved proximally and then back distally until it fits the malleolar contour. We selected a plate that provides atleast 4 cortical screws in the proximal tibial shaft.

It is important to restore axial alignment, length and rotation. Reduction can be performed with a single reduction tool (eg, large distractor), or by combining several steps (for example fracture table ± external fixator, ± reduction via the implant, etc) to achieve the final reduction. Once the reduction and plate position is confirmed with image intensifier, K wires passed through plate are used to secure the plate position. Proximal screws are inserted under image intensifier control through stab incisions using a drill sleeve. The distal end of the plate is fixed to medial malleolus using cancellous screws and then locking screws are inserted to provide angle stability.

Wound is washed and closed in the routine manner. Tourniquet was not used. A below knee plaster back slab was kept till suture removal followed by non weight bearing ambulation and active mobilization of ankle and knee.

Patient is followed up clinically at first, third, sixth month and one year. Follow-up X-rays are taken at the end of 1st, 3rd, 6th month and one year post operatively. Clinically fracture was considered to be united if there was no pain at the fracture site during palpation and attempted movements of ankle; no local increase in warmth at the fracture site; no pain during attempted weight bearing. Radiologically the fracture was considered united when serial roentgenograms showed bony trabeculae crossing the fracture site.

Functional assessment was made using Olerud-Molander Ankle Score (OMAS).[6]

The OMAS is a self-administered patient questionnaire with a score of zero (totally impaired) to 100 (completely unimpaired) and is based on

nine different items: pain, stiffness, swelling, stair climbing, running, jumping, squatting, supports and work/activities of daily living. The OMAS at 6 months post surgery was used to evaluate the results.

OBSERVATIONS

Out of the total 25 patients, 19 were males and 6 females. 14 patients were in the age group of 30-50 years. The most common cause of trauma was road traffic accidents (16 cases) followed by fall from height (5 cases) and assault (4 cases).

Patients with extraarticular fractures were allowed full weight bearing at about 8 weeks. For patients with intrarticular fractures full weight bearing was delayed till 12 weeks. The average union time for both the groups was about 8-9 weeks.

The average ankle range of dorsiflexion plantarflexion arc in patients with intraarticular fractures was 30 degrees and in patients with extraarticular fractures was 33 degrees

Types of fracture patterns

S. No.	Fracture Group	Total No of Patients	Isolated Fracture lower 1/3Tibia	Fracture lower 1/3 Tibia & Fibula
1	Extra Articular Fractures	19	07	12
2	Intra Articular Fractures	6	02	4
Total		**25**	**09**	**16**

Functional Outcome Measured by Olerud-Molander Ankle Score (OMAS) at 6 months after surgery

S. No.	Outcome Assessment	Biological Plating No of Patients	% of Patients
1	Excellent (OMAS above 80)	18	72%
2	Satisfactory (OMAS 60-80)	5	20%
3	Poor (OMAS below 40)	2	8%

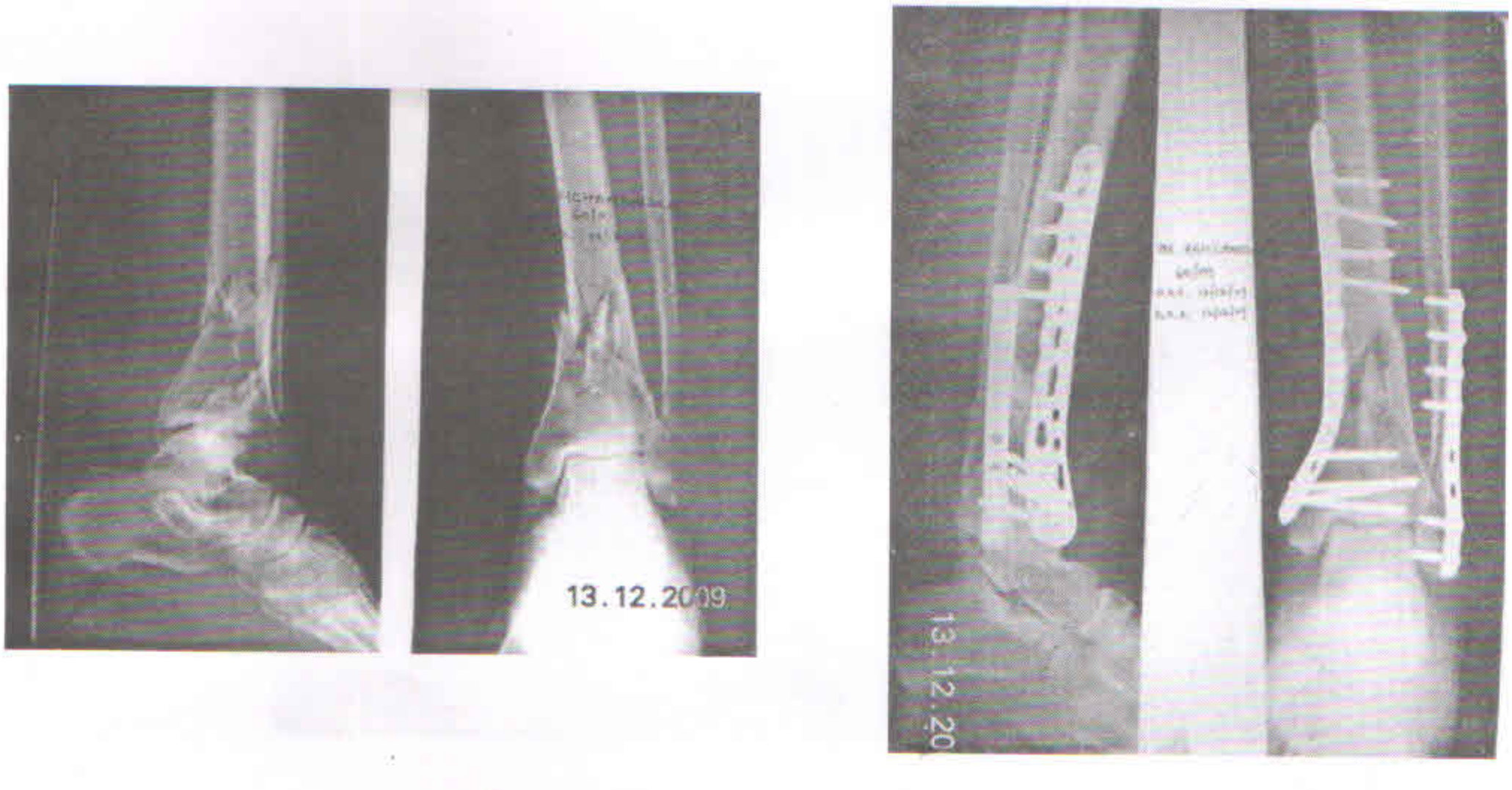

Figure 1 : 60 year male patient treated by MIPO

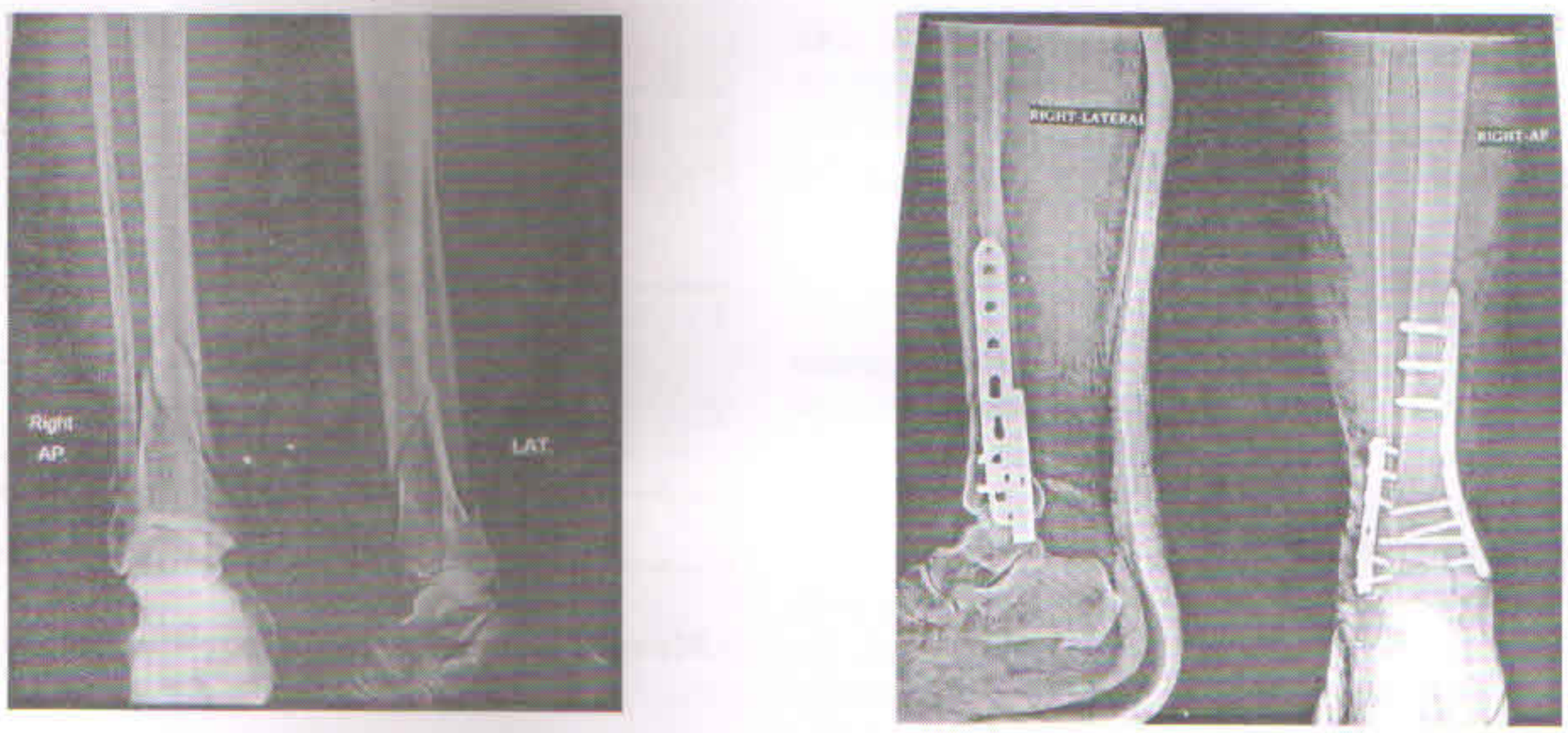

Figure 2 : 30 year female treated by MIPO

COMPLICATIONS

One case developed deep infection at the plate entry wound and was managed by debridement and parenteral antibiotics. This patient developed a stiff ankle with just 10 degree arc of dorsi and plantarflexion.

Malalignment at fracture site in the form of sagittal plane angulation was observed in 2 cases. Fortunately both the cases went on to union satisfactorily again highlighting the advantage that biological plating provides by preserving the vascularity of fracture fragments.

Figure 3 : Infection at plate entry site

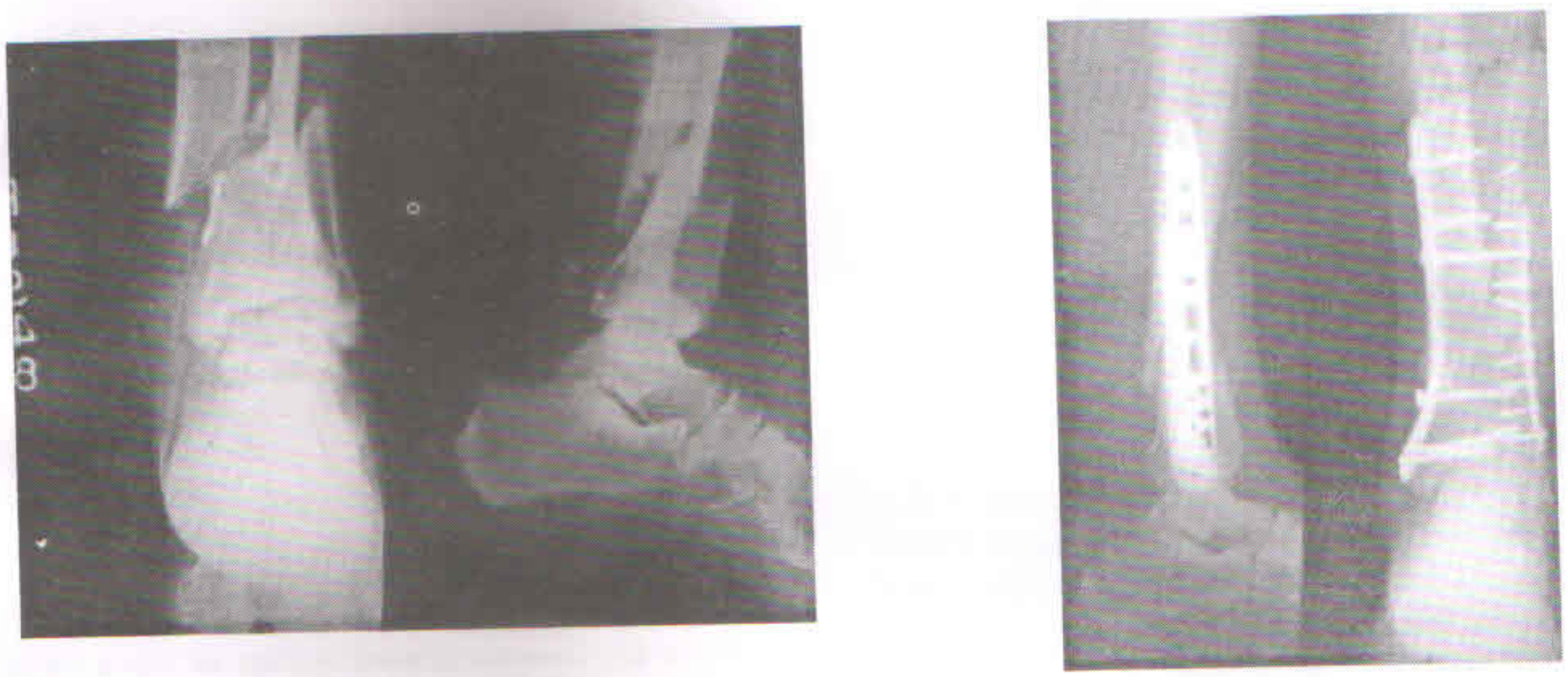

Figure 4 : Sagittal plane malalignment after biological plating

DISCUSSION

The management of distal tibia fractures can be challenging because of the scarcity of soft tissue, their subcutaneous nature, and poor vascularity. Minimally invasive techniques are based on principles of limited exposures, indirect reduction methods and limited contact between bone and implant. As a result of these principles this technique, reduce iatrogenic soft tissue injury and damage to bone vascularity and preserve the osteogenic fracture hematoma. Open reduction of these fractures is fraught with risks of delayed union, infection, non-union, refracture, and implant failure.

In our study the most important cause of injury was road traffic accidents which is explained by the fact that most of our patients were in a younger age group and males.

The average age of patients in our study was 38 years which ranged in other studies from 38 yrs (Pradyuman et al)[7] to 82 years (Mario Ronga).[8] We had total 25 patients in our study of which 19 (76%) males and 6 (24%) females. The present study does not show a biphasic age distribution of the patient population as has been seen in some other studies (Bell et al, 1992)

Some loss of ankle range of motion is inevitable in these fractures, more pronounced in fractures with intraarticular extension. The average range of ankle motion in our study was 30 degrees for intraarticular fractures and 33 degrees for extraarticular fractures which in other studies ranged from 21 degrees (Shewring DJ and Meggitt BF 1992)[9] to 30 degrees (P Kanabar, V Kumar, PJ Owen 2007)[10]

The average time to union ranged from 6 weeks (Kanabar et al)[10] to 8 weeks (Pradyuman et al).[7] In our series it was 6 weeks for extraarticular fractures and 8 weeks for intraarticular fractures.

In our study 94% of extra-articular fractures and 66% of intra-articular fractures treated by internal fixation had excellent/satisfactory results which is in accordance with other series by Gellman 1996, Cooper 2006

In our series there was 1 case (4%) of deep infection which was controlled after appropriate antibiotics. The studies by Shewring DJ and Meggitt BF 1992 and by James B Giles et al 1982 had no post-operative infection. The study by Siliski JM, Mahring M and Hofer HP 1989 noticed deep infection with compound fractures and all of

those 3 patients had poor results.[11]

We did not encounter any implant failure or loss of reduction. Malreduction in the form of sagittal plane angulation of less than 15 degrees was observed in two cases but both healed eventually.

There are studies comparing precontoured locking plates and conventional plates used biologically and most studies have found the precontoured locking plates to be better.[14] In our study we have not made any such comparison. The need for fixation of fibular fracture associated with distal tibial metaphyseal fractures has also been assessed in various studies.[15] In our series we always fixed a lower third fibular fracture if present before attempting tibial biological plating. Fixation of fibula significantly helps in getting the alignment of tibial fracture.

To conclude we would like to recommend biological plating using MIPO for treatment of distal tibial metaphyseal fractures because of low rate of complication, better union rates and good functional outcomes.

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A RARE CASE OF SILENT MULTIFOCAL TUBERCULAR ABSCESSES WITH PATHOLOGICAL DISLOCATION OF HIP IN 10YR OLD CHILD

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ABSTRACT

Extra-pulmonary T.B. is noted in approximately 14% of patient, with 1-8% having osseous disease.[1] In literature some case of pathological case of dislocation of hip psoas abscess have been described, but reports on multifocal tubercular abscess without sign and symptoms with pathological dislocation of hp are extremely rare. Tuberculosis can present in myriad ways & it can mimic any disease. The sole purpose of writing this article was to report one of the extremely rare presentations of skeleton tuberculosis and to increase high index of suspicion.

Key word: silent multifocal tubercular abscesses, pathological dislocation of hip, 10yr child.

INTRODUCTION

Tuberculosis of hip joint is very common, about 15% of all oseteoarticular T.B, next to pott's spine in developing countries.Tubercular hip present with flexion, adduction, internal rotation, shortening with gross destruction and reduction in joint space.[2]

Pathological dislocation of hip joint in children is relatively rare and frequently associated heavy bone destructive defect of acetabulam and femoral head and neck as well as the residual anatomical deformity. Dislocation of hip may remain hidden for some time or go undiagnosed and may cause lifelong disability when missed or ill-treated.[3]

In children the outcome of treatment closely resemble the radiological finding as noted by some shanmugasundaram[4] that is good result in 92% of normal type, 80% of perths type,50% of dislocation type,29% of acetabulam and motor and pestle type.[5]

Approximately 50% of patient with oseteoarticular tuberculosis will have spinal involvement he most common site is thoracic42% followed by lumbar 26%, thoraco-lumbar 12% and cervical 12%. Most common presentation involves destruction adjacent to the end plates of two or more vertebral bodies (para-discal type). It starts with disc space narrowing and bony changes appears after 4-5 months.abscess may give rise to vertebral scalloping (aneruysmal phenomenon). Abscess below diaphragm may trickle down and can give rise to psoas abscess.

CASE REPORT

A 10yr male child FTND born of non-consangious marriage resident of burhanpur came with c/o pain and redness over left hip since 15days.

Patient was apparently all right 6 months back when he started developing fever on and off 6 months back for which he took medicines from local physician. Since 1 month he developed limp over left side and finally was unable to move left hip since 15 days with no other medical or surgical history.

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On general examination patient was thin built, Gc -average, PR-90/min, febrile (slightly raised above baseline) well oriented to time, place and person. Locally there was swelling and redness with tenderness. Patient's hip was in flexion, internal rotation and shortening with painful extension at hip (Fig. 1.1).

Patient felt more comfortable to lie down in right lateral position. Hematological examination showed hemoglobin 10gm/dl, Erythrocyte sedimentation rate of 60 mm at the end of 1hr (Normal 6-12mm /hr), total WBC count 7.5×109/L (4.3 - 10.8×109/L) with total differential count of polymorphs 70%,lymphocyte 25%and platelet count of 3.4 lack/cu mm & C- reactive protein was raised too high.HIV test was negative. On Neurological examination Cranial nerves and higher functions are normal. Power in upper and lower limb was normal.X-ray revealed posterior superior dislocation of Hip (Fig. 1.2).

Antibiotics (ceftriaxone 375mg + amikacin 10mg/kg) were started.

Above clinical, radiological, &pathological findings raised suspicion of pathological dislocation of left hip so immediate MRI was done on 20/4/14

MRI was immediately ensued with findings which were highly suggestive of tubercular abscess and joint effusion resulting in posterior superior dislocation of left hip. Large loculated fluid collection extending along the iliacus muscle up-to pelvic inlet and inferiorly it is also seen extending into the medial compartment of upper thigh. Erosions are seen in superior pubic ramus and anterior column. Small left external lymph nodes are also seen. Sacroiliac joint and right hip appears normal. (Fig. 1.3)

AKT with sterptomycine 500mg on alternate day was started.

The iliacus abscess drainage was done from left antero-lateral approach which was approximately 300-350 ml (Fig. 1.3).

The head of femur was easily reduced. Pt shifted from OT with above knee skin traction and Thomas splint support.

Post operative x-ray shows re-posterior dislocation of hip (Fig. 1.4).

Post operative pain and stiffness showed remarkable reduction, Pt was able to lie down comfortably in supine position. Gentle above knee traction was continued.

Due to high index of suspicion of Pott spine MRI whole spine was done on 27/4/14 which revealed altered marrow signal in the C5 -D4 vertebral bodies with superior inferiorly extending pre and paravertebral abscess opposite to C5-D4 level measures about 1.5 cm to 2.0 cm in thickness. No vertebral collapse or discitis is seen. Posterior elements appear normal most likely due to tubercular etiology. No epidural soft tissue or cord compression seen. (Fig. 1.5)

The abscess from C5-D4 was drained through small 3 cm incision on right side through posterior aspect of sterno-cleido-mastoid muscle and about 20-30 ml pus was drained (Fig1.5).

The dislocated hip was relocated and transfixed with K-wire (Fig. 1.6).

DISCUSSION

Tuberculous osteomyelitis is thought to occur secondary to lymphohematogenous dissemination to the bone at the time of initial pulmonary infection, with local reactivation at a later date.[6] Usually there is minimal periosteal reaction or new bone formation surrounding the affected area.[7] Damage to the adjacent epiphyseal growth centers has been reported to occur in upto 41% of cases of bone disease in metaphyses are typically affected.[8]

The gold standard for the diagnosis of osseous tuberculosis is culture of mycobacterium tuberculosisfrom bone tissues.Positive Ziehl-Neelsen staining for acid-fast bacilli requires atleast 100 acid-fast bacilli per milliliter of specimen and does not differentiate between tuberculous and non-tuberculous mycobacteria.[9]

Tuberculosis of hip can have a variable picture specially in children. Due to destruction of capsule and acetabulum pathological dislocation in adult may occurs. Shanmugasundaram suggested a

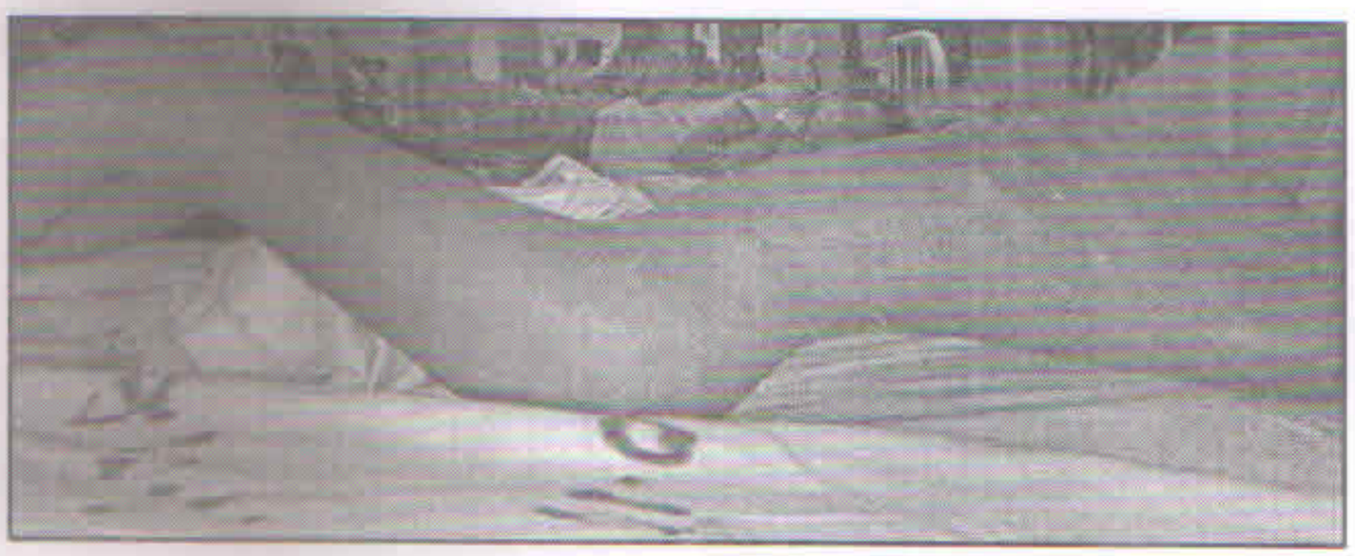

Figure 1 : Child with FFD lift hip

Figure 2 : Pathological dislocation left hip

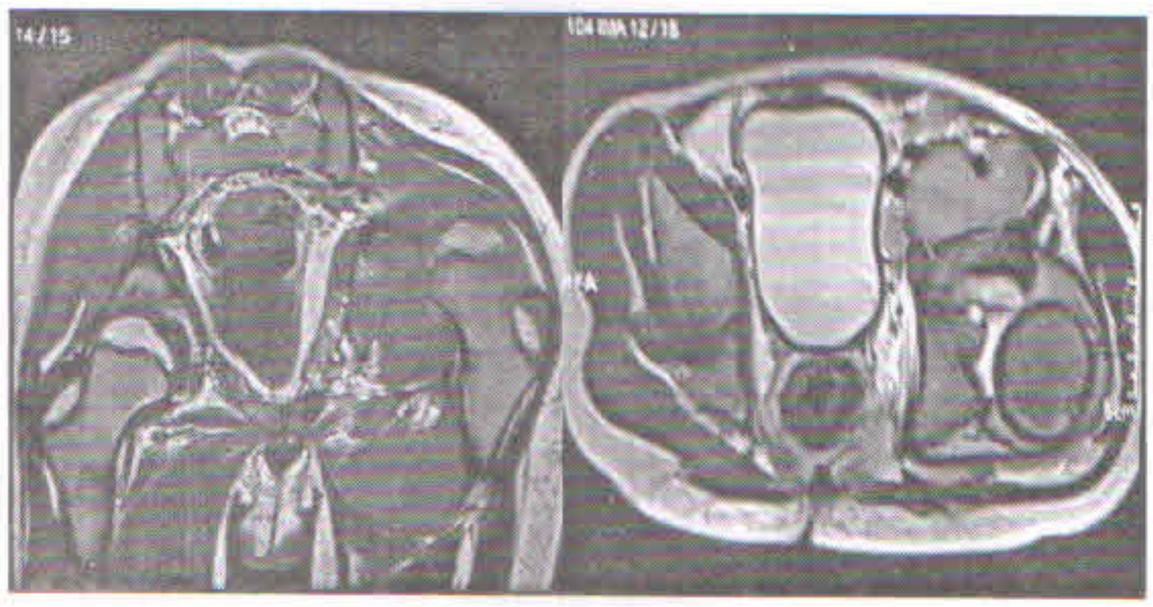

Figure 3 : MRI showing tubercular distruction and pathological dislocation of left hip

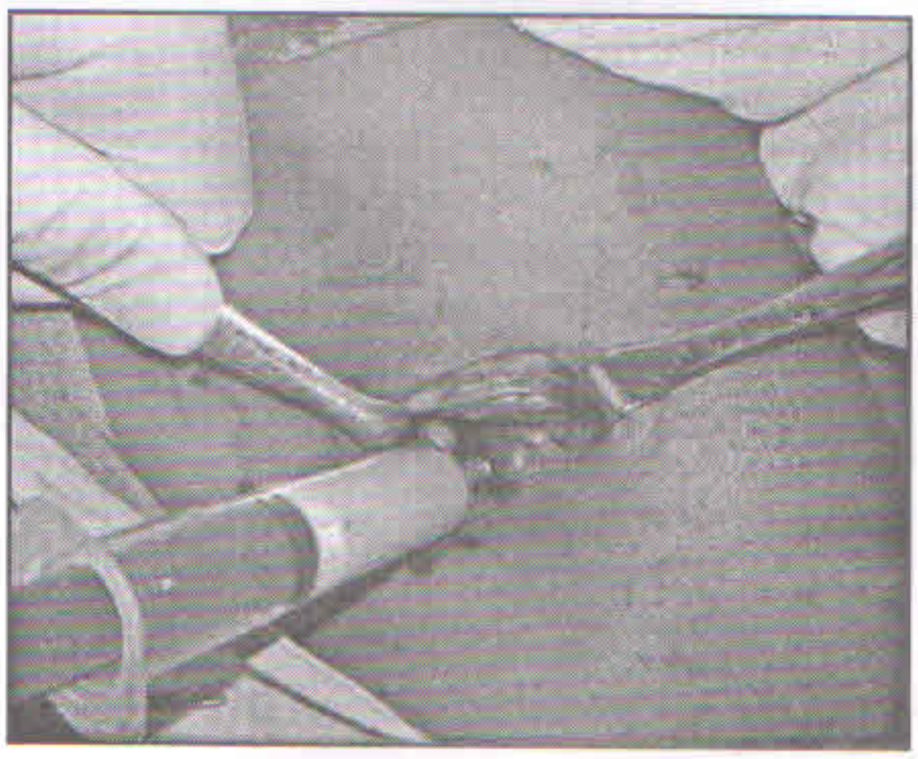

Figure 4 : Cold Abscess being aspirated

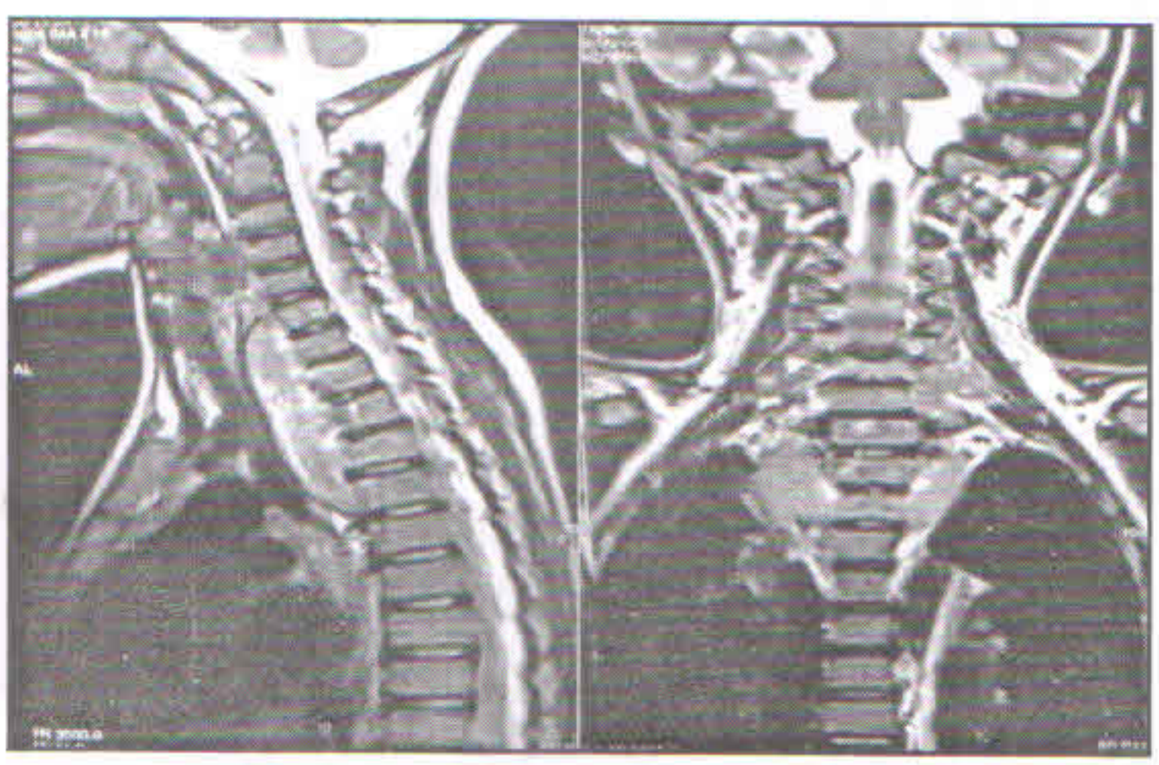

Figure 5 : Cold abscess anterior to cervical spine

Figure 6 : Hip relocated following Joint clearance

new classification for tuberculous disease of hip applicable for lesions in children.[4]

In children with arthritis, the deformity and subluxation/dislocation is corrected or minimized by employing traction. Failure to achieve correction of gross deformities and minimization of subluxation / dislocation in children warrants open arthrotomy, synovectomy and debridement of the diseased joint and improvement of displacement. Arthrodesis of the grossly destroyed hip joint or excisional arthroplasty in children should be deferred till the completion of growth potential of the proximal femur.

In our case the iliacus abscess results from hip joint and an asymptomatic retropharyngeal paravertibral abscess from C5 -D4 vertebrae was diagnosed just because of high index of suspension. The paravertibral abscess below level of diaphragm can only trickle down to form iliopsoase abscess show it is very unusual presentation in an immune-competent 10 yr old child of paravertebral retropharyngeal abscess from C5-D4 with pathological dislocation of tubercular hip with abscess and joint effusion.

SUMMARY AND CONCLUSION

A case of pathological dislocation of hip is presented. He was found to have tubercular abscess and joint effusion of hip joint with large locculated fluid collection from iliacus to medial compartment of thigh later on asymptomatic paravertibral retropharyngeal abscess from C5-D4 was detected. Abscesses are drained and dislocated hip was transfixed with acetabulum through K-wire. A long term follow up is desirable to see the viability of hip joint.

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BONE DENSITY OF YOUNG INDIAN ADULTS AND EFFECT OF EXERCISE, CALCIUM INTAKE AND SOCIOECONOMIC STATUS ON PEAK BONE MASS

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ABSTRACT

Objective: To collect data of bone mineral density of young Indian adults and to assess the effect of exercise, calcium intake and socioeconomic status on bone mineral density in them.

Method: This was a cross sectional design in which T-score data of 152 athletes and 150 sedentary young Indian adults of age 18-30 yrs was collected. Record of their per capita income and three days meal pattern, to assess calcium intake, was also collected.

Result: This study depicts that sedentary young Indian adults fail to acquire adequate peak bone mass and become osteopenic as early as age 25, especially females while athletes achieve much higher values of bone mineral density as compared to their Caucasian counterparts. Per capita income <1000rs./mth results in lower bone mineral density, affecting sedentary ones more than the athletes. Calcium intake <500mg/day negatively affects bone mineral density. However, levels above this value do not have any direct relationship with positive effect on bone mineral density.

Conclusion: Indian young adults achieve much less peak bone mass as compared to their western counterparts. That is why the prevalence of osteoporosis is much higher amongst Indians. Though, Indians are not genetically predisposed to have low peak bone mass. Rather, it is the lack general health awareness reflected through lack of exercise and low socio economic status (secondarily affecting the dietary calcium), which results in poor bone health among young Indian adults. These young individuals can attain peak bone mass higher than their western counterparts with regular exercise program.

Keywords: Bone density, dietary calcium, exercise, socioeconomic status, young adults, Indian.

INTRODUCTION

Osteoporosis is a major public health threat worldwide. Based on 2001 census, approximately 163 million Indians are above the age of 50, this number is expected to increase to 230 million by 2015. Even conservative estimates suggest that of these, 20 percent of women and about 10-15 percent of men would be osteoporotic.[1] Studies have reported that Asian women are more predisposed to osteoporosis as compared to their Caucasian counterpart.[2,3] It is a matter of further research that what makes Asians more predisposed to poor bone mineral health. Is it general ethnic physical characteristics or the lifestyle differences or the socioeconomic status? We still lack adequate data of Indian population to understand this high predisposition to osteoporosis or poor bone health.

Poor bone health can be explained in terms of bone mineral density and micro-architecture of bone. Osteoporosis is usually considered a disease

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of old age. In early years of life bone mass is gained and after a certain age, bone mass starts losing, at a certain pace in physiological conditions.[4,5] Hence, bone health at old age is determined by the bone health at young age.

Peak bone mass refers to genetic potential for bone mass. Peak bone mass is achieved mostly by the age 30. To add this, 90 percent of peak bone mass in young girls is achieved by the age 20.[6] After achieving peak bone mass, bone mineral density declines. Therefore, accretion of higher bone mass at younger age is decisive factor for late development of osteoporosis.[5]

This study is aimed to collect a data of bone mineral density (BMD) of young Indian adults, to assess the peak bone mass achieved by them, to know whether Indian young adults are physically at disadvantage in achieving higher peak bone mass as compared to their Caucasian counterparts and how much the physical exercise, calcium intake and socioeconomic status in terms of per capita income, affect the accrual of peak bone mass in them, so as to show the general trends of bone health in young Indian adults.

MATERIAL AND METHOD

This study comprised total 352 young individuals of the age 18 to 30 years. Out of these 152 (83 male and 69 females) were dedicated athletes from various physical training institutes, and 150 (85 male and 65 females) were sedentary young individuals, selected to meet the definition as:

Athletes: young individual practicing high impact sport activity for at least one hour since at least 6 months.

Sedentary: young individuals, who never did physical training of any kind, either institutional or at home since last 2 yrs.

Individuals having any pre-existing condition known to affect bone mineral density were discarded from the data.

A questionnaire was provided to every individual detailing about physical training, per capita income and last three days meal pattern to determine the average daily calcium intake.

Bone mineral density of every individual was measured using ultrasonic bone densitometer (Hologic) (Quantitative ultrasound [QUS] - Calcaneus) in terms of T-score, using the reference of young active adult Caucasian population (as the purpose of the study was to compare the bone mineral status of participants with the reference, not to measure the absolute bone density. QUS had been proven to be equally efficient to DXA (statistically significant) in evaluating risk of osteoporosis.[7,8,9] T-score values were used for analysis). T-score was interpreted as:

> 0	=	bone density more than the reference.
0 to -1	=	bone density equivalent to reference up to one SD below the reference, considered as normal bone mineral density (BMD).
-1 to -2.5	=	bone density between -1 SD and -2.5 SD, below reference, considered as osteopenia.
< -2.5	=	bone density less than 2.5 SD below reference, considered as osteoporotic.

RESULT

Sedentary young individuals start losing bone mass as early as age 20. Rate of loss is more in females, as compared to males, so as to bring them in the range of osteopenia as early as age 25 (76% of young sedentary females after age 25 had t-score < -1, while 67% of those < 25 yr age had t-score < -1). While in general, males are in normal BMD range up till the age 30, though gradually losing bone mineral density, 38% upto the age of 30 had t-score < -1(Table 1).

In contrast, athletes maintain their BMD above that of reference (i.e. >0) throughout the study's age range (up to age 30) (Table 2). 91% of athlete females up to the age 30 had t-score > -1, while 86% of athlete male had t-score > -1

Calcium intake seems to affect BMD when

Table 1
Age wise average t-score of sedentary individuals

Age	Male	Female	Total
18	-	0.77 (n=1)	0.77 (n=1)
19	-	0.17 (n=2)	0.17 (n=2)
20	-0.45 (n=4)	-0.75 (n=2)	-1.08 (n=6)
21	-0.40 (n=2)	0.06 (n=5)	-0.07 (n=7)
22	-0.53 (n=3)	-1.04 (n=7)	-0.89 (n=10)
23	-0.27 (n=5)	-0.78 (n=3)	-0.46 (n=8)
24	-0.54 (n=7)	-0.55 (n=7)	-0.55 (n=14)
25	-0.74 (n=10)	-1.47 (n=3)	-0.91 (n=13)
26	-0.10 (n=11)	-1.46 (n=8)	-0.68 (n=19)
27	-0.69 (n=10)	-2.33 (n=3)	-1.07 (n=13)
28	-0.86 (n=17)	-1.43 (n=10)	-1.07 (n=27)
29	-0.71 (n=7)	-1.80 (n=2)	-0.95 (n=9)
30	-0.97 (n=9)	-1.27 (n=12)	-1.15 (n=21)
	N=85	**N=65**	**N=150**

Table 2
Age wise average t-score of athletes

Age	Male	Female	Total
18	-	-0.03 (n=2)	-0.03 (n=2)
19	0.5 (n=1)	1.20 (n=7)	1.12 (n=8)
20	1.40 (n=2)	0.26 (n=7)	0.51 (n=9)
21	0.08 (n=12)	-0.19 (n=12)	-0.06 (n=24)
22	-0.05 (n=9)	0.48 (n=18)	0.30 (n=27)
23	0.68 (n=16)	0.74 (n=8)	0.70 (n=24)
24	0.70 (n=10)	0.60 (n=4)	0.67 (n=14)
25	0.50 (n=17)	0.82 (n=5)	0.57 (n=22)
26	1.23 (n=7)	-0.2 (n=2)	0.91 (n=9)
27	0.03 (n=4)	0.56 (n=3)	0.25 (n=7)
28	0.67 (n=3)	0.2 (n=1)	0.55 (n=4)
29	1.2 (n=1)	-	1.2 (n=1)
30	1.8 (n=1)	-	1.8 (n=1)
	N=83	**N=69**	**N=152**

intake is very low. Athletes maintain their bone mass above the reference in spite of low calcium intake (up to 500mg/day), in comparison to recommended 1000mg/day (chart 1), as all athletes had their calcium intake below recommended. Effect of further low calcium intake could not be assessed in athletes, as all were institutional athletes and had somewhat regulated dietary plan.

Bone mass decreased rapidly in sedentary individuals when the calcium intake was below 500mg/day (chart 2). 73% of sedentary individuals, who had calcium intake below 500 mg/day, had t-score < -1, in comparison to sedentary individuals having calcium intake >500 mg/day, among whom 38% had t-score < -1.

Low income group seemed to affect the bone mass both in athletes and sedentary individual. Per capita income group <1000rs. / mth had 25% athletes osteopenic and 8% osteoporotic (chart 3), while 65% sedentary individuals were osteopenic and 9% were osteoporotic in this group (chart 4).

DISCUSSION

It is imperative from the data that young, physically non-active Indian adults, fail to develop adequate bone mass in the golden years of bone mass development.[10] However, physically active young ones achieve bone mass higher than their Caucasian counterparts,[11] explaining that genetic predisposition does not seem to inhibit the accrual of higher bone mass.[3] Simultaneously, low per capita income and its consequences on socioeconomic status,[12,13] may be acting through lack of general health awareness, affect the bone health negatively. As observed from data that most of individuals from low per capita income group were sedentary and lowest calcium intake was also observed in them.

Low daily calcium intake is not an inhibitor of bone mineral density, provided it is not very much low (<500mg/day), nor increasing the calcium intake has direct correlation with higher BMD.[14] However, the importance of adequate intake of

calcium (recommended allowance), cannot be ignored in early years of growth (pre-pubertal and pubertal).[15]

CONCLUSION

Definitely, there is higher prevalence of osteoporosis amongst Indians as compared to the individuals from more developed countries. Largely, this prevalence is the result of poor health awareness in early growth years of life.

Lack of physical training in youth is responsible for the large share of this prevalence. Physical training need not to be an institutional one (which keeps the BMD above reference range), can be a general fitness schedule at home. All this can be achieved by seeding the concept of health awareness in young individuals, which has to be associated with improvement of the socioeconomic status. To fight with osteoporosis, physical training has to be stressed more in youth than mere calcium supplementation.

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MANAGEMENT OF A TRAUMATIC ATLANTO OCCIPITAL & ATLANTO AXIAL SUBLUXATION WITH FRACTURE OF DENS BY A NEW FIXATION TECHNIQUE: A CASE REPORT

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ABSTRACT

Atlanto occipital subluxation and dislocation, both are fatal brain stem injuries. Very few survivors have been reported in literature. Various procedures are prescribed for atlanto occipital and atlanto axial fusion. We are presenting a new fixation technique for the same acquired as an alternative to Goel & Harms technique to deal with a case complicated by intra-operative excessive bleed from C1-C2 junction and pre mature ventricular beats causing hypotensive shock. One month post operatively, patient is stable & neurological deficit is resolving. The rationale behind this approach is discussed and the relevant literature reviewed.

Key words: Atlanto occipital subluxation, atlanto occipital dislocation, atlanto axial subluxation, Goel & Harms technique.

INTRODUCTION

Atlanto-occipital subluxation of more than 2 mm indicates a loss of major occipitocervical stabilizers.[1,2] Occipitocervical dislocation is associated with a fatal brain stem injury leading to cardiac and respiratory arrest. Most authors advocate occipitocervical fusion, for which various methods have been described viz. Gallie fusion, Brooks-Jenkins fusion, Sonntag posterior C1-C2 technique, C1-2 trans-articular screw technique, Goel's technique modified by Harm and plate-screw -rod construct.

We treated this patient with occipital plate linked by rods to lateral mass screw of axis vertebra and atlas vertebra to connecting rod by circlage wire in association with bone graft.

CASE REPORT

A 14 years old, mentally challenged female came to the emergency department of MBS Hospital, Kota (RAJ), with history of fall from stairs. On examination, she found to have right upper and lower limb paralysis (MRC grade 0). Babinski's sign, well sustained clonus & exaggerated knee & ankle jerk were evident on right side. Initial radiographs revealed atlanto-axial subluxation with no visualisation of dens. NCCT cervical spine [Fig. A & B] revealed atlanto-axial & atlanto-occipital subluxation with displaced Type 2 fracture of dens. MRI revealed compression at C 1 - C 2 level.

SURGICAL TECHNIQUE

Original plan for the surgery was to fix occiput, C1& C2 in reduced position by Goel's Technique modified by Harm.[3] 2 poly axial 3.5 mm pedicle screw were fixed in C2 vertebra. C1 lateral mass screws were being put but due to excessive bleeding from C1 - C2 epidural space patient landed in hypotensive shock and developed premature ventricular contractions and this step

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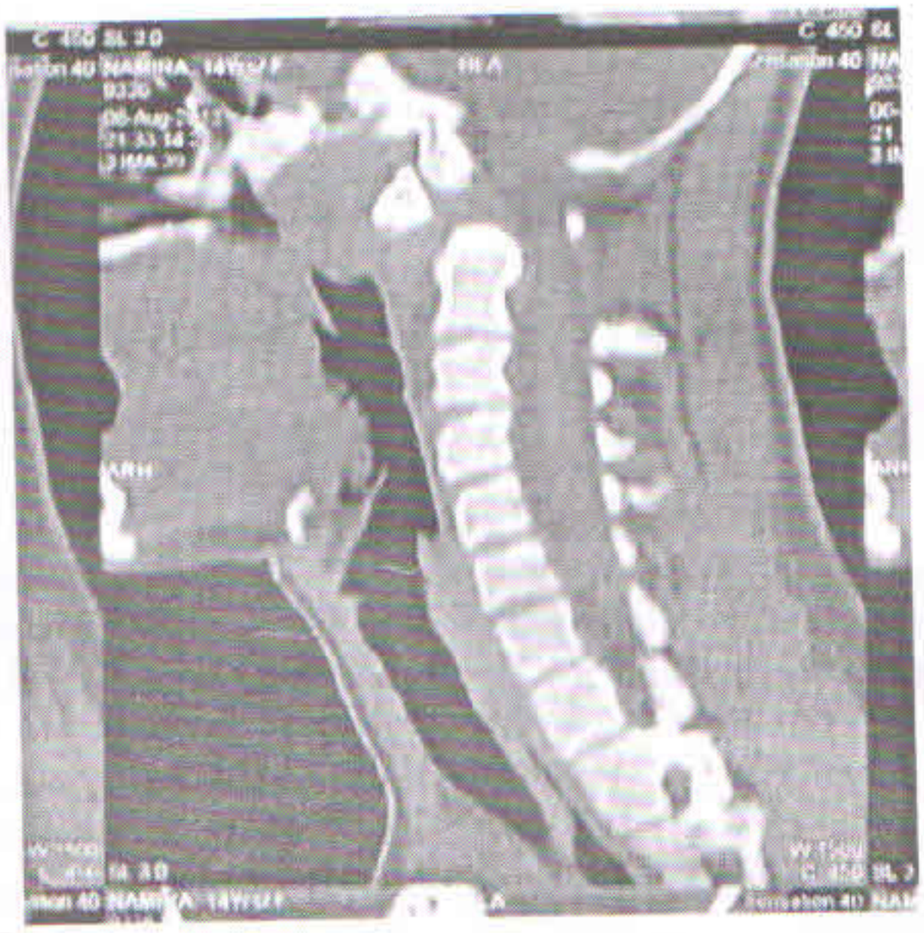
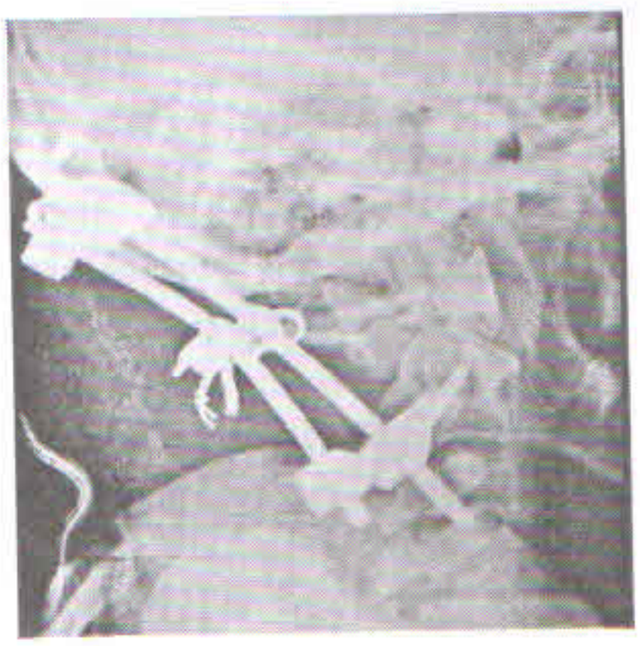


Fig. A and B: Pre-operative NCCT showing Atlanto-occipital and Atlanto-axial subluxation along with fracture dens.



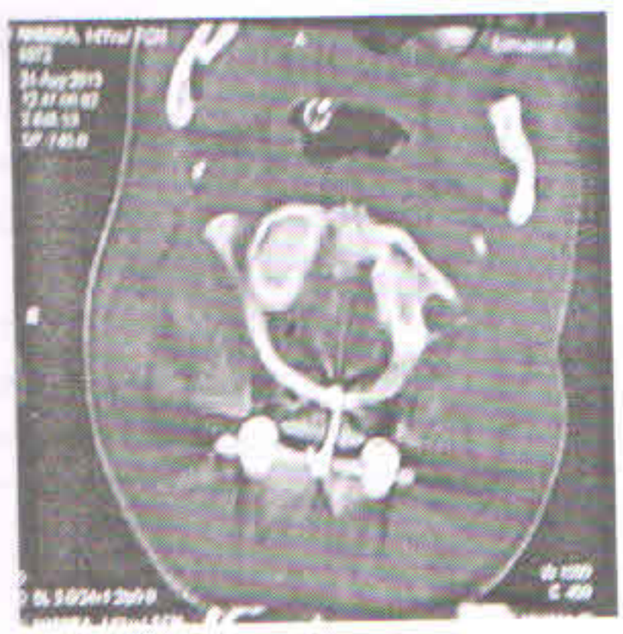


Figure C, D & E: Showing posterior instrumentation along with circlage wire holding posterior arch of C1 to cross link bar.

was abandoned. T plate was fixed to occiput and connected to C2 pedicle screws by connecting rod. A sub laminar 20 gauze circlage wire was passed below the centre of posterior arch of C1 and tightened to cross link bar between to connecting rods and bone graft placed. [Fig. C, D & E]

DISCUSSION

Oda et al[4] studied the biomechanics of five different occipitocervical fixation constructs in cadaveric spines, and found that screw fixation from the occiput to the pedicle of C2 was the stiffest. Transarticular screws afforded greater stability than hooks and wires. The use of wires relies on the integrity of the posterior elements and associated with risk of injuring dura when they are passed through occipital burr holes or under the lamina of the spine. The siting of transarticular screws is technically demanding. Currently, the best method to achieve atlanto-axial fixation is the technique first described by Goel and popularised by Harms.[3] We would expect our construct to function biomechanically in much the same way as Oda'soccipitoaxial pedicle screw fixation, but with the loss of cervical rotation.

CONCLUSION

Atlanto-occipito-axial posterior instrumented fusion, as described in this paper for traumatic atlanto-occipital and atlantoaxial subluxation has provided stability. Successful reduction has been confirmed radiologically on follow up & can be used when placement of C1 lateral mass screw placement is difficult.

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VITAMIN D DEFICIENCY AND DEGENERATIVE DISC DISEASE IN CHILDHOOD

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ABSTRACT

Vitamin D deficiency results in abnormalities in calcium, phosphorus, and bone metabolism. Vitamin D deficiency causes a decrease in the efficiency of intestinal calcium and phosphorus absorption of dietary calcium and phosphorus, resulting in an increase in PTH levels. Secondary hyperparathyroidism maintains serum calcium in the normal range at the expense of mobilizing calcium from the skeleton and increasing phosphoruswasting in the kidneys.We report a case of 14 yr old female with degenerative disc disease with hypovitaminosis D, for which supplementation with vitamin D for 10 weeks cures her back pain which is still not been reported in literature.

INTRODUCTION

Vitamin D deficiency results in abnormalities incalcium, phosphorus, and bone metabolism. Specifically,vitamin D deficiency causes a decrease in theefficiency of intestinal calcium and phosphorus absorption of dietary calcium and phosphorus,resulting in an increase in PTH levels. Secondary hyperparathyroidism maintains serumcalcium in the normal range at the expense of mobilizingcalcium from the skeleton and increasing phosphorus wasting in the kidneys.Phosphaturia caused by secondaryhyperparathyroidism results in a low normal or lowserum phosphorus level. This results in an inadequatecalcium-phosphorus product, causing a mineralization defect in the skeleton. In young children whohave little mineral in their skeleton, this defect resultsin a variety of skeletal deformities classically known as rickets. In adolescents, the epiphyseal plates are getting closed, and there is enough mineral in the skeleton toprevent skeletal deformities so that this mineralizationdefect, known as an osteomalacia, often goesundetected.[1] However, osteomalacia is associated with isolated or generalizedachesand pains in bones and muscles.

CASE REPORT

We report a case of 14 yr old female who presented in our OPD with the complain of back pain for 6 months with deep tenderness in entire dorsal and lumbar spine. Neurological examination of patient was essentially normal so our initial presumptive diagnosis was mechanical back pain we gave her a trial with NSAIDS and physical therapy like core strengthening,flexibility exercises, hamstring stretching, and massage therapy. However the patient continued to have same symptoms even after adequate treatment.We decided to investigate the patient with possible causes of chronic back pain (Table 1).[2]

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Table 1
Classification of diseases causing back pain in children and adolescents

A.	**Traumatic**
	1. Mechanical or sports injury
	2. Discogenic herniation
	3. Traumatic spondylolysis and secondary spondylolisthesis
	4. Ring apophyseal fracture
B.	**Diseases related to growth disturbance**
	1. Disc degeneration
	2. Spondylolisthesis without spondylolysis
	3. Scoliosis
	4. Scheuermann's disease
C.	**Infections/Inflammation**
	1. Tuberculous
	2. Non-tuberculous
	3. Inflammatory spondylo-arthropathy
D.	**Neoplastic disorders**
	1. Benign
	a. Osteoid osteoma
	b. Osteoblastoma
	c. Aneurysmal bone cyst
	2. Malignant
	a. Langerhans cell histiocytosis
	b. Osteosarcoma
	c. Ewing's sarcoma
	d. Leukemia
	e. Lymphoma
	f. Metastases
E.	**Hematological disorders**
	1. Sickle cell disease
F.	**Metabolic disorders**
	1. Osteoporosis
	2. Alkaptonuria
G.	**Miscellaneous**
	1. Osteopetrosis

Her blood investigation showed haemoglobin, leukocyte count, serum calcium,phosphorous, alkaline phosphatase and inflammatory marker within normal limit but serum 25 -OH vitamin D level of 13.96 ng/ml, which showed she is vitamin D deficient although the patient did not have any sign and symptoms of rickets. Radiological examination of Dorsal and Lumbar spine showed degenerative disc disease with disc space narrowing and end plate irregularity. We decided to treat her hypovitaminosis with cholecalciferol 60000IU for 10 weeks and continued physical therapy as advised earlier. At 12 weeks follow up patient has no back pain and deep tenderness in spine has also disappeared.

DISCUSSION

The term degeneration is commonly applied to a variety of pathologic and imaging manifestations of spine morphology, reflecting the complexity of the process and gaps in our current knowledge. Back pain with activity (mechanical back pain) is a common source of morbidity in adolescent patients.[3] However, pain associated with intervertebral disc degeneration in children and adolescents is usually considered to be a rare and anomalous condition. Despite this, there is an increasing recognition of disc degeneration in adolescentpatients marked by disc space narrowing, end plate irregularity and central hernia of the intervertebral disc through the end plate into the vertebral body.During growth, disc degeneration may develop,with or without vertebral endplate changes, inassociation with Scheuermann's disease, Schmorl's nodes, and limbus vertebrae.[4] Some authors have shown however increasedassociation between disc degeneration and backpain, in particular, in the rapid physical growth period.[5] Adolescent discogenic disorder, represents a condition where the endplates of the disc spaces are not strong enough to withstand the pressures generated within the disc spaces. This leads to disc herniations into the vertebral bodies (called Schmorl's nodes) and causes back pain at an early age.[6] Vitamin D

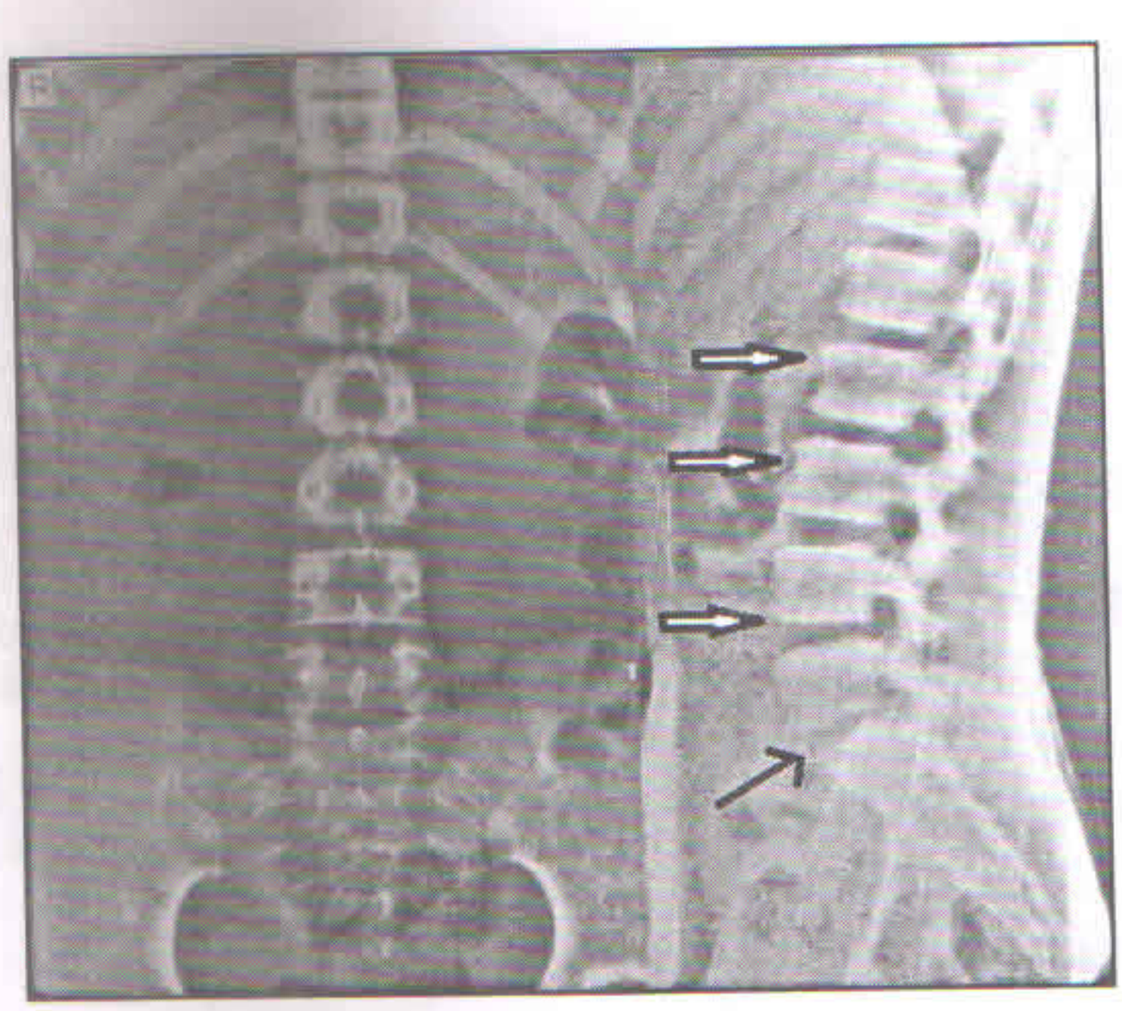

Figure 1 : Antero-posterior and lateral radiographs of the Dorsal and lumbar spine reveal decreased disc space at L5-S1 level (arrow) and multiple small osteophyte anteiority (Block arrows). Also note the ballooning of multiple disc spaces at L2-L3. L3-L4 and L4-L5 levels.

deficiency causes, PTH-mediated increase in osteoclastic activity which creates local foci of bone weakness in vertebral endplates.

There are many reports from around the world that showed Vitamin D deficiency as the cause of back pain and vague musculoskeletal pain in adults.[7,8,9] Could making vertebral endplates strong enough to withstand disc pressure is the solution?. It is very difficult to answer now with one case report showing supplementation with Vitamin D can cure degenerative disc disease pain in adolescent, howeverthere are many question which need to be answered by a properly done randomized control trial to completely validate this hypothesis.

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BOHLER'S ANGLE: CORRELATION WITH OUTCOME IN DISPLACED INTRA-ARTICULAR CALCANEAL FRACTURES TREATED WITH LOCKING COMPRESSION PLATE FIXATION WITH AND WITHOUT BONE GRAFTING

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ABSTRACT

Aims: The aim is an accurate reduction of the fracture with reconstruction of Bohler's angle, length, axis and subtalar joint surface. To determine whether autologous bone graft supplementation is beneficial in achieving and maintaining restoration of Calcaneal height and anatomic reduction.

Settings and Design: Level 1 trauma center, Prospective, randomized.

Methods and Material: Consecutive 46 patients who had fracture calcaneum were treated by open reduction and internal fixation by locking plate with and without bone graft during the period from November 2009 to April 2012.

Statistical analysis used: AOFAS-Ankle-Hindfoot Scale, t Test.

Results:Fewer complications and statistically significant better results related totreatment with locking plates with bone grafting confirmed in comparison to without bone grafting ones were noted for intra-articular calcaneal fractures.In Group A the mean time for union was 10.39 wks.The results were good and excellent in 86.95%, 8.69 % had fair result and 4.34% had poor results.

In Group B the mean time for union was 11.95 wks.The overall results were good and excellent in 73.91%, 13.04 % had fair result and 13.04% had poor results.

Conclusions: The operative treatment of intra-articular calcaneal fractures could restore Böhler's angle better and the patient could return to full weight bearing earlier.we confirmed that autologous bone graft supplementation is beneficial in achieving and maintaining restoration of calcaneal height and anatomicreduction.

Key-words: low profile locking plate, intra-articular calcaneal fracture,Bohler's angle,early weight.

Key Messages: Autologous bone graft supplementation is beneficial in achieving and maintaining restoration of Bohler's angle.

INTRODUCTION

Calcaneum is the commonest tarsal bone to be fractured. Injuries to calcaneum are caused by falling from a height and landing on foot or motor vehicle accidents. It is common in young adults engaged in building construction work and in those climbing trees and electric pole. Calcaneal fractures are one of the most disabling fractures in men, with frequent occurrence during the wage-earning period of life. The rehabilitation process can be time-consuming, and take up to 9 months and even longer in 20 percent of patients. calcaneal

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fractures are a large economic burden to society. The functional sequelae of the foot are serious, and therapy is economically demanding.

Calcaneal fractures are relatively rare injuries, with reported occurrence of 2% of all fractures. The intra-articular types constitute to 75% of calcaneal fractures. 70% has involvement of the posterior subtalar joint, and approximately 80% of all fractures occur in male patients. Calcaneal fractures are rare in childhood; only 5% of all calcaneal fractures are seen in children.

TREATMENT MODALITIES

The treatment of calcaneal fracture has long been major orthopaedic problem. Because of its unique shape, difficulties arose in understanding the geometry of the fracture. Because of its location, surgical treatment was fraught with complication. Recentely with the development of computerized tomography (CT) scanning with 3D reconstrution, the anatomy and pathology of this fracture has been understood. The imaging technique has revolutionized the treatment of calcaneum fracture.

There is a considerable amount of literature on calcaneal fractures and their treatment; however the best management approach has yet to be determined. The treatment of calcaneal fractures is complex and has to be individualized depending on patient characteristics, fracture type and the condition of the soft tissues.

The therapeutic modalities for displaced intra-articular calcaneal fractures can be divided into conservative and operative management. The latter comprises both the open reduction and internal fixation (ORIF) and percutaneous reduction and internal fixation (PRIF). Since the mid nineties, ORIF is considered the gold standard treatment for displaced intraarticular fractures of the calcaneus by most experts, as it generally provides overall good to excellent results and the ability to anatomically restore the subtalar joint. Good results are achieved if the stable anatomical reduction of the posterior facet is possible. Several open surgical techniques have been described in the past, of which the extended lateral approach has been applied most frequently. Alternative operative techniques include a medial approach, plantar approach,combined lateral and medial approach, limited posterior approach, and the sinus tarsi approach. The results of ORIF and conservative treatment have been described and compared in several studies. These studies show improved outcome after operative treatment in subgroups and a higher rate of failed initial treatment with an increased need for a subtalar arthrodesis in conservatively treated patients.

The calcaneus has been compared to an egg, with its cortical shell being cored with cancellous bone. It is this cancellous core, that is usually compressed during calcaneal fracture. It has been a common practice during open reduction and internal fixation for fracture of the calcaneus to supplement the fixation with bone graft, most commonly using an autograft from the iliac crest. This practice aims to fill in the empty core of the calcaneus to facilitate fracture healing. While morbidity at the donor site from iliac crest autograft is well recognized.

Bohler's tuber joint angle is commonly assessed when evaluating calcaneal fractures. A severe heel fracture will result in a significant decrease or loss of this angle.At present, there is only a limited amount of data available on the outcome after open reduction internal fixation of calcaneal fractures. However, most available studies lack sufficient patient numbers or duration of follow-up.

The purpose of this study was to evaluate the correlation between Bohler's angle and functional outcome in displaced intra-articular calcaneal fractures Treated with low profile locking plate Fixation with and without bone grafting.

SUBJECTS AND METHODS:

Inclusion Criteria

Included in this study were all patients that fulfilled our department's general criteria for surgical therapy of calcaneal fractures: Age more than 18 years and less than 65 years,Deformation

of the calcaneus, the flattening of the foot (Bohler's angle), the intraarticularfracture type.

Exclusion Criteria

Contraindications were general or local contraindications to surgery in general, a biological age of more than 65 years, Extra-articular fractures. Compound calcaneal fracture,peripheral vascular disease and patients who might have been unwilling or unable to follow the postoperative regime.

We operated 38 males (90.47%) and 04 females (9.52%) with an average age of 33.59 years (18-65 years).46 fracturesTreated with low profile locking plate Fixation with and without bone grafting.The most frequent cause of accident was a fall (n = 33) (78.57%) from an average height of up to 3m. Traffic accidents were seen in 08 cases (19.04%) and assault in 01 case (2.38%).

According to the classification by Essex-Lopresti, predominantly joint depression type fractures occurred (n = 30)(65.21%), with 16 cases (34.78%) of tongue type fractures. 05 cases (11.90%) were associated with additional injuries, 04 patients (9.52%) had suffered fractures of the spinal column.

Surgical treatment of the fractures took place once soft tissue conditions allowed.The average duration from admission to surgery was 8 days(5-14days).the mean operative time was 1 hr 45 minutes (1hr 25 min-2 hr 55min). In all cases a fluoroscopy was performed after reduction and temporary fixation of the fracture.Postoperatively radiographs were taken; we did not regularly perform CT scan postoperatively.. All patients had pre- and postoperative X-Rays, so the change of the Bohler's angle and the length of the hindfoot could be measured exactly. Clinical follow-up examination was performed at 4 weeks, 6 weeks,10 weeks,3months,6 months and 1 year.

SURGICAL TECHNIQUE

Patients were operated under spinal/ general anastesia. The patient is positioned in a lateral decubitus position. Pneumatic tourniquet/ Esmarch rubber tourniquet was used inall patients. Patients were positioned laterally on an operating table with a radiolucentcarbon part. An extended lateral approach was performed. The approach was developedas a full-thickness flap.

The lateral cortical fragment (bulge fragment) was then hingedaway. Subsequently, a good view into the subtalar joint was obtained.The soft tissue flap was held back by K-wires, which had been inserted into the talus andbent. Use of the joy-stick technique with a Schanz-screw placed through the tubercalcanei achieves reduction and in particular the length and axis is regained. The fractured lateral wall of the calcaneus is gently opened, leaving the fracture fragmentswithin their periosteal envelope. The fragments are elevated, the articular surface isreduced. The individually reduced bone fragments were fixed temporarily with K-wires.Seen under C-Arm IITV. In group A patients bone graft was taken from ipsilateral iliac bone without cutting iliaccrest to decrease donor site morbidity. The bone graft consisted of both inner & outer cortex withcancellous bone sandwiched between them. It was placed in the defect below articlar surface. Bohlers angle was reconstructed and seen under C-arm. After satisfactory reduction, plate was applied and fixation of the plate was done with locked screws. Particular care is taken to fix the central fragment (posterior subtalar fragment) in a good and stable position.

The implant used was a multi-directional low profile locking plate.

STATISTICS

Statistical significance was taken as 0.05. The t test for equality was used to test for significance of difference.

Group A

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre-op	9.52	21	3.763	0.821
	post-op	28.90	21	5.873	1.282

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	pre-op & post-op	21	0.500	0.021

P value is < 0.05 i.e. 0.021, means there is significant difference in

Bohler's angle after operation. At 20 degrees of freedom, 5% significant limit of t is 2.09.The observed t value is 7.237 times the SE hence there is no doubt that surgery improvesBohler's angle.

Group B

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	post-op	21.10	21	6.156	1.343
	pre-op	10.95	21	2.906	0.634

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	post-op & pre-op	21	0.839	0.000

P value is < 0.05 i.e. <0.0001, means there is significantdifference in Bohler's angle after operation. At 20 degrees of freedom, 5% significant limit of t is 2.09. The observed t valueis 11.50 times the SEhence there is no doubt that surgeryimproves Bohler's angle.

Group A & Group B

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	post-op A	29.38	21	5.687	1.241
	post-op B	21.10	21	6.156	1.343

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	post-op A & post-op B	21	-.165	.474

At 20 degrees of freedom, 5% significant limit of t is 2.09. The observed t value is 4.198 times the SE hence Group A is better than Group B.

RESULTS

Group A

In pts treated with plating with bone grafting partial wt bearing was started within 6-8 weeks and full wt bearing within 3-6 months. 13 patients (61.90%) walked full weight bearing in 3 months duration, while 08 patients (38.09%) took 4-6 months due to delayed wound healing or associated injuries.

The time for union was 8-14 wks. in 22 cases (95.65%) normal Bohler angle (i.e. 200-400) was achieved. There were 3 cases (13.04%) of post operative delayed wound healing.The gaping was at the angle of the incision for 2-3 cm.It was deep till subcutaneous tissue but plate was not exposed. All healed with daily dressing and delayed mobilization within 3 weeks and had no further treatment. 01 patients (4.34%) had superficial wound infection and were been treated with oral antibiotics. None of the patients developed severe infection. None of the pt developed sural nerve complication in the form of loss of sensation on lateral aspect of foot or had painful hardware.

The overall results according to the AOFAS Ankle Hindfoot Scale were good and excellent in 20/23 (86.95%), 4 (17.39 %) of the patients had excellent results, 16 (69.56%) had good results, 2 (8.69%) had fair result and 1 (4.34%) had poor results

Group B

In group B patients treated with plating without bone grafting, partial wt bearing was started within 6-8 weeks and full wt bearing within 3-6 months.10 patients (47.61%) walked full weight bearing in 3 months duration, while 11 cases (52.38%) took 4-6 months due to delayed wound healing or associated injuries.

The average time for union was 10-16 wks. in 17 cases (73.91%) normal Bohler angle (i.e. 200-400) was achieved. There were 3 cases (13.04%)

of operative delayed wound healing. It was deep till subcutaneous tissue but plate was not exposed. All healed with daily dressing and delayed mobilization within 3 weeks and had no further treatment. 01 patients (4.34%) had superficial wound infection and treated with oral antibiotics. None of the patients developed severe infection. 01 (4.34%) of the patient developed sural nerve complication in the form of loss of sensation on lateral aspect of foot and 01(4.34%) had painful hardware, so implant removal was done after bony union.

The overall results according to the AOFAS Ankle Hindfoot Scale were good and excellent in 17/23 (73.91%). 3/23 (13.04%) had fair result and 3/23 (13.04 %) had poor results.

Table 1

	Group-A	Group-B
Mean Partial wt bearing (weeks)	6.47	6.61
Mean Full weight bearing (months)	3.09	3.95
Mean Pre-operative Bohler angle	10.08°	10.95°
Mean Post-operative Bohler angle	29.08°	21.43°
Mean Bohler angle at the time of Union	28.43°	18.26°
Mean Union (weeks)	10.39	11.95
Delayed wound healing	3	3
Superficial wound infection	1	1
Painful hardware	0	1
Sural nerve complication	0	1

There is statistically significant difference between the bone graft and non-bone graft patients regarding the change in Böhler's angle obtained with surgery.we confirmed that autologous bone graft supplementation is beneficial in achieving and maintaining restoration of calcaneal height and anatomic reduction.

DISCUSSION

Although surgical treatment of displaced calcaneal fractures is an established surgical standard.it is not clear, if accurate anatomic reduction is of major importance. literature showed that fracture volume treated by an institution is an independent determinant for the postoperative infection rate and for the development of subtalar arthritis. The restoration of the tension of the plantar fascia by reconstruction of Bohlers angle and hindfoot length is important for the biomechanics of the foot. CT diagnostic provided improved understanding of calcaneal fractures and led to a clinically relevant classification of these injuries. Thus a better surgical planning became possible.

Anatomical and biomechanical studies refer to the important role of the posterior joint facet, which has to be stabilised to reconstruct the subtalar joint. Incidence and severity of posttraumatic subtalar arthrosis depends on the fracture type, calcaneal shape, and position after the osteosynthesis, chondral injury of the subtalar joint, and articular facet congruency.Special plates have been invented to suit the needs for the treatment of calcaneal fractures (e.g. AO calcaneal plate, Galveston plate, low contact plate). The selected implant should be able to neutralize the forces resulting from the Achilles tendon and maintain reduction of the fragments until bony consolidation. Because of the variety of holes each fracture can be treated individually. Especially the main fragment (posterior fragment) can be fixed safely.

The operative treatment of intraarticular calcanium fractures with/without bone graft is a still a topic of debate. Many studies had reported higher infection rate in the treatment of intraarticular calcanium fractures with bone graft and this was one of the reason for the authors to propagate no use of bone graft.

In our study we observed lesser infection rate in bone graft group than without bone graft group there is also concerne of donor site morbidity

associated with iliac creast bone graft but we were able to decrease the donor site morbidity by preserving the iliac creast. Restoration of bohler angle was associated with better outcome. In our study post operative bohler angle was significantly higher in bone graft group.

Restoration of bohler angle was statistically significantly better in the bone graft group than non bone graft group. We have confirmed that in treatment of intraarticular calcanium fractures bone graft augmentation could restore the bohler angle better and prevent late collapse.the patients with bone grafts could return to full weight bearing earlier.

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IRREDUCIBLE TRAUMATIC KNEE DISLOCATION : A CASE REPORT

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ABSTRACT

Dislocation of knee joint is a rare injury. Even rarest is unsuccessful closed reduction attempt of traumatic knee dislocation. In such cases, open reduction is the recommended method of treatment. Interposition of the soft tissues on the medial aspect of the joint is shown to be the cause of an unsuccessful reduction. We present a 50-yearold male with an knee dislocation after a motorcycle accident in which open joint reduction and repair of the medial collateral ligament and retinaculum was performed in the first stage of treatment. In the second stage, arthroscopic isolated posterior cruciate ligament reconstructions were carried out.The purpose of this article is to provide a brief summary of recent literature on irreducible traumatic knee dislocation and our experience.

Key words: Traumatic knee dislocation, Irreducible knee dislocation, Posterolateral knee dislocation.

INTRODUCTION

Dislocation of the knee joint is a rare injury, and irreducible knee dislocation is even rarest.[1] Most of the cases of irreducible knee dislocation are posterolateral dislocations where the torn medial collateral ligament,[2] vastus medialis[3,4] muscle and capsule[5] may be interposed in tibiofemoral joint and prevent closed reduction.Open knee dislocations and dislocations occurring due to high energy traumas are frequently associated with fractures, neurovascular injury and multiple ligament injuries as compared to closed dislocations.[6,7] The knee can easily be reduced by a closed manipulation in such high energy injuries. We present a patient with an open knee dislocation, irreducible by closed manipulation. The patient was treated with open reduction and subsequent ligament reconstruction.

CASE REPORT

Clinical History

A 50-year-old man had an close dislocation of the left knee after a motorcycle accident. He first admitted to a nearby hospital, where closed reduction attempt was carried out of the dislocation. He was immobilized with an above knee plaster cast after the operation. However, the pain did not resolve, the follow-up radiograph showed an incomplete reduction and the patient was referred to our hospital on the tenth day of the injury. The medial femoral condyle was palpable under the ecchymotic skin on the medial part of the knee (Fig. 1). Ligament stability could not be optimally evaluated because of the locked flexion position of the knee.

Imaging findings

On the anteroposterior and lateral

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radiographs, it was seen that the left knee medial joint space was opened and the tibia proximal was displaced toward the lateral and the posterior (Fig. 2). As patients belongs to low socioeconomic class so MRI of the knee could not be obtained.

Intraoperative findings and management

After discussing with the patient his daily activities demand, open reduction with ligamentous reconstruction was planned. The first surgical intervention was performed on the day following admission. First, a closed reduction was reattempted under anesthesia which failed. An anterior (medial parapatellar approach) incision was made to expose the medial femoral condyle. The medial collateral ligament and the adductor longus muscle were completely dissected from their femoral insertion sites. The medial retinaculum and capsule were in the intercondylar notch area and the medial collateral ligament was interposed into the tibiofemoral space (Fig. 3). The joint was reduced after the removal of these trapped structures, although joint stability could not be obtained. No chondral lesion was detected in the joint and the menisci were intact. The posterior capsule was torn to the posterior cruciate ligaments. The anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL) was having midsubstance tear. The medial collateral ligament and the medial retinaculum was repaired. Posterolateral structures were intact. After the operation, the knee was immobilized with a percutaneous pins through tibia to femur, locked at 30° of flexion. As the patient had no wound problems, intermittent passive range of motion exercises between 0 and 50 degrees were introduced after removal of pins three week with knee brace to bear in between exercises. The patient was mobilized with the brace without any weight bearing for six weeks. The patient underwent a second closed manipulation which increased the flexion from 90° to 100° in the second month. By the 3rd month, the patient was able to walk with full weight bearing without the brace. Arthroscopic isolated PCL reconstructions was performed as the second stage treatment after 5months (Fig. 4). The patient's knee was stable with a flexion range of 90°, 18 months after the initial injury (Fig. 5).

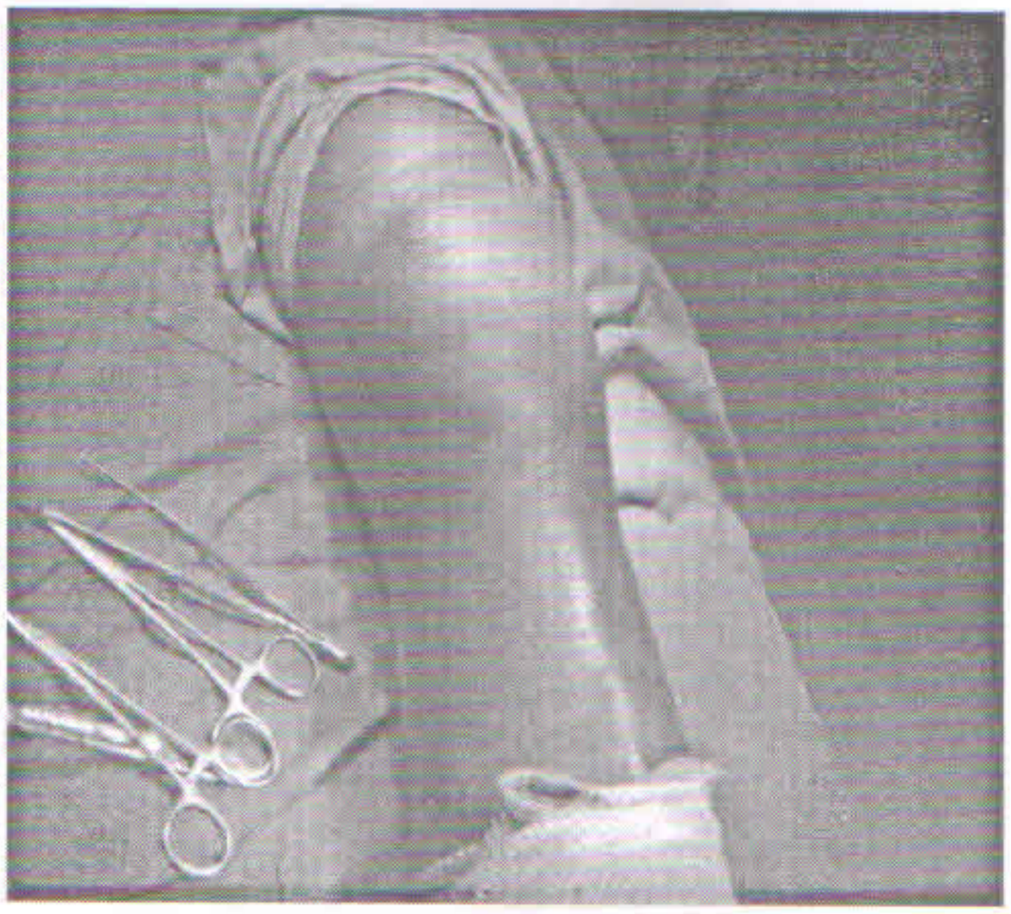

Figure 1 : Ecchymotic skin on the medial part of the knee

Figure 2 : Preoperative X-ray, knee medial joint space was opened and the tibia proximal was displaced toward the lateral and the posteriorto femur

Figure 3 : Intraoperative, capsule were in the intercondylar notch area and the medial collateral ligament was interposed into the tibiofemoral space

Figure 4 : Postoperative x-ray showing arthoscopic PCL reconstuction

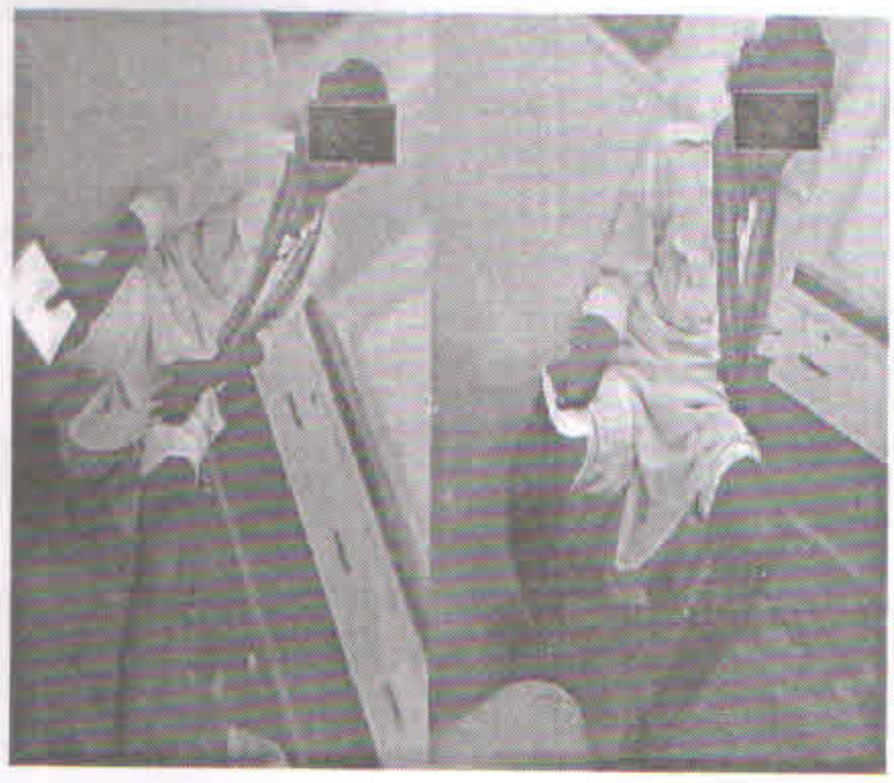

Figure 5 : Postoperative knee flexion range of 90°, 18 months after the initial injury

DISCUSSION

Knee dislocations are very rare injuries but have some serious neurovascular injuries which might even require amputations.[1,8] Motor vehicle accidents are the most common etiological cause. Knee dislocations due to high energy traumas are usually reduced with closed methods.[6] Open knee dislocations are even quite rare.[7] In previous studies, open knee dislocations were usually classified as open joint injuries. Collins and Temple classified open joint injuriesinto four groups according to the damage to the extracapsular and intraarticular structures and assigned the joint dislocations to the last group.[9] King et al. graded joint injuries based on the Gustilo open fracture classification.[7] It has been recognized that most patients present with the knee spontaneously reduced following a dislocation. Most of these injuries could be reduced under sedation by closed

methods but a few of them are irreducible and require urgent surgical intervention. Irreducible dislocation of the knee joint as reported in the literature are usually posterolateral dislocations, due to low energy traumas.[2,3,4,5] The mechanism of injury in such irreducible posterolateral knee dislocation is usually abduction and external rotation forces applied to a flexed knee.This occurs when the medial femoral condyle buttonholes through the medial capsule and the medial collateral ligament (MCL) invaginates into the knee joint, preventing reduction.[2,5] Quinlan and Sharrard stated that the interposition of the medial retinaculum may further interfere with the reduction in the posterolateral knee dislocation.5 The sine qua non of this condition is a transverse furrow seen on the medial side of the knee. Clinically, ecchymosis (dimple sign) on the skin of the medial part of the knee is characteristic.[2,3,4,5]

Irreducible knee dislocations must be immediately reduced with surgery. Acute treatment of the damage to extracapsular structures is important in order to protect the extremity and prevent infection. Objectives of treatment should be to achieve a stable, painless, and mobile knee joint without much functional limitations. Therefore, debridement of necrotic tissue and irrigation of the joint followed by the repair of damaged ligaments is suggested in the treatment of open joint dislocation. Ligament repair may usually be required to provide knee stabilization following the open reduction. Urguden et al. performed open reduction and external fixator application on their two cases with irreducible knee dislocation due to low energy trauma.[2] In our case,joint stability could not be achieved in the first stage despite the repair of the medial collateral ligament and retinaculum from the joint. Stability was obtained after the repair of the medial capsule and collateral ligament. There is still some controversy on the timing of ligament reconstruction. Owens et al. reported better results with primary ligament repair within the first 2 weeks of the closed knee dislocation.[10] Bin and Nam performed a two-stage treatment in closed knee dislocation with multiple ligament injury.[11] In the first stage, they repaired the medial and lateral collateral ligaments and obtained a full knee range of motion within 3 months. In the second stage, they performed the arthroscopic cruciate ligament reconstruction. Richter et al. managed a case of old traumatic knee dislocation by arthrolysis simultaneouslyPCL reconstruction, and hinged external fixation device.[12] At the follow-up of 1 year, the patient had painless motion with mild residual posterior subluxation. Similarly, we also performed the second stage ligament reconstruction after achieving complete knee range of motion. The new trauma of an early surgery may further increase the risk of stiffness and infection. We applied a two-stage treatment to avoid infection and skin problems. Searching the English literature, only a few reports of neglected knee dislocations are there.[13-18] Due to rarity of the situation and lack of enough literature, the treatment methods for a neglected knee dislocation are confusing ranging from open reduction with ligamentous reconstruction to arthroplasty or arthodesis.[13-18]

CONCLUSION

In irreducible traumatic knee dislocations, immediate open reduction should be considered. Repair of the medial collateral ligament and medial retinaculum is sufficient in the first stage treatment after open reduction. This serious pathology, with different degrees of soft tissue injury, may necessitate subsequent procedures to obtain a stable knee with an adequate range of motion.

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URO BAG TUBE: AN EFFECTIVE ALTERNATIVE TO MEDULLARY TUBE DURING CLOSED ANTEGRADE INTRAMEDULLARY NAILING FOR FEMORAL SHAFT FRACTURE: A CASE REPORT

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ABSTRACT

The present report illustrates a rare clinical scenario where an effective alternative to usual exchange medullary tube was used during closed antegrade intramedullary nailing for a femoral shaft fracture.

Key words: closed antegrade intramedullary nailing,femoral shaft fracture,exchange medullary tube Key message:Uro bag tube can be used as an effective alternative to medullary tube during closed antegrade intramedullary nailing for femoral shaft fracture

INTRODUCTION

With improvements in technique and especially the availability of image intensifiers, closed procedure have almost replaced the open technique. Interlocking intramedullary nails have become the treatment of choice for nearly all femoral shaft fractures.[1,2] During this procedure, a medullary tube may be used to exchange the ball-tipped reaming guide-wire for the straight guide-wire. This is the most critical step during closed femoral interlocking nailing as the tube maintains the fracture reduction during the process of exchanging.[3,4] Unavailability of required/desired medullary exchange tube during the closed procedure is an unpredictable and unusual event that creates an awkward situation for surgeon and other team members. It not only increases the operative time but also lost the fracture reduction. To the best of our knowledge, the present case is the only report of using a cost effective alternative for exchange medullary tube during the closed femur interlocking procedure.

CASE REPORT

In Feb 2012, a 25 year old ladypresents to the emergency room following a road traffic accident. Her right thigh shows significant swelling and deformity. The patient was hemodynamically stable. Her vital signs were stable. True antero-posterior and lateral radiographs were assessed for fracture location, pattern anddegree of comminution. X-ray of the right thigh revealeddiaphyseal fracture femur. The patient was admitted to the unit in traction for diaphyseal fracture femur and pre-operative routine investigations were ordered according to protocol of our institution.Closed antegrade femoral interlocking nailingwas planned. After informed consent under epidural anesthesia, the patient was positioned supine on the fracture table. Closed reduction was achieved under the image intensifier. After entry of femoral awl at the piriformis fossa, ball tipped guide wire was inserted through the entry hole and manipulated it down the proximal femur. At the fracture site, the Guide Wire was

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again manipulated under C-arm control and finally negotiated the reaming guide wire into the distal fragment. A flexible reamer was passed along the ball-tipped reaming guide wire, and the medullary canal was reamed to size 10.5 mm. After completion of desired reaming, the plastic exchange tube was decided to insert over the Ball-Tip Guide Wire. In an attempt to check the flexibility of the tube by bending before the procedure the tube shattered into segments. This could be due to brittleness of the tube.In the present scenario we had two options, to wait for another exchange medullary tube or try to negotiate straight nail guide wire across the fracture site in parallel with the ball-tipped reaming guide wire. Both of the available options would increases the operative time and morbidity. Authors have decided to use an alternative to exchange tube. Now the present challenge was how to choose such alternative? We have three options viz nasogastric tube, negative suction drain tube and Uro bag tube. The diameter of the available nasogastric tube was inadequate to accommodate the guide wire especially ball-tipped reaming wire. The width of the drain tube was too large to negotiate through the portal and also it kinked several time while pushing. We left with the sterile Uro-bag tube (Fig. 1). The adequate diameter, plasticity, flexibility, sufficient length and smooth passage of ball tipped guide wire through it made Uro-bag tube as an alternative to exchange tube (Fig. 2). With the Uro-bag tube the nail was inserted without complications (Fig. 4). In the application of present technique (Fig. 3) Authors speculated, when taking the ball tipped guide wire out of the tube, do not handle the guide wire roughly or pull it out abruptly. Also, one should stabilize the tube with an artery forceps to prevent its proximal migration (Fig. 3). The patients had excellent function and radio- graphic outcome.

DISCUSSION

During closed Intramedullary nailing procedure, a medullary tube may be used to exchange the ball-tipped reaming guide wire for the straight nailing guide wire. There have been studies[4,5] on the mechanical andphysical properties of medullary tube. Generally, it has been found that with time the tube showed significant change both in appearance (from white to yellow) and mechanical properties (from flexibility to brittleness). The change in mechanical properties seems therefore to bemainly due to repeated autoclaving and reusing. Altered properties of these tubes may lead to unpredictable consequences.[4,5,6,7,8] Study[5] showed that the

Figure 1 : Sterile Urobag

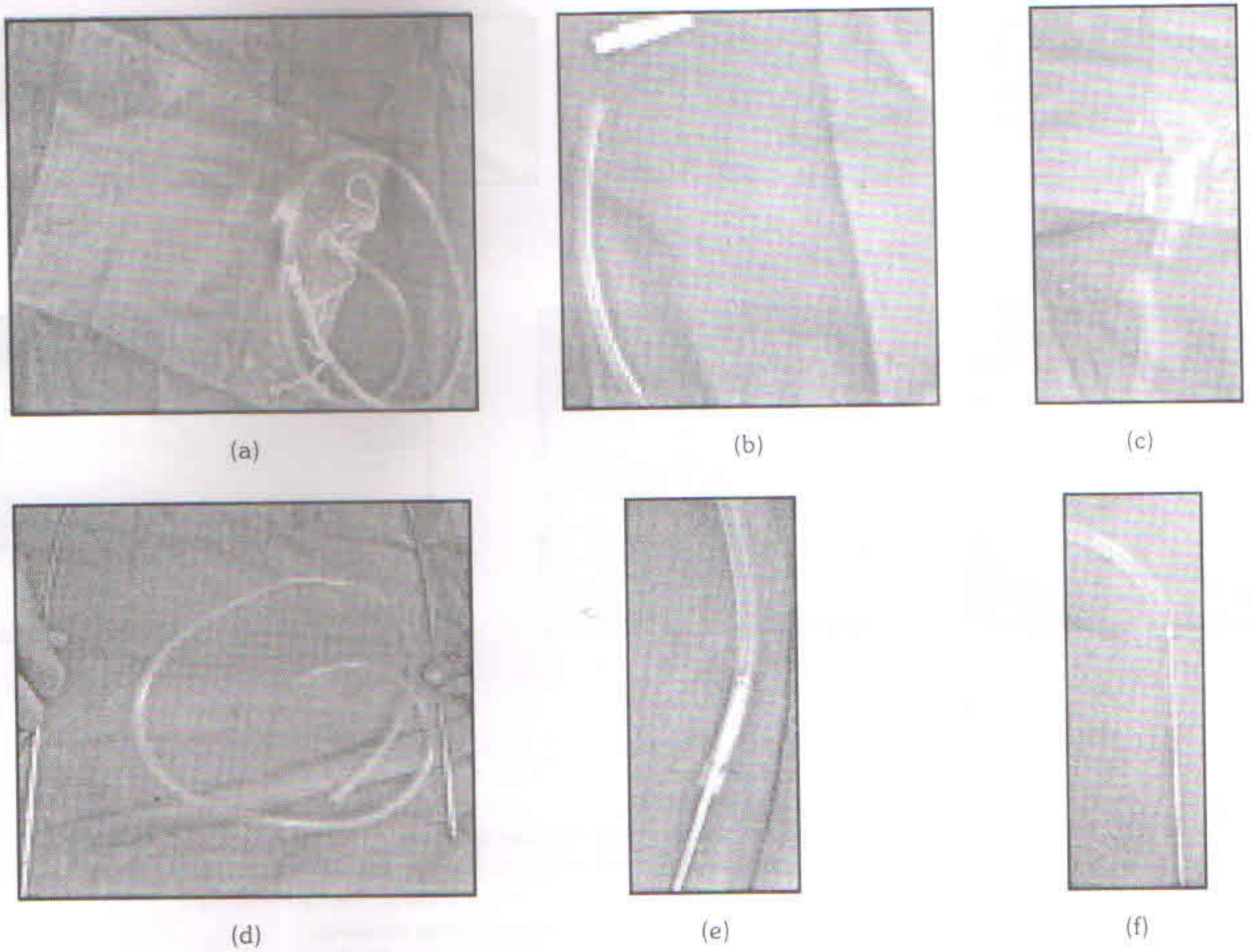


Figure 2 : (a) Urobag with tube; (b) Wide proximal end of U ot tube after removing the connecting cannula; (c) Distal end of Uro tube after cutting from its attachment with the Uro-Bag; (d) Beaded Guide wire and Modified Uro tube; (e) free passage to ball tipped guide wire through the wide proximal end of Uro tube; (f) free passage to ball tipped guide wire through the distal end of Uro tube.

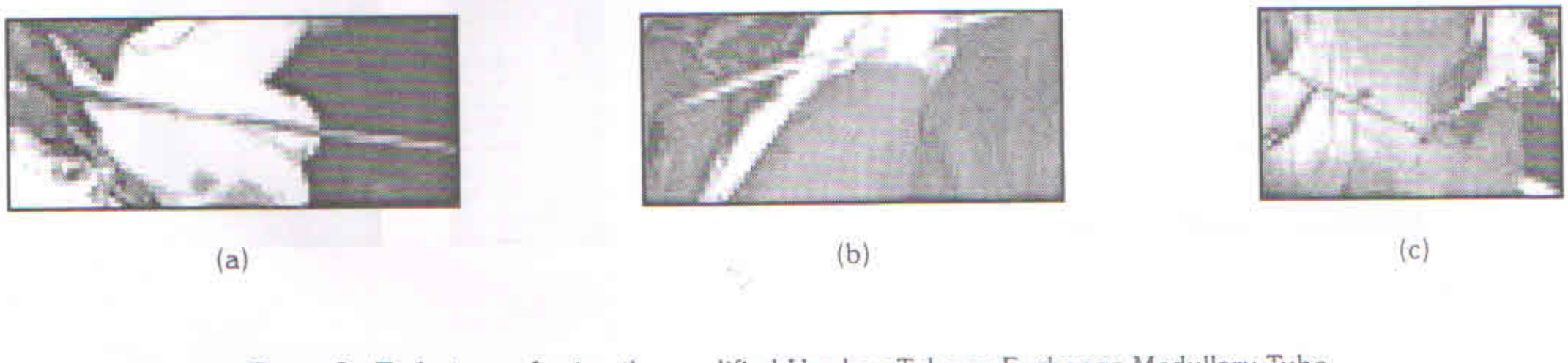
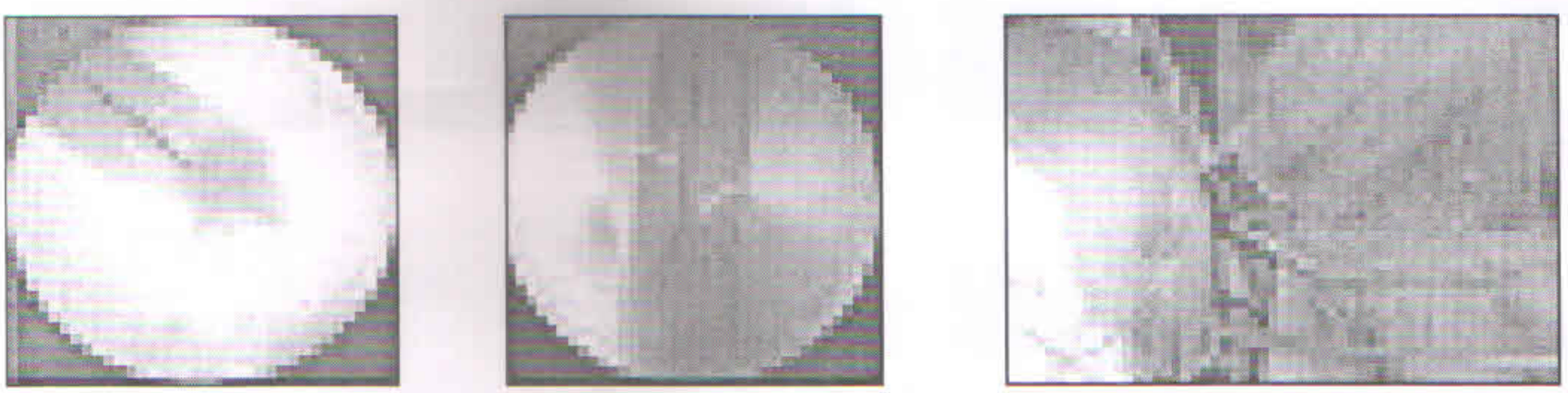


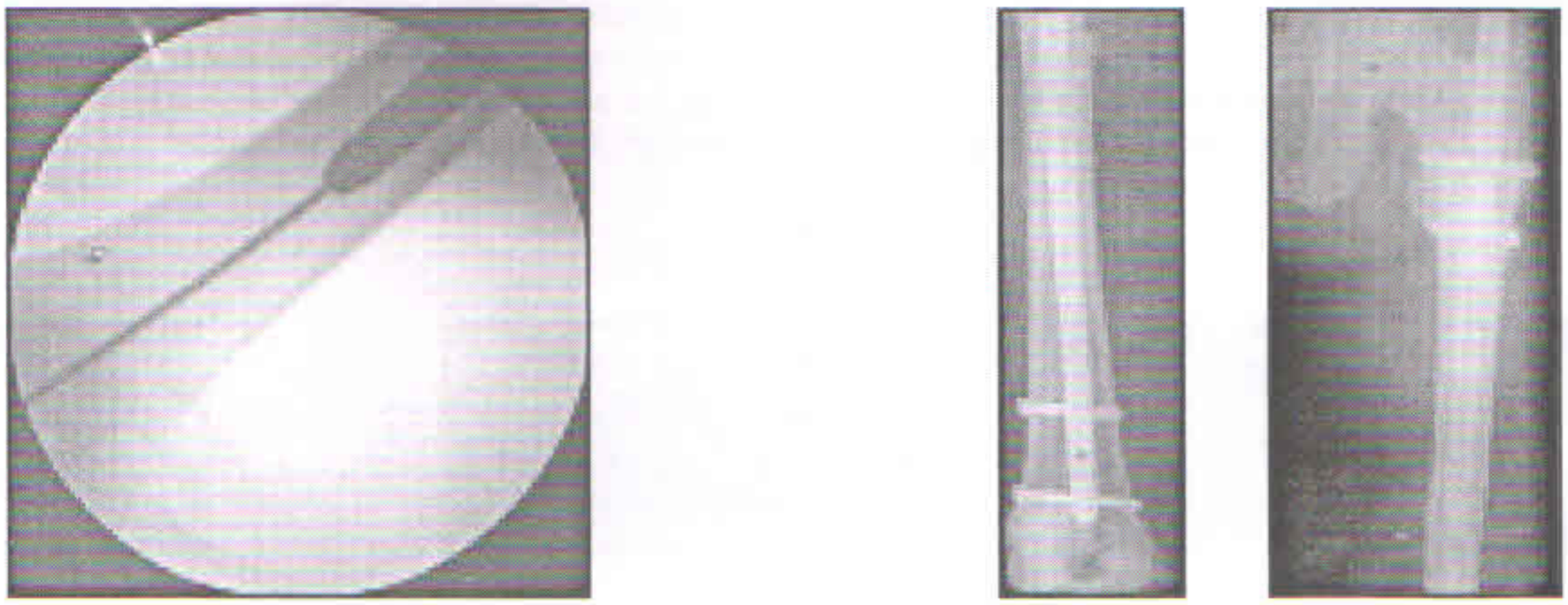
Figure 3 : Technique of using the modified Uro bag Tube as Exchange Medullary Tube (a) Inserting tube over the ball tipped guide wire: (b) the tube is smoothly negotiated into the distal fragment over the ball tipped guide wire (left with sufficient length); (c) After stabilizing with the artery forcep the ball tipped guide wire was gradually removed;

(d) (e) (f)



(g) (h) (i)

Figure 3 : Technique of using the modified Uro bag Tube as Exchange Medullary Tube
(d) The ball tipped guide wire (as shown);
(e) After stabilizing the tube the ball tipped guide wire was removed;
(f) Smooth nailing guide wire was inserted;
(g) AP view-the nailing guide wire passed smoothly through the tube (arrow);
(h) Lateral view-the nailing guide wire passed smoothly through the tube (arrow);
(i) After exchanging the guide wires the tube was removed.



(a) (b) (c)

Figure 4 : Procedure done without any complication
a : nail was inserted smoothly over the straight guide wire;
b & c : AP view showing nail in position with locking.

medullary tube should be replaced before 100 autoclave cycles. In the present case the tube became brittle and shattered while bending. Although published peer-reviewed scientific evidences[4,5,6,7,8] that highlights the complications in context with the exchange medullary tube areavailable but until recently, to the best of our knowledge, we could find no published literatureconcerning the use of an effective alternative to the exchange tube. This is probably the first documented description of using Uro-bag tube as substitute to exchange tube. Furthermore, the authors advised to check the tube routinely for its flexibility before the procedure and should have at least one more tube to avoid such awkward situations.

CONCLUSION

We are reporting this method of using Uro-bag tube as an alternative to medullary exchange tube during the closed femoral interlocking nailing for its simplicity. This is a cost-effective technique that can be used in emergency and/or critical situations (such as unavailability of tube, defective, brittle or an old re-used tube) when the usual exchange tube is not fit within the described criteria.[9] Originality and versatility as a method to be considered a valid option.

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FAILED BACK SURGERY SYNDROME A REVIEW WITH TREATMENT CONSIDERATIONS

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ABSTRACT

Advancements in the field of medicine has given many options for treating spine problems and yearly the patients who are undergoing Spine surgeries for correcting spine problems are increasing progressively. Despite these advancements numerous patients who are underwent technically and anatomically correct spine surgeries for correction of their spine problems complain persistence of their previous complaints or onset of newer symptoms. Onseti (1) gave a term Failed Back Surgery Syndrome (FBSS) for describing these group of patients. Treating these patients is a greater challenge for Pain physicians, Orthopaedicians, Neurosurgeons, Neurologists, because of the patients negative premonition over the treating physicians because of their previous experience with Surgery. This article gives a broad view on how FBSS manifests and the treatment modalities available for dealing with FBSS.

Key words: Failed Back Surgery Syndrome, Flat back syndrome, Persistent back pain, Spinal cord Stimulation, Percutaneous adhesiolysis

INTRODUCTION

"The failed back surgery is easy to recognize but difficult to define wrote Onesti in 2004.[1] Failed Back Surgery Syndrome (or FBSS) refers to patients with persistent or new pain after spinal surgery for back or leg pain.[2] It is defined as "persistent or recurrent pain, mainly in the region of the lower back and legs, even after technically, anatomically successful lumbosacral spine surgeries".[3] It is a widespread public health problem which has a considerable impact on the patient, health care system and the society.[2] The spine surgery may have involved removing bone (laminectomy or foraminotomy) or disc material (discectomy) or a fusion of the spinal segment or segments instrumented or bony fusion, sometimes referred to as a PLIF or posterior lumbar interbody fusion or as an ALIF or anterior lumbar interbody fusion.

The pain condition does not have to be worse after surgery to attract the term FBSS, it can be reduced but still present and qualify for this term. The term does not imply that something has gone wrong with surgery or that it is somehow the surgeon's fault that pain has not completely gone or that pain gets worse over time. It merely refers to a subset of patients (as some do very well indeed with surgery) who have persistent pain symptoms after spine surgery.

Intervertebral disc herniation, spinal stenosis, and degenerative spondylolisthesis with stenosis are the 3 most common diagnoses of low back and leg symptoms for which surgery is performed.[63,64] Post surgery syndrome and other synonyms such as post lumbar laminectomy syndrome or failed back surgery syndrome represent a cluster of syndromes following spine surgery wherein the

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expectations of the patient and spine surgeon are not met. Persistent pain following lumbar surgery is common.[16-21,60,61,62]

CONTRIBUTING FACTORS

Multiple factors can contribute to the onset or development of FBSS.[2] One of the problems after surgery can be excessive inflammatory healing after the operation and the subsequent development of fibrotic tissue in the epidural space, often enveloping the most recently decompressed spinal nerve roots. Failed back surgery syndrome (FBSS) is a debilitating chronic neuropathic pain condition involving back and legs in 10-40% of patients after lumbosacral spine surgery.[5,6]

The conditions that contribute to FBSS includes :[7]

1. Recurrent or persistent disc herniation (12% to 16%)
2. Lateral (58%) or Central canal stenosis (7% to 14%)
3. Arachnoiditis (1% to 16%)
4. Epidural fibrosis (6% to 8%)
5. Instability (5%)

Superimposed on many of these conditions is discogenic back pain, a relatively common cause of back or leg pain following surgery. Furthermore, patients may be predisposed to FBS due to systemic disorders such as diabetes, autoimmune disease, psychiatric disease, or vascular disease. Overall, it is clear that both biological and psychological issues play a significant role in the outcome of lumbar spine surgery.

The specific causes of FBS have been a topic of much debate. Patients with this syndrome can be divided into one of two groups:

1. Patients in whom surgery was never indicated, or the surgery performed carried a low likelihood of achieving the desired result.
2. Patients in whom the surgery was indicated but the surgical procedure was inadequately or incompletely performed, failing to achieve the intended result.[8]

Waguespack et al showed that the most common diagnosis for FBS was residual lateral recessor foraminal stenosis from an inadequate bony decompression. Discectomies or laminectomies done to decompress the central canal without addressing underlying lateral recess or foraminal stenosis can lead to continued radicular symptoms and disappointing results.[9] FBS after a lumbar fusion can ensue due to extensive instrumentation or fusion across multiple segments.

This can result in a 'flat back syndrome' or loss of normal lumbar lordosis leading to FBS. Pseudoarthrosis and non-union (incomplete fusion; 5-35%), or hardware failure (fracture or loosening) may also contribute to continued back pain and FBS. Transitional or adjacent segment. Syndrome may also be a cause of FBS after lumbar fusion. This is where accelerated degenerative changes occur at levels adjacent to a spinal fusion resulting in instability that is characterized by hypermobility, kyphosis or scoliosis above or below a spinal fusion segment.[8]

One of the most common and most overlooked causes of FBS is inappropriate patient selection. Appropriate patient selection is one of the most important factors in the outcome of any spinal surgery. In a retrospective study of patients who had low back surgery, less than half met the standard criteria for surgery, emphasizing that failure of initial surgery is not an indication for a second surgery.[8] Psychological, social, and behavioral issues play a significant role in the outcome of the surgery as well, since patients with chronic low back pain as a result of FBS frequently have psychological illnesses.

These psychopathologies include depressive disorders, anxiety, and somatization, all of which may be undertreated. A patient's psychopathology is thought to influence the pain level and outcome from aggressive spine surgeries. In cases where there is pre-existing neural damage, it is important to not have unrealistic expectations of a complete return to full premorbid condition. Patients must understand that they may continue to have some

residual pain as a result of pre-existing nerve injury. Partial relief from their pain can sometimes help patients improve their quality of life and help them tolerate any residual pain. In addition to pre-operative expectations, limited social support may contribute to a poor outcome after spine surgery.[8]

TREATMENT

Current treatment recommendations for FBSS include an interdisciplinary approach. As with the majority of chronic pain conditions, conservative treatment should be attempted first. This includes physical therapy, pharmacotherapy, psychiatric/ psychological treatment and other non invasive options. If conservative therapy is not effective, the patient should be evaluated for mildly invasive procedures, such as epidural or facet block injections. If injections are inadequate and pain is intractable, neuroablative and neuroaugmentative procedure may be used. Spinal cord stimulation is an increasingly popular neuroaugmentative procedure that works by blocking transmission of pain at the level of the spinal cord dorsal horn via electric stimulation.[10] The recommended order in which different modes of therapy should be tried in a case of FBSS. First trials with low doses of selected antidepressants and anticonvulsive drugs and TENS is compulsory. When (pulsed) radiofrequency treatment adjacent to dorsal root ganglion fails SCS is strongly recommended before a dose increase of drugs.[15]

PHYSICAL THERAPY

Vigorous physical therapy and behavioral therapy aimed at the elimination of local mechanical issues has been shown to improve function and patient satisfaction.

LIFESTYLE CHANGES

- Weight loss
- Smoking cessation

ROLE OF VITAMIN D SUPPLEMENTATION

Vitamin D deficiency is fairly common in patients with chronic pain syndrome and musculoskeletal pain.[11-13] An evaluation of serum 25-hydroxy-calciferol level and failed back surgery syndrome made by Saranatra waikakul et al showed that respectively 3 and 6 months after vitamin D2 and vitamin D3 supplementation in 9 patients with failed back surgery syndrome, the mean serum 25-hydroxy-calciferol level had improved significantly, the mean pain score and the mean JOA back score (Japanese Orthopaedic Association low back score), on the other hand, patients with neurological deficits showed little improvement.[14] Sufficient vitamin D supplementation has significant clinical impact on chronic pain syndrome.[12]

PHARMACOTHERAPY

For neuropathic pain, a series of

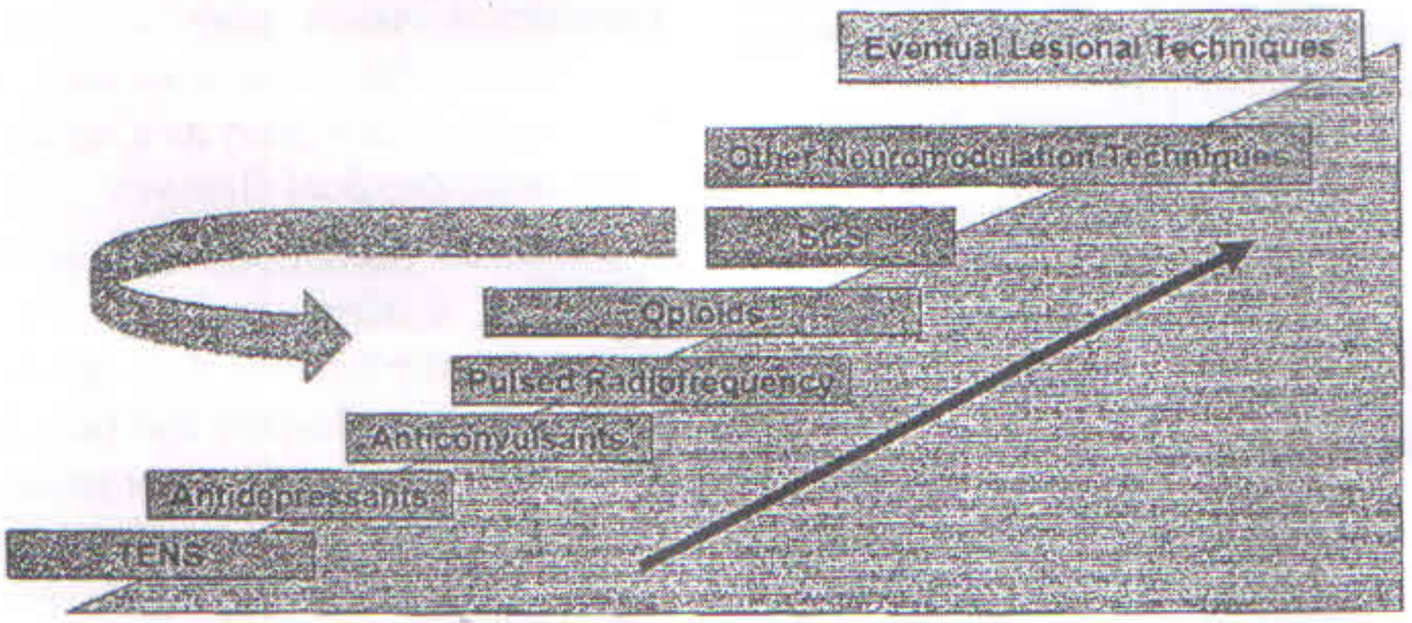


Figure 1 : Therapeutic staircase for FBSS

anticonvulsants such as Tegretol and Neurontin have been found to be useful.[8] Tricyclic antidepressants have also proved beneficial, though may be limited by anticholinergic and central effects. When pain is of somatic origin, NSAID's have been a mainstay of treatment. Recently published treatment guidelines suggest oral amitiptyline, gabapentin or pregaba as first line treatment (NICE 2010).[15] Spinal narcotics may be administered epidurally or intrathecally for pain relief in the form of a permanent delivery system such as pain pump. Morphine is the most common analgesic agent used FBS is the most common indication for pain pump insertion, and anywhere from 60-80% of patients achieve good pain relief from intrathecal drug administration. Pump malfunction causing overdose or withdrawal symptoms, infection, meningitis, or respiratory failure are some of the complications associated with these devices.[8]

PERCUTANEOUS ADHESIOLYSIS

Adhesiolysis with or without hypertonic saline neurolysis provides effective treatment for FBSS. Best reserved for patients with FBSS who have failed other treatment for radicular symptoms. Epidural scarring has several causes, the most common being spine surgery. Causes of post laminectomy syndrome include acquired stenosis, adjacent segment degeneration, internal disc disruption, recurrent disc herniation, retained disc fragment, spondylolisthesis, epidural or intraneural fibrosis, degenerative disc disease, radiculopathy, facet joint pain, sacroiliac joint pain, discitis, arachnoiditis, pseudoarthritis, segmental instability, and others.[16-18,19-21,22-29]

However, among multiple etiologies, epidural fibrosis, discogenic pain, recurrent disc herniation, and spinal stenosis can be treated with either caudal epidural injections or percutaneous adhesiolysis in patients nonresponsive to caudal epidural injections.[22-26,30-38] Epidural fibrosis may account for as much as 20% to 36% of all cases of failed back surgery syndrome.[19,20,22-26,39,40] Percutaneous adhesiolysis is a procedure which can provide relief in patients who have not responded to epidurals, physical therapy or medications. Percutaneous adhesiolysis is also called the Racz procedure, after Gabor Racz, M.D., who developed it. It is an outpatient procedure, similar to an epidural, from the point of view of the person having the procedure. Adhesiolysis is well tolerated and patients into their eighties and nineties can safely have it. The purpose is to break up any scarring which might occur in the epidural space.

Scarring can come about from surgery or simply from aging of the spine. There are many veins in the epidural space and as arthritic changes set in, these veins can tear and cause tiny bleeds. Each little tear and bleed on its own is of no matter. Over time, however, they can cause scarring which can prevent the nerves or the dura from moving. This scarring can occur either around the nerve root or it can attach the dura, the lining that keeps the cerebral spinal fluid in place, to the lining of the spinal canal. Nerves can be tethered or veins can become swollen, pressing on the nerves. Either way, the nerve, or the dura, can cause pain. What we do with epidural adhesiolysis is to try to break up this scarring. The first thing we want to do is to confirm that scarring is present. This can be done on a MRI, with contrast.

We can also show adhesions by looking at the flow of dye when we do an epidural. Scarring will cause an area where the dye will not flow. If there is scarring in a part of the epidural space that could be causing your pain, then an adhesiolysis procedure is a good option. We do is to pass a special spring wound catheter to the area of scarring. This catheter is soft enough to not damage the nerve. It is firm enough to be steerable and, because it has the wire spring in it, it is very unlikely that it will be cut. We first inject some dye to confirm that the scarring in present. We then use this catheter to do a mechanical lysis of adhesions, breaking up the scarring. We then inject more dye to show that we have dye where the dye previously did not go and that the scarring is decreased. There will usually be some residual scarring, so we then inject local anesthetic and steroid and saline (salt

water, just like salt water we have in our body.)

You may have saline that is just like what we have in our body or you may get a more concentrated form of saline, 10% hypertonic saline, which will expand eleven-fold and place more pressure on the remaining scar. Sometimes, we use an enzyme called hyaluronidase to help the spread of the fluid, although hyaluronidase works only on normal tissue and does not itself break up scars. All of the components of adhesiolysis help break up the scar from the inside. Another way to break up the scar is to pull on the nerve, like tugging on a rope. To do this, we will ask you to do some exercises at home. These include bringing your knees up to your chest and bringing your legs straight up in the air and then spread them in and out.

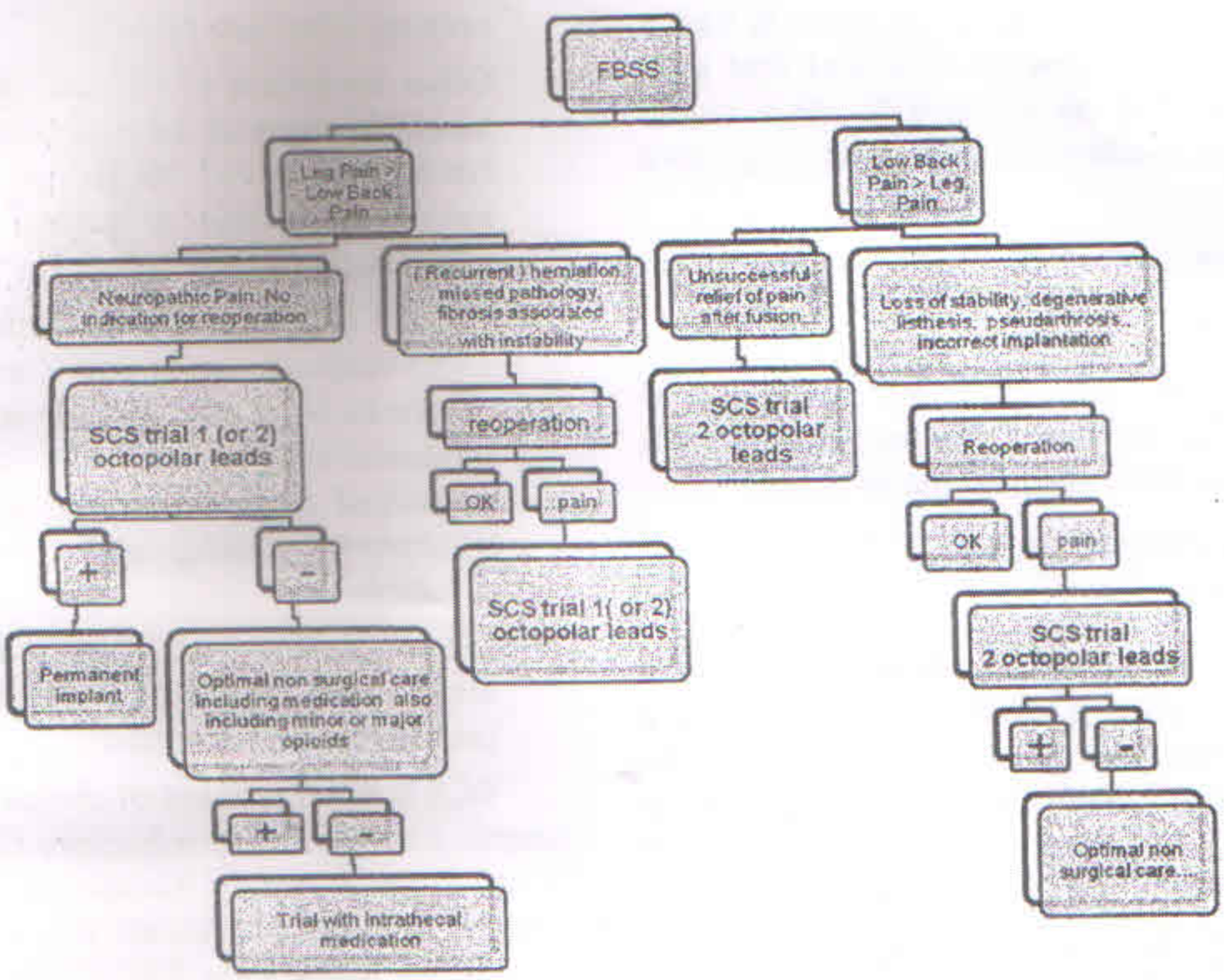
In this manner, we bring in every tool possible to break up the scar, mechanically breaking it up with the catheter, using fluids to open the space and using motion of the nerves themselves to free the nerves up. Patient may return to your normal activities the day after the procedure. Adhesiolysis is generally a safe procedure. Like any procedure, patient can have localized discomfort, infection or hematoma. If hypertonic saline is used, we use great care to make sure it does not go into the subarachnoid space. There is high quality evidence to show that adhesiolysis works in patients who have had lumbar spine surgery and who have spinal stenosis or disc protrusions. There was recently an excellent randomized trial out of four centers in Germany where they compared adhesiolysis to a placebo, with adhesiolysis being very effective.[52]

In the case of post surgery syndrome and spinal stenosis only a moderate proportion of patients showed improvement in pain and functional level with epidural injections.[24,36,41,42] Two recent studies evaluating the effectiveness of caudal epidural injections secondary to post surgery syndrome and spinal stenosis showed encouraging results.[30,31] However, the evidence derived from percutaneous adhesiolysis procedures has been moderate to strong in managing pain of post surgery syndrome.[22,24,25] Percutaneous epidural adhesiolysis has been employed in inter ventional pain management in the management of chronic, refractory low back and lower extremity pain[22-26,37,43-51] with the purpose of eliminating scar tissue and assuring the delivery of high concentrations of injected drugs to targeted areas.

SPINAL CORD STIMULATION

A spinal cord stimulator is a device used to exert pulsed electrical signals to the spinal cord to control chronic pain. Further applications are in motor disorders. The lumbar spinal cord is a preferred target for the control of spinal spasticity[52,53] or augmentation of standing and stepping capabilities.[55,56] Spinal cord stimulation (SCS), in the simplest form, consists of stimulating electrodes, implanted in the epidural space, an electrical pulse generator, implanted in the lower abdominal area or gluteal region, conducting wires connecting the electrodes to the generator, and the generator remote control. SCS has notable analgesic properties and, at the present, is used mostly in the treatment of failed back surgery syndrome, complex regional pain syndrome and refractory pain due to ischemia. Spinal cord stimulation (SCS) has been proven to be a successful therapeutic option in FBSS patients This technique was first applied in the intrathecal space and finally in the epidural space as described by Shealy in 1967.[8]

In the present day, SCS involves the implantation of leads in the epidural space to transmit pulsed energy across the spinal cord or near the desired nerve roots. Anatomical placement of SCS leads depends on the location of the painful region with the goal of inhibiting pain pathways in the dorsal horn nucleus. In literature reviews, successful treatment of patients in whom SCS systems were implanted for chronic pain was defined as either greater than 50% pain relief or significant reductions in VAS score. As this treatment strategy is utilized and tested over a span of chronic pain conditions, new applications are arising.



Only a few clinical circumstances would preclude a conservative approach and these include severe spinal instability, infection, or impending neurologic dysfunction. SCS has proven to be an effective therapeutic modality for the treatment of certain chronic pain syndromes, including FBSS, pain associated with peripheral vascular disease, peripheral neuropathies, multiple sclerosis and complex regional pain syndrome.[2] The ideal patient is one who suffers from intractable sciatic pain. This method involves placing percutaneous leads in the epidural or intrathecal space and providing electrical stimulation over a specified portion of the spinal cord based on the patient's pain pattern. Infection, lead migration or breakage, CSF leak, and weakness are some of the complications associated with these devices. Success rates are on the order of 50% improvement in patients at specialized centers.

MECHANISM OF ACTION

The gate control theory proposed that painful peripheral stimuli carried by C-fibres and myelinated A-delta fibers terminate at the substantia gelatinosa of the dorsal horn. Large myelinated A-beta fibers responsible for touch and vibratory sensation also terminate at the "gate" in the dorsal horn. It was hypothesized that their input could be manipulated to "close the gate" to the transmission of painful stimuli. As an application of the gate control theory, the implantation of spinal cord stimulator device was developed for the treatment of chronic pain. The neurophysiological mechanisms of action of spinal cord stimulation are not completely understood.

However, recent research has given an insight into effects occurring at the local and supraspinal levels, and through dorsal horn interneuron and neurochemical interactions.[11,12] Experimental evidence points to SCS having a beneficial effect at the dorsal horn level by favourably altering the local neurochemistry, thereby suppressing hyperexcitability of the wide dynamic range interneurons. A longterm retrospective review of 254 patients selected for dominant neuropathic

pain in the leg found that 68% of patients had a good to excellent response to SCS and that pain improved significantly by up to 57%. As a result, concomitant pain medication was reduced by more than 50%.[1]

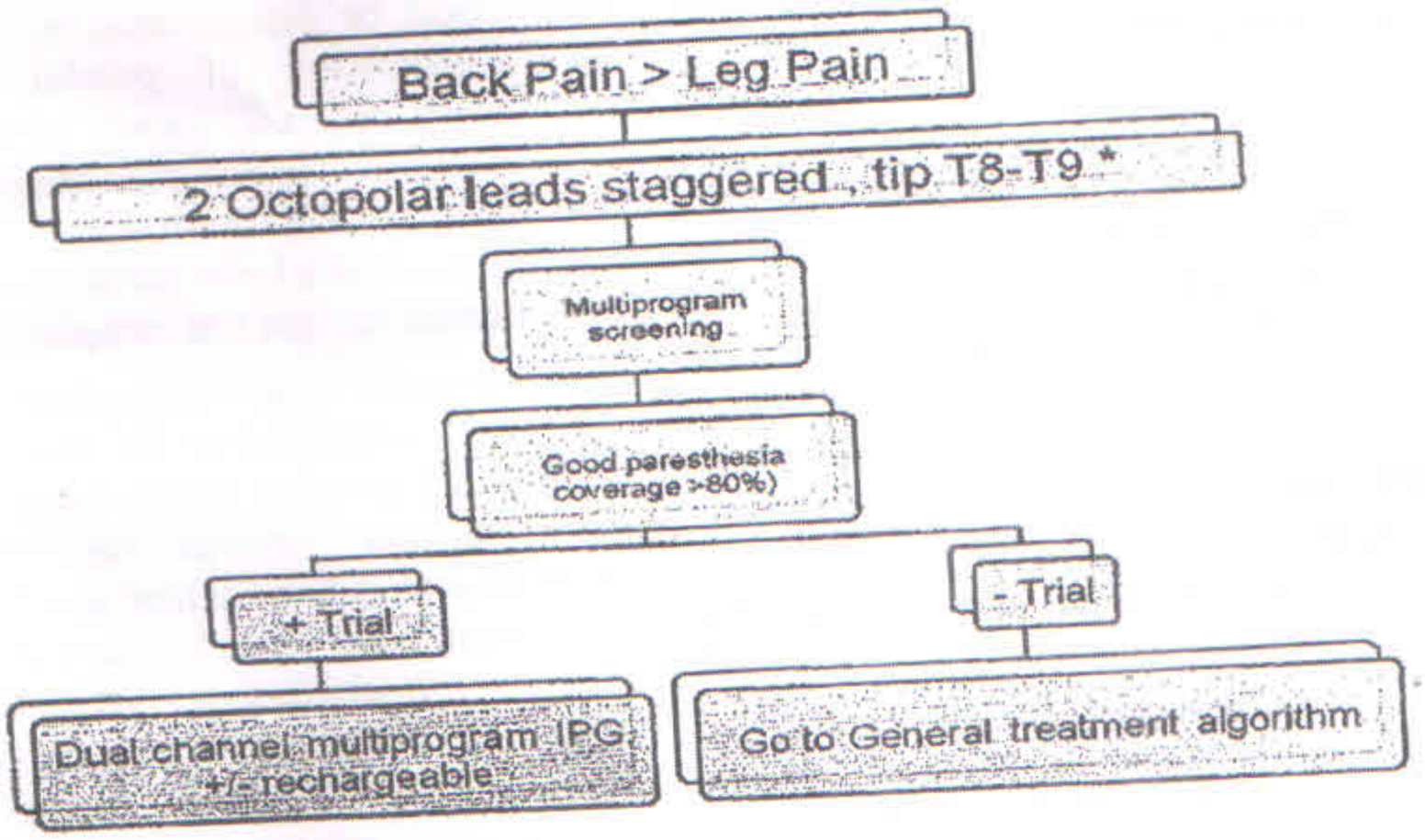
SCS should be considered early in the management of FBSS, prior to a second operation and before the use of high-dose opioid analgesics.[3] A randomised controlled trial by North et al demonstrated that compared with reoperation, SCS provides effective pain relief for many years.[58]

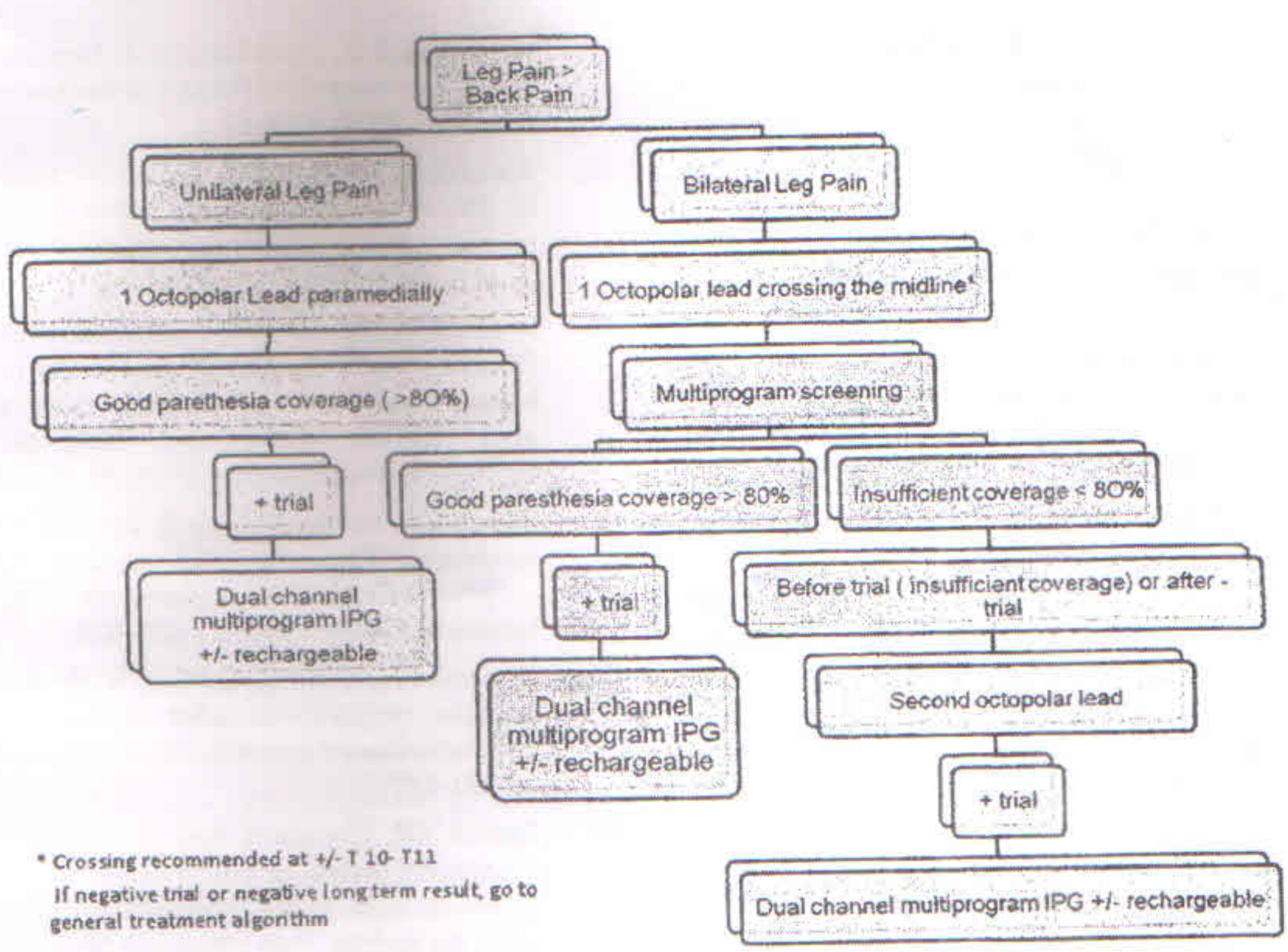
SELECTION PROTOCOLS FOR SCS IMPLANTATION

Currently, the selection protocols for SCS implantation stipulate a screening period using temporary percutaneous placement of leads and an external generator.[57] Medicare regulations use the following criteria to determine whether or not a candidate is suitable for SCS.[58]

- To treat chronic pain caused by documented lumbosacral arachnoiditis that has not responded to medical management.
- To treat intractable pain caused by nerve root injuries, including those associated with post surgery syndrome (FBSS).
- The implantation of the stimulator is used only as a last late resort.
- Other treatment modalities (pharmacological, surgical, physical, or psychological therapies) have not proved to be satisfactory or are judged unsuitable or contraindicated for the given patients.
- Patient has undergone careful physical and psychological screening, evaluation, and diagnosis by a multidisciplinary team prior to implantation. All facilities, equipment, and personnel required for the proper diagnosis, treatment, training, and follow-up must be available.
- Demonstration of pain relief with a temporarily implanted electrode precedes permanent implantation.

SCS is the treatment of choice in well-selected patients with medically refractory FBSS and should be considered when analgesics are no longer effective or cause intolerable side effects. Although spinal cord stimulation (SCS) has been shown to be an effective treatment in the relief of intractable neuropathic pain, more research is needed to assess SCS effectiveness in increasing a patient's functional status. Thorough social, psychological, and physical screenings are required before SCS therapy.





CBT IN PAIN MANAGEMENT

Cognitive behavioural therapy or CBT is a form of talk therapy. This type of therapy helps patients identify their pain and develop the skills necessary to change their negative thoughts and behaviours into positive ones. Individuals involved in CBT believe that patient creates their own experiences, including pain and that by changing their behaviours and thought patterns related to pain, patient can develop or improve coping strategies by addressing what fuels their physical pain by recognizing it.

- Instead of trying to change pain reports, mood, and disability by using analgesics (i.e, pain relief) and keeps on looking for the cause of pain, CBT entails a degree of acceptance of pain and developing ways of improving mood and function (restoring normal a activities of daily life)
- Reducing the use of unhelpful medication/ increasing pain control.
- Identifying and challenging unhelpful beliefs and fears.
- Increasing self-reliance, despite persisting pain

SCRAMBLER THERAPY

Scrambler Therapy (ST5) interferes with pain signal transmission, by "mixing" a "non-pain" information into the nerve fibers.[59]

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Review Article

UNDERSTANDING COMPLEX REGIONAL PAIN SYNDROME

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ABSTRACT

Complex regional pain syndrome (CRPS) is characterised by the presence of regional pain & sensory changes following a traumatic noxious event or spontaneously. The diagnosis of CRPS is predominantly based on clinical signs & symptoms and there is no specific diagnostic test. This article discuss the diagnosis, pathophysiology & treatment options based on the limited evidences available in literature.

Key Words: CRPS, Complex regional pain syndrome, Causalgia, Reflex Sympathetic Dystrophy, Sudeck's dystrophy, sympathetically mediated pain

INTRODUCTION

Complex regional pain syndrome (CRPS) describes an array of painful conditions that are characterized by continuous, spontaneous regional pain which is seemingly disproportionate in time or degree to the usual course of any known trauma or other lesion. The pain is regional and usually distal with predominance of abnormal sensory, motor, sudomotor(stimulation of sweat glands), vasomotor (relating to the constriction and dilatation of blood vessels) and/or trophic changes (changes brought about in tissues from interruption or destruction of nerve, blood supply or both).[1] CRPS can occur after even trivial injury and, on occasion, can develop spontaneously or following a vascular event such as MI, CVA. Pain is an early presenting feature and can be the most prominent symptom. A high index of suspicion is needed as early diagnosis and treatment may prevent the progression of disease and prevent disability.

INCIDENCE

CRPS is an uncommon disease with a prevalence of <2% in most retrospective series.[2] higher incidence of CRPS is reported in patients between the ages of 40-49 and in women (76%).[3] The upper limb is affected twice as compared to the lower limb, and a fracture is the most common trigger (46%). In 10-26% of patients with CRPS, no precipitating factors can be found.[3] No correlation to diabetes, smoking or alcohol has been found.[4]

IASP (International Association for the Study of Pain)-proposed CRPS clinical diagnostic criteria as in Table 1.

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Table 1
IASP diagnostic criteria for complex regional pain syndrome (CRPS)*

1.	The presence of an initiating noxious event, or a cause of immobilization†
2.	Continuing pain, allodynia, or hyperalgesia in which the pain is disproportionate to any known inciting event
3.	Evidence at some time of edema, changes in skin blood flow, or abnormal sudomotor activity in the region of pain (can be sign or symptom)
4.	The diagnosis is excluded by the existence of other conditions that would otherwise account for the degree of pain and dysfunction

* If seen without "major nerve damage" diagnose CRPS (Reflex Sympathetic Dystrophy) ; if seen in thepresence of "major nerve damage" diagnose CRPS II (Causalgia).
† Not required for diagnosis; 5-10% of patients will not have this.

As IASP criteria lacked specificity, a new set of diagnostic criteria were adapted at a closed conference of leading experts from around the world in 2004 in Budapest, Hungary-these were called the 'Budapest criteria'discussd in Table 2.

Table 2
Proposed clinical diagnostic criteria for CRPS'Budapest criteria'

To make the clinical diagnosis, the following criteria must be met:
1. Continuing pain, which is disproportionate to any inciting event
2. Must report at least one symptom in three of the four following categories:Sensory: Reports of hyperesthesia and/or allodyniaVasomotor: Reports of temperature asymmetry and/or skin color changes and/or skin color asymmetrySudomotor/Edema: Reports of edema and/or sweating changes and/or sweating asymmetry Motor/ Trophic: Reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes(hair, nail, skin)
3. Must display at least one sign at time of evaluation in two or more of the following categories:Sensory: Evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or temperature sensation and/or deep somaticpressure and/or joint movement) Vasomotor: Evidence of temperature asymmetry (>1°C) and/or skin color changes and/or asymmetrySudomotor/Edema: Evidence of edema and/or sweating changes and/or sweating asymmetryMotor/Trophic: Evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
4. There is no other diagnosis that better explains the signs and symptoms

PATHOPHYSIOLOGY

Multiple mechanisms are involved & following theories have been proposed

1. **Inflammatory Process:** Originally proposed by Sudeck & hence the synonym Sudeck's dystrophy. Increased local, systemic & cerebrospinal fluid level of IL-Iβ, 2, 6 & 8[7-20] and TNFα with decreased level of anti-inflammatory cytokines like IL-4 & IL-10.[18]
2. **Role of Circulatory Catecholamines:** Lower Noradrenaline (NA) levels in CRPS affected versus unaffected limb. The lower NA level may imply diminished local Sympathetic Nervous System outflow. Exaggerated catecholamine responsiveness because of Receptor up regulation related to reduced Sympathetic Nervous System outflow.[21-23]
3. **Facilitation of CRPS by central sensitization:** Constant nociceptive afferent

input result in even a non-noxious afferent input to be misrecognised by the brain as noxious stimuli causing hyperalgesia & allodynia. Central sensitisation is mediated by Substance-P & bradykinin with the excitatory amino acid glutamate acting at spinal NMDA receptors.[24-25]

4. **Facilitation of CRPS by peripheral sensitization:** After tissue trauma, primary afferent fibres in the injured area release neuropeptides such as Substance-P & bradykinin. They increase baseline firing of nociceptors, increase firing in response to nociceptive stimuli & decrease the firing threshold for thermal & mechanical stimuli.[26-27]

5. **Involvement of Genetics in CRPS:** The involvement of HLA-B62 & HLA-DQ8 in CRPS with dystonia may indicate that these HLA loci are implicated in the expression of CRPS.[28]

6. **Psychological factors:** Significant stressor at time of injury precedes the development of CRPS. This theory has been denied in recent rivews. Although Cognitive Behavioral Therapy (CBT) has been effective in many patients with CRPS.[29]

7. **Cortical Reorganisation:** There is reduced representation of the CRPS affected limb in somatosensory cortex. These alterations are associated with greater pain intensity & hyperalgesia.[30-34]

8. **Dysfunction of Sympathetic Nervous System:** Excessive sympathetic nervous system outflow causing vasoconstriction resulting in common autonomic features of CRPS such as cool bluish limb, suggesting that pain in CRPS is sympathetically mediated.[35]

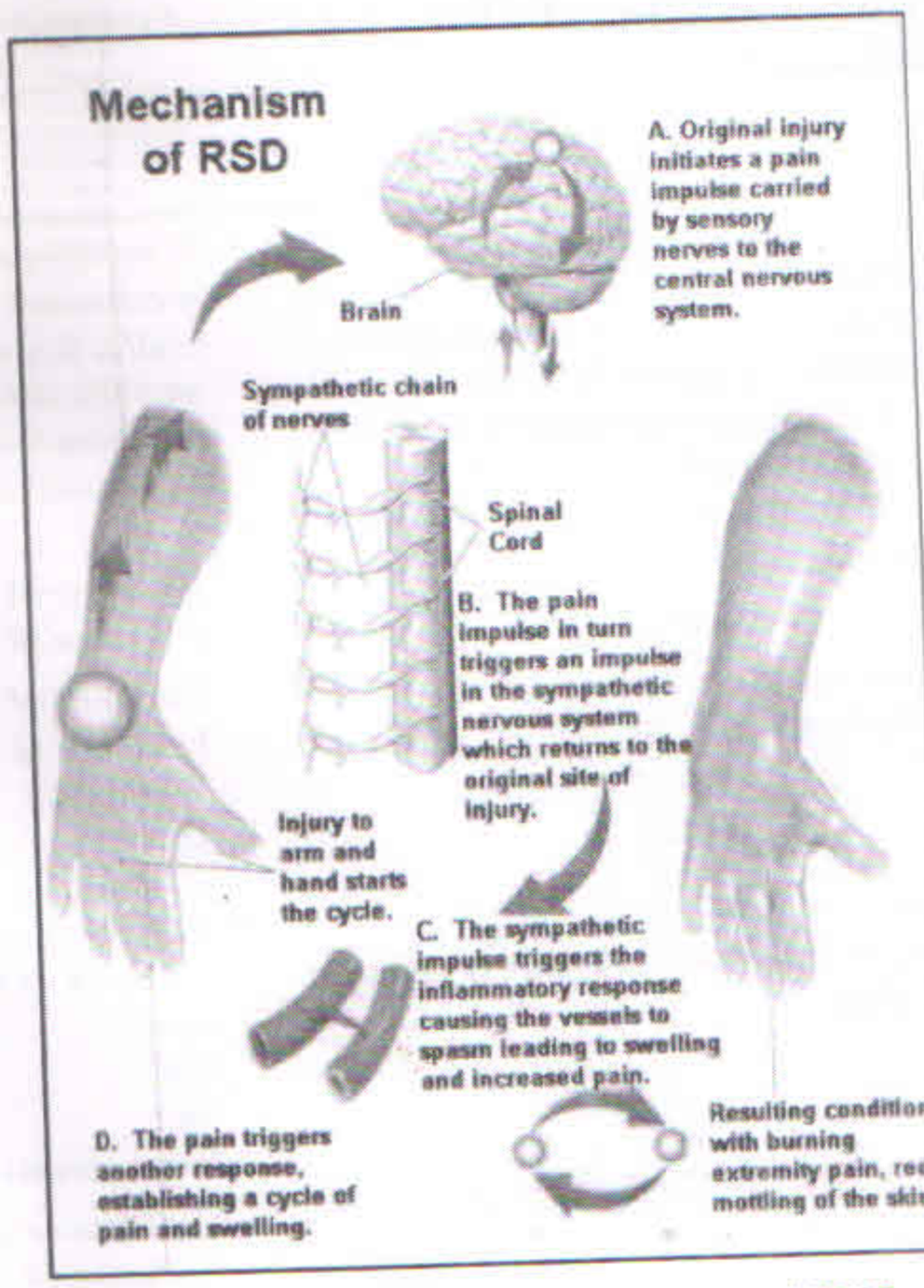

Figure1 : Flow chart showing mechanism of CRPS

CLINICAL CHARECTERSTICS

Based on the duration of symptoms CRPS has been divided into three stages of progression.[5]

- Stage I (Acute stage: 0-3 months): It is characterized primarily by pain/sensory abnormalities (e.g. hyperalgesia, allodynia), signs of vasomotor dysfunction, and prominent edema and sudomotor disturbance.
- Stage II (Dystrophic stage: 3-9 months): It is characterized by more marked pain/sensory dysfunction, continued evidence of vasomotor dysfunction, with development of significant motor/trophic changes
- Stage III (Atrophic stage: 9-18 months): It is characterized by decreased pain/sensory disturbance, continued vasomotor disturbance, and markedly increased motor/ trophic changes.

Not necessarily all patient's diseases progress in a sequential fashion as given above. However recognizing the stage and predominant complains will help in the management of patient.

INVESTIGATION

There is no single diagnostic test to confirm CRPS. Diagnosis is based on the affected individual's medical history and signs and symptoms that match the definition as per Table 2. But because several other conditions can cause similar symptoms, careful examination is important. Since most people improve gradually over time, diagnosis may be more difficult later in the course of the disorder.

Table 3
Common Clinical Charecterstics of CRPS[60]

Diagnostic category	Symptom	Sign
Sensory	Continuous burning pain in the distal part of the affected extremity. Pain is disproportionate in intensity to the incitingevent and usually increases when the extremity is in adependent position.Sensory abnormalities are most pronounced distally, and have no consistent spatial relationship to individual nerveterritories or to the site of the inciting lesion.	Stimulus-evoked pains include mechanical and thermalallodynia and/or hyperalgesia, and deep somatic allodynia (pain due to touching the joints and movement of joints).
Vasomotor	Reports of temperature asymmetry Reports of skin color changes/ asymmetry	Evidence of temperature asymmetry Evidence of skin color changes/ asymmetry
Motor/ Trophic	Reports of decreased range of motion Reports of motor dysfunction Weakness Tremor Dystonia Coordination deficits Disturbed body perception of the affected extremity Reports of trophic changes Hair Nail Skin	Evidence of decreased range of motion Evidence of motor dysfunction Weakness Tremor Dystonia Coordination deficits Evidence of trophic changes Hair Nail Skin Osteoporosis
Sudomotor/ Edema	Reports of edema Reports of sweating changes and/or sweating asymmetry	Evidence of edema Evidence of sweating changes and/or sweating asymmetry

The distinguishing feature of CRPS is usually a history of earlier injury to the affected area, as most of these other conditions are not triggered by injury. Individuals without a history of injury should be carefully examined to make sure that another treatable diagnosis is not missed.

1. **Hematological Investigations:** The complete blood count,ESR, C-reactive protein, and serum auto-antibodies results are useful in ruling out infections and rheumatologic conditions.[36]

2. **Tests to Verify Clinical Findings**

- Goniometer- to assess active or passive range of motion whenmotor disturbances are present.
- Visual analogue scale can be performed for measurements of painintensity.37
- ThermographyAn infrared thermometer (accuracy of±0.1°C) is used to measure several symmetrical points on the affected and contralateral extremity, making comparisons between the two extremities. A difference of 0.5°C is considered mildly asymmetrical, and a difference of 1.0°C is considered significant.[38]

3. *Sympathetic Function Test*

Sweat testing: An indicator powder that changes colour when it comes in contact with sweat is used in this test. The powder is applied to the affected limb, and change of colour noted. Sweating is measured at rest (basal levels) and on stimulation of the sudo motor axonal reflex by inducing a cholinergic challenge, and the difference in output is measured quantitatively.

4. Neurophysiological Tests

Neurophysiological tests are useful in the differential diagnosis of complex regional pain syndrome I and II to confirm a peripheral nerve or central nervous system lesion; however, the findings are not specific for the disease.

- Nerve conduction velocity testing: discrete abnormalities more than 20% of normal value on testing may be observed due to edema or peripheral vasoconstriction.40 and may indicate underlying peripheral nerve lesion, eg, carpal tunnel syndrome or complex regional pain syndrome II.
- Electromyography: recordings were not routinely as it is painful and may worsen complex regional pain syndrome.
- Somatosensory-evoked potentials recordings-. Normal results indicate that the abnormalities may be due to functional neuroplastic changes and further diagnostic procedures (ie, magnetic resonance imaging [MRI] of the brain or spinal cord, lumbar puncture) are only required if the clinical picture reveals structural central nervous system lesions.[39]

5. **Imaging Tests**

- X-Ray:Changes are diffuse osteoporosis with a severe patchy demineralization, especially of the periarticular regions, combined with a subperiostal bone resorption (Figure 2). In the middle of the past century, several authors noted evidence of a radiographic progression paralleled to the clinical disease activity.[41,42]
- Three-phase bone scans: This is a more sensitive investigation than plain radiography and involves the use of technetium-99 (Tc-99m) - labelled bisphosphonates to detect early bone changes. The scan has three phases; a blood pool phase, a blood phase and a scan phase-hence the name. Findings include increased periarticular uptake in the third phase (scan phase) and evidence ofvasomotor instability and abnormal patterns of flow distribution in the first and second phase (blood pool and blood phase). Studies have found that the sensitivityof bone scans

decreases and the specificity increase with disease duration.[43-45]

- Bone densitometry: They will show a lowered bone mineral density and bone mineral content in affected limb of patients withCRPS. This can be used to monitor treatment efficacy as these indices often improve in patients undergoing treatment.[43]
- Magnetic resonance imaging: MRIexamination in complex regional pain syndrome I patients revealed various findings that change during the course of the disease in a characteristic manner. Skin thickening and bone signal intensity changes in carpal and metacarpal bones as well as effusions of adjacent joints are supposed to be related to the acute and early phase of complex regional pain syndrome I.46-48 In the early phase of complex regional pain syndrome disease patients often present without typical MRI findings. Thus MRI is not a useful screening method, but may be helpful in the exclusion of differential diagnoses.

6. Diagnostic Sympathetic Blocks

A cervicothoracic block (stellate ganglion/ upper thoracic) is used for upper extremity symptoms and a lumbar paravertebral block is used for lower extremity symptoms. In patients who respond to the block, pain is relieved, whereas motor function is retained.[49]

PREVENTION

High dose vitamin C (500 mg/day) has been shown to have a prophylactic role in diminishing the incidence of CRPS in patients with wrist fractures.[50]

TREATMENT

Treatment should be immediate & directed towards restoration of full function of the diseases limb. Multimodality therapy is used involving team work which should include pain physician, anaesthesiologist, orthopaedic surgeon, neurologist, physiotherapist, psychologist, dermatologist & occupational therapist.

There are '4Ps'of treatment of CRPS are:

1. Patient Information and education
2. Pain Relief (medications, interventions& Blocks)
3. Psychological Support
4. Physical & vocational Rehabilitation

1. Patient Information and education

Patient is made to understand the following points:

- CRPS is an infrequent nerve pain disorder of arm or leg
- CRPS is generally preceded by injury but the cause is inadequately understood
- Pain continues after the original injury has healed
- Unlike some other medical conditions, there is no specific cure
- This pain can lead to anxiety, depression, lack of sleep, disability and distress
- CRPS pain cannot be prevented; it is not hereditary
- It can get better by itself or may be helped with specialized treatment and antiepileptic or antidepressant medication
- The Physician may refer the patient to a multidisciplinary team for specialized treatment
- Aim to improve the function of the limb with help from physiotherapists and occupational therapists

2. Pain Relief (medications, interventions& Blocks)

Medications

The severity of pain determines the selection

of the drug.

- Control of inflammation & mild to moderate pain

NSAIDs[51] especially COX-2 inhibitors &Corticosteroids[52] are useful in acute stage

- Calcium modulating drugs[53,54]

Inhibition of osteoclasts/support of anti-nociceptive system in CNS

Calcitonin, Bisphosphonate (alendronate), nifidipine, Amlodipine

- Free radical scavengers: They decrease the production of toxic O2 free radicals & hence the inflammatory response.

Topical di-methyl-sulphonamide, N-acetyl cysteine.

- Inhibition of peripheral or central sensitization

Baclofen (GABA agonist), Carbamazepine[55] (anticonvulsant), Phenytoin[56] (anticonvulsant), Gabapentin[57] (calcium channel modulator), Ketamine (NMDA receptor blocker), Lignocaine (Sodium channel Blocker), Morphine (opioids are used for sever pain)

- Sympatholytic agents useful for Sympathetically Maintained Pain(SMP)

Clonidine (a adrenoceptor agonist)[58]

Guanithidine

For refractory dystonia:Continuous Intrathecal Pump Implantation of baclofen has been used.

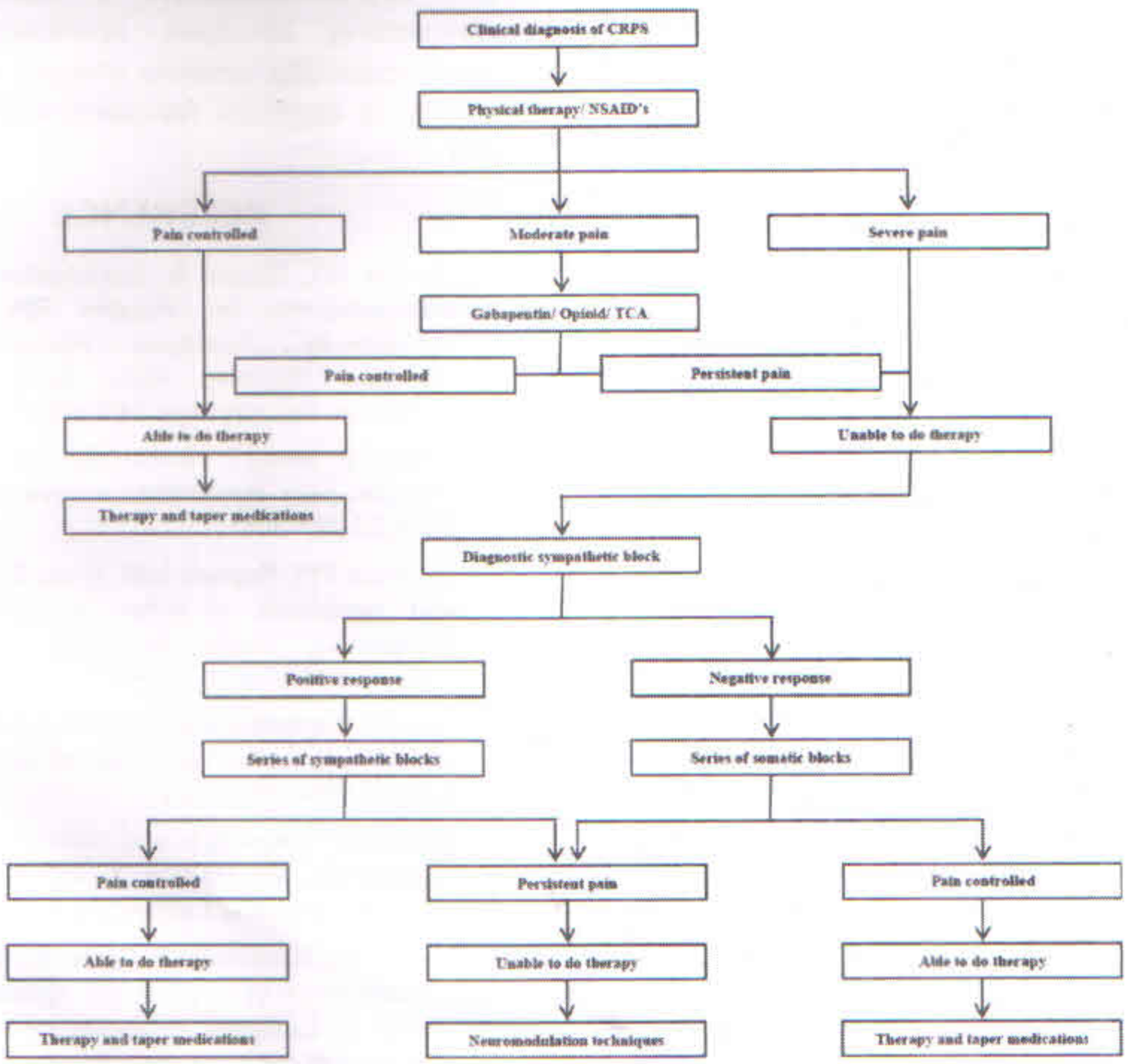

Figure 2: Algorithm for treatment of CRPS59

Intervention & blocks

Regional Anaesthesia Techniques

Two types of regional anaesthesia technique

1. Sympathetic Nerve Block done after patient has remarkable improvement following diagnostic sympathetic block
2. Somatic plus sympathetic block done when poor response to diagnostic sympathetic block.

Commonly used blocks are stellate ganglion block, lumbar sympathetic block

Radiofrequency neurolysis (RFN) is advantageous over chemical & surgical sympathtectomy as RFN has low incidence of neuritis, tinitis, blindness & stricture formation

Neuromodulation Technique

It involves delivery of electric current to modulate central pain pathways eg. Spinal cord stimulation, Peripheral nerve stimulation, TENS (Trans Cutaneous Electrical Nerve Stimulation) But these are invasive procedure hence used as resort but beforesurgery.

Surgical Technique

Endoscopic thoracic sympathectomy or motor cortex stimulation used in refractory cases. Amputation when severe uncontrolled underlying infection is present which is unresponsive to medical treatment

3. Psychological Support

Psychological support in the form of cognitive behavioural psychotherapy, relaxation techniques, meditation to maintain a positive attitude. Any other stress in life & any potential condition should be identified & dealt with hence offering additional psychological support. CBT is synergistic to medical management & physiological rehabilitation of CRPS patients.

4. Physical & vocational Rehabilitation

It includes fine motor exercise which involves isotonic strengthening, helping the patient in regaining & maintain a normal posture, gradual weight bearing, stretching mirror therapy which provides visual feedback to substitute the improper proprioception in the diseased limbs & improves pain

Gradual motor imagery- Computer based program which involves an exercise to train the brain in better recognising the affected limb & can reduce pain & swelling in some patients.

CONCLUSION

CRPS is a severe disabling disorder that causes physical as well as emotional & financial consequence to patients. Hence therapy should be commenced immediately with a systematic approach to avoid chronic disease. In doubtful cases repeated examinations at short intervals may detect CRPS. Therefore a holistic approach encompassing constant reassurance, ongoing support, creativity, positive attitude, compassion & flexibility is essential for successful treatment of CRPS.

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COMPARATIVE STUDY OF FUNCTIONAL OUTCOME OF FIXATION WITH TWO LATERAL K-WIRES VERSUS ONE MEDIAL AND ONE LATERAL K-WIRE IN GRADE -II AND GRADE - SUPRACONDYLAR HUMERUS FRACTURE IN CHILDREN

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ABSTRACT

Introduction: Thirty children with displaced type II and III supracondylar fractures of the humerus will be managed with two different techniques i.e. two lateral K-wires and one medial one lateral K-wire from time period June 2012 to June 2014. Results will be generated according to modified Flynn's criteria and rating will be given on the basis of total carrying angle loss, extension loss and flexion loss. Follow up will be taken on 3 weeks 6 weeks and 9 weeks. Considering all the satisfactory and unsatisfactory results even the intra operative and post operative complications final result will be reached.

Method: Patients with displaced supracondylar fractures admitted between May 2012 to May 2014 was recruited into the study. They were randomised to treatment either with medial-lateral pin fixation or with 2-lateral pin fixation.

Result: 30 children with mean age of 5.78 yrs were admitted during the study period. The mean follow up was 6 months. The difference in carrying angle between injured and normal elbow was 3.57 and 3.70 in mediolateral pin fixation and 2 lateral pin fixations respectively. The extension and flexion loss was 7.14 and 8.68 respectively in mediolateral pin fixation and 7.11 and 11.16 respectively in 2 lateral pin fixations. The Baumann angle difference was 5.96 in mediolateral pin fixation and 5.20 in two lateral pin fixations. Statistical analyses show that these differences are not significant.

Conclusion: both method of fixation were comparable in terms of stability, duration of bone healing, and risk of injury to ulnar nerve.

INTRODUCTION

Supracondylar fracture of humerus is one of the most common fracture in the first decade of life accounting for 50% to 70% of all elbow fracture in children

Age is a key factor in the incidence of supracondylar fractures (Elison EL 1934).[14] Falhey has observed that older children have a greater displacement with their supracondylar fracture. (Falhey JJ 1960).[13] This was also referred in Nenrikson's series of over 800-supracondylar fractures. (Henrickson 1966).[12]

Injuries of elbow demand respect because for their vascular damage and nerve injury they cause than any other injuries in the body (Hanlon & Ester 1954).[11]

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There are various modalities of treatment advised for the management of supracondylar fracture of humerus. At present closed reduction and percutaneous pin fixation is most widely accepted treatment method for displaced supracondylar fracture but controversy persists regarding the optimal pin fixation technique.

Traditionally this type of fracture was associated with a high rate of malunion, nerve injury, and vascular complication. The incidence of cubitus varus deformity after treatment was about 5% according to Flynn et al 1974.[16]

Current method of treatment of supracondylar fracture of humerus in children is based on Gartland classification.

The cross pin configuration may be mechanically more stable than lateral pins in torsional loading but associated with a risk of iatrogenic injury to ulnar nerve

In another study it has been reported that the injury to ulnar nerve is due more often to the pin constricting the cubital tunnel then to direct penetration of pin. Hence chances are more in cross k-wires selection.

Incidence of cubitus varus deformity after treatment was 5%, ulnar nerve deficit was found in 15% of patients who were treated with medial and lateral pin

AIM

- To compare the result of two types of fixation.
- To study the incidence of complication in each of the methods.
- To compare the healing time in two methods.

OBJECTIVES

- Accuracy and alignment of reduction.
- It's functional outcome.
- Final range of movements.
- Maintenance of reduction later on because of internal fixation.
- It's radiological evaluation by Baumann's angle and Medial Epicondyle Epiphyseal (MEE) angle.
- Prevention of complication by making decision between two lateral & cross - medial and lateral k-wires fixation.
- Comparison of carrying angle of both elbows in final follow up considering the cosmetic deformity.
- To compare the data of this study with the previously published data of same fracture.

MATERIAL AND METHODS

- Source of Data:
  - Study conducted at Sri. Aurobindo Institute of Medical Sciences, Indore(MP)
  - In patients under age of 14years with supracondylar fractures of humerus.

    (Grade 2 and 3 of GARTLAND Classification)

    Time period - June 2012 to June 2014(Total no. of cases - 30)
- They were randomised to treatment either with medial-lateral pin fixation or with 2-lateral pin fixation.

Inclusion criteria:

- Both sexes.
- Age less than 14 yrs
- Those presenting within 1week of injury.
- Gartland type II fractures.
- Gartland type III fractures
- No previous fracture in either elbow
- No concomitant fracture or other injury in the same limb

Exclusion Criteria:

- Age more than 14
- Gartland type I fractures
- Undisplaced fractures.

- Compound / open fractures
- Those with concomitant fracture or other injury in same limb
- Adjacent long bone fracture.

Modified Flynn's criteria

Result	Rating	Carrying-angle loss (in degree)	Flexion loss (in degree)	Extension loss (in degree)
Satisfactory	Excellent	0-4.9	0-4.9	0-4.9
	Good	5-9.9	5-9.9	5-9.9
unsatisfactory	Fair	10-14.5	10-14.5	10-14.5
	Poor	≥15	≥15	≥15

MODIFIED GARTLAND CLASSIFICATION

Type I

- Non displaced or minimally displaced (by <2mm),
- Intact anterior humeral line
- Posterior fat pad ±
- Periostium intact circumferentially

Type II

- Displacement >2mm
- Posterior cortex presumably intact but hinged
- Anterior humeral line does not pass through middle third of capitellum
- No rotational deformity

Type III

- Displaced with no meaningfulcortical contact
- Extension in sagittal and rotationin frontal plane
- Periostium extensively torn
- May be associated with softtissue and neurovascular injury
- Collapse of medial column

Type IV

- Multidirectional instability
- Incompetent periosteal hinge Circumferentially
- Unstable both in flexion andextension

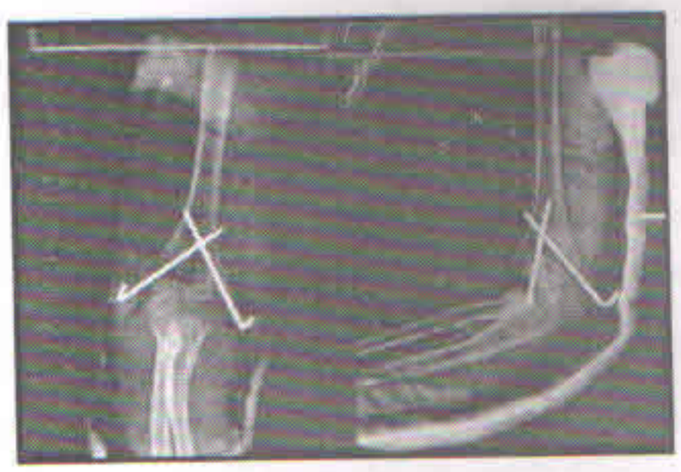
TECHNIQUE

- Under Short GA patient's fracture was reduced closed with guidance of image intensifier with traction in extension followed by flexion with thumb pressure on olecranon of the patient.
- Anteroposterior correction was obtained under image intensifier.
- Followed by Medio/lateral correction was done.
- Followed rotational deformity was waited for.
- As the reduction was confirmed in both AP + Lat views then K-Wire of 2.5mm to 3 mm was passed by first passing medial condyle by guarding the ulnar nerve with thumb, palpating medial epicondyle.
- Followed by passing K-wire in lateral view under image intensifier guidance.
- After passing the K-wire position and reduction were rechecked.
- 2nd K-wire passed from lateral side in the same method
- 2 cross K-wires position confirmed in AP and Lat views under Image Intensifiers.
- Elbow was checked by doing Flexion and Extension.
- Radial Artery pulsation checked, carrying angle checked. Followed by - Both the K-wire was cut and tips were buried in the skin.
- Then Above Elbow slab was given post operatively

ILLUSTRATIVE CASES

Case - 1

Pre op

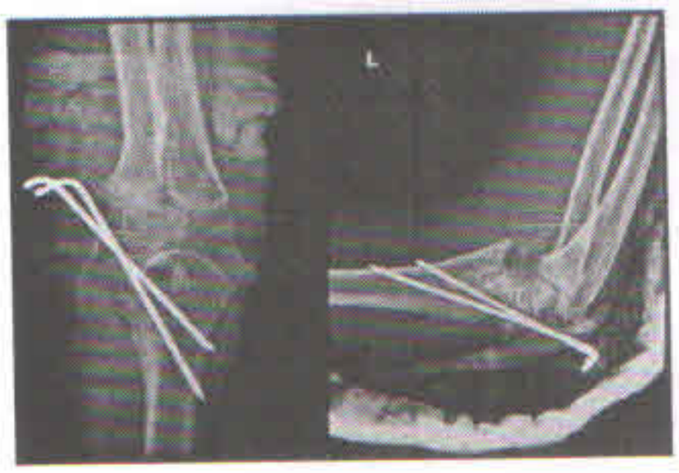


Post op

After k wire removal

Case - 2

Pre op



Post op

After k wire removal

RESULTS

Data of the Patients	Group A	Group B	Total	%
No. of Patients	15	15		
Age	5.8±3.4	6.2±2.2		
Ses				
Male	7	6	13	43.3
Female	8	9	17	56.6
Mode of Injury				
Fall from Height	6	7	13	43.3
RTA	6	6	12	40.1
Others	3	2	1	16.6
AFFECTED SIDE RIGHT LEFT	69	510	1119	
NEUROVASCULAR STATUS				
PLUSELESS VIABLE HAND	2	1	3	10.2
MEDIAL NERVE INJURY	1	0	1	03.4
RADIAL NERVE INJURY	0	0	0	0.0
PRIMARY SPLINTAGE				
YES	14	15	29	
NO	1	0	1	
DISPLACEMENT				
POSTEROMEDIAL	5	5	10	33.3
POSTEROLATERAL	6	7	13	43.4
POSTERIOR	4	3	7	23.3
LOSS OF REDUCTION				
MAJOR	0	0	0	
MINOR	0	1	1	
NONE	15	14	29	
INJURY HOSPITAL DURATION HOURS	10.6±2	14.2±2	-	
IATROGENIC ULNAR NERVE INJURY	0	0	0	0
BAUMANN ANGLE LOSS	3	4	7	23.3
HUMEROCAPITELLAR ANGLE LOSS	6.1±5.1	6.3±4.4		
CARYING ANGLE LOSS	3.70±4.24	3.57±4.6		
RANGE OF MOTION				
EXTENSION	More than 4 Degree	More than 3 Degree		
FLEXION	133±2	130±2		
FLYNN'S GRADE				
EXCELLENT	4	4	8	26.6
GOOD	4	8	12	40.3
FAIR	4	2	6	20.5
POOR	3	1	4	13.3
SUPERFICIAL INFECTIONS	5	3	8	26.6
RE-OPERATION	0	1	1	
RETURN TO FUNCTION				
FULL	9	10	19	63.3
MINOR	4	5	9	31.1
MAJOR	2	0	2	05.2

DISCUSSION

Treatment of displaced extension type III supracondylar fracture of humerus treated by closed reduction and percutaneous pin fixation has consistently given satisfactory result compared to other method of treatment. But controversy still persists regarding the adequate pin fixation technique comparing lateral pin fixation with medial and lateral pin fixation.

In this study we found no significant difference between both fixation methods in terms of stability but there is a evidence of iatrogenic ulnar nerve injury (3%) in medial and lateral pin group.

The lateral and medial pin fixation method supposed to have the advantage of better fracture stability, although iatrogenic ulnar injury can occur with this technique. Conversely, lateral pin entry has the advantage of avoiding ulnar nerve injury but this construct has been thought to be biomechanically less stable.

In a study conducted by NY OTSUKA 1997, they concluded that the treatment of type II and type III supracondylar fractures of the humerus in children with closed reduction and percutaneous pinning has dramatically lowered the rate of complications from the injury. The incidence rates of malunion (cubitus Varus) and compartment syndrome have both decreased.[2]

In a study conducted by Rijal & Pandey 2006, concluded that percutaneous crossed K - wire pinning after closed manipulation in supracondylar extension type III fracture of the humerus is a reliable and safe method of treatment and is recommended in all.[3]

In a study conducted by Devkota 2008, found that closed reduction and percutaneous K-wire pinning in the management of supracondylar fractures of humerus in children is safe as regards avoidance of vascular complications, effective in obtaining good results and relatively economical regarding hospitalization. The disadvantage is the need for proficiency and the availability of C - arm fluoroscopy.[4]

In a study conducted by Haque et al 2010, found that open reduction and internal fixation by K - wire is an excellent method of management of supracondylar fractures of humerus in children when the reduction could not be achieved by closed means.[5]

In a study conducted by Babal et al 2010, they found that medial pinning carries the greater overall risk of nerve injury as compared with lateral - only pinning and that the ulnar nerve is at risk of injury in medially pinned patients.[6]

In a study conducted by Sial et al 2011, in their study concluded that open reduction and crossed pin fixation is a sound and effective modality for the treatment of displaced supracondylar fractures with the advantages of decreased duration of hospital stay, anatomical reduction, stable fixation and early mobilization.[7]

In a study conducted by Dua et al 2011, they concluded that closed reduction and crossed pinning of displaced supracondylar fractures of humerus in children is a safe and effective method even with delayed union.[8]

In 2002, De Pablos. J and Tejero.[19] A in the text book of children orthopedic and fracture describes that the most the most common elbow fracture in children accounting for up to 75% of all fractures in that area are supracondylar fracture of humerus. They explained that the fracture line of supracondylar fracture lies typically at level of coronoid fossa of the humerus and extends on both sides of lower end of humerus through the medial and lateral column. This is the narrowest and most vulnerable point of humerus.

A cadaveric study reported by Lee SS et al and Ziouts et.al suggested that medial and lateral entry provides greater torsional rigidity than lateral entry pin fixation does.[20]

The overall strength of this construct is not only related to pin entry but mainly to divergence of the pins in different column and number of pins.

The greater strength seen with the divergence of the pins was related to the location of the interaction of the two pins and the fact that the

greater amount of divergence between the two pins allow for some purchase in the medial and the lateral column.[21,22]

Bloom et al. reported that three lateral divergent pins were equivalent to cross pin fixation and both of these constructs were stronger than two lateral divergent pins.

The rate of iatrogenic ulnar nerve injury associated with cross medial and lateral pin has been reported to be from 0% to 6%.[23,24,25,26,27,28]

In 1977 Arino et al. recommended two lateral pins in order to avoid ulnar nerve injury.[29]

Although ulnar nerve injury recovered in most of the cases but there are several reports of permanent ulnar nerve injury.[30,23,32]

Skaggs et al. reported that even making an incision over the medial epicondyle in an effort to ensure that the ulnar nerve is not directly injured does not guarantee protection of the nerve.[30]

Obvious undeniable conclusion is that, if medial pin is used, the lateral pin(s) should be used first followed by medial pin fixation with elbow in extension.

But the best way to avoid ulnar nerve injury is not to place medial pin

CONCLUSION

We conclude that there is no significant difference between the stability provided by the medial and lateral pin fixation and two lateral pin fixation methods.

But the medial and lateral pin fixation group shows three (5%) cases of iatrogenic ulnar nerve injuries which is also shown by many other studies.

Therefore, lateral pin fixation method for the treatment of type III supracondylar fracture is a reliably safe method to avoid iatrogenic ulnar nerve injury which also provides adequate stability if proper pin fixation principles are used

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OSTEOPOROMALACIA: A PLAUSIBLE CAUSE OF SPONDYLOLISTHESIS

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ABSTRACT

Many classification systems are universally accepted, however none of them considers Osteomalacia as a contributory cause.We are reporting on the plausible link between Osteoporomalacia and spondylolisthesis that we found in a small series of five patients which presented to us with spondylolisthesis and on investigation were found to be Vitamin D deficient.

Key Words: Spondylolisthesis, Osteoporomalacia, backache.

Background : Spondylolisthesis (Spondylos=vertebrae; Listhesis= slippage) is forward slippage of one vertebra on another and may be the result of a spondylolysis. The termspondylolisthesis was coinedby Kilianin 1854. He proposed that various forcescaused subluxation of the lumbosacral facets; this inturn was believed to cause gradual vertebral body subluxation.

The classification proposed by Wiltse, Newman, and Mac-Nab divided spondylolisthesis on the basis of etiology asisthmic, degenerative, dysplastic, traumatic, and pathological types.Marchetti and Bartolozziattempted to further classifyspondylolisthesis in two broad aetiological groups, namely developmental and acquired which is universally accepted today, however authors on the basis of observation in 5 cases propose a hypothesis that this classification is incomplete in present day and causes like Vitamin D deficiency should be added in this classification.

INTRODUCTION

The first written description of spondylolisthesis is given byHerbiniaux, a Belgian obstetrician; in 1782, hedescribed an osseous prominence anterior to the sacrumthat caused narrowing of the birth canal. This obstructionwas due to anterior subluxation of L-5 over S-1. The termspondylolisthesis was coined approximately one centurylater, in 1854, by Kilian. He proposed that various forcescaused subluxation of the lumbosacral facets; this inturn was believed to cause gradual vertebralbody subluxation.

Soonthereafter, anatomical studies conducted by Robert andLambl revealed that, typically, a neural arch defect precededthe subluxation. This defect, at the pars interarticularis, was termed spondylolysis. In 1888, Neugebauerdemonstrated that both lysis and elongation of the parsinterarticularis could lead to spondylolisthesis. A newdimension was added when Junghanns detailed a series ofpatients with spondylolisthesis in whom pars defect orelongation was absent.As knowledge of the origin of spondylolisthesis wasgained, attempts were made to classify its various types; the classification proposed by Wiltse, Newman, Mac-Nabin 1976 is first to classify spondylilisthesis,[1] followed by classification given by Marchetti and Bartolozzi in 1997.[2]

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MARCHETTI AND BARTOLOZZI CLASSIFICATIONS

Developmental

High dysplastic
With lysis
With elongation
Low dysplastic
With lysis
With elongation

Acquired

Traumatic
Acute fracture
Stress fracture
Post surgery
Direct surgery
Indirect surgery
Pathological
Local pathology
Systemic pathology
Degenerative
Primary
Secondary

WILTSE, NEWMAN, AND MACNAB'S CLASSIFICATION

- **Type I, dysplastic** - Congenital abnormalities of the upper sacral facets or inferior facets of the fifth lumbar vertebra that allow slipping of L5 on S1. No pars interarticularis defect is present in this type.
- **Type II, isthmic** - Defect in the pars interarticularis that allows forward slipping of L5 on S1. Three types of isthmic spondylolistheses are recognized:

  Lytic-a stress fracture of the pars interarticularis An elongated but intact pars interarticularis An acute fracture of the pars interarticularis
- **Type III, degenerative** - This lesion results from intersegmental instability of a long duration with subsequent remodeling of the articular processes at the level of involvement.
- **Type IV, traumatic** - This type results from fractures in the area of the bony hook other than the pars interarticularis, such as the pedicle, lamina, or facet.
- **Type V, pathological** - This type results from generalized or localized bone disease and structural weakness of the bone, such as osteogenesisimperfecta

We propose a hypothesis on the basis of observation in 5 cases having low serum 25 OH Vitamin D and spondylolisthesis, that this classification is incomplete and some other factors like Vitamin D deficiency should be added as one of the possible causes of spondylolisthesisespecially in the pathological group. Since progression of the vertebral slippage has been noted during adolescence; whether this implicates hormonal influencesor growth potential or vitamin D deficiency as factors in the developmentof spondylolisthesis isuncertain and worthy of further research.

CASE SERIES

Inashort duration of one month 5 cases in the age group 40 -50 presented to authorswith symptom like low back pain, pain with extension of thelumbar spineand hamstring tightness. On history none of the patient had any history of trauma nor did they have any past history of similar symptoms. All the patients had asymptomatic adolescent and childhood phase and it is only for a short duration that these patients were experiencing symptoms. On careful neurological examination of these patients none of the patients have signs of canal stenosis or root compression.

Authors decided to investigate these patient with plain radiographs of the lumbosacral spine along with routine investigations of blood and serum 25 OH Vitamin D levels. Radiographs of the lumbosacral spine in all the patient's revealed spondylolisthesis of grade 1 and 2 without any obvious pathological reason. Blood investigations were also normal with all inflammatory marker

within normal limit, however all the patient had 25(OH) Vitamin D level < 20ng/ml. Author tried to classify this patients on the basis ofboth classificationsystem given byWiltse et al andMarchetti and Bartolozzi which is universally accepted, but these 5 patients were not fitting in any of the subtypes in both the classification. On the basis of our observation in these 5 cases we propose a hypothesis that classification given by Wiltse et aland Marchetti and Bartolozzi is incomplete at present and other factors like Vitamin D deficiency should be added in this classification.

DISCUSSION

The incidence of spondylolysis is 5-6 % in the general population, however the increased prevalence (up-to 12%) noted in adolescents with Scheurman's disease, weight lifters, athletes such as football lineman and gymnasts, signifies that mechanical factors may be important in the aetiology of this condition.[3] Several studies suggest a congenital predisposition to spondylolysis, with prevalence's of 27 to 69% among family members of the affected individuals.[4] Spondylolisthesis is associated with an increased incidence of sacral spina bifida (28% to 42%) and congenital deficiency of the sacrum and superior sacral facets.[5] It is thought that, in a dysplastic spine, repetitive or acute traumatic stress on the pars inter-articularis leads to structural failure.[6] The pars defect is thought to be primarily acquired and is seen very rarely in the newborn.[3] The most commonly affected vertebrae are L4 and L5, which are the keystones of the lumbo-sacral spine, providing stability by supporting physiological loads.Identified only in humans, spondylolisthesis has neverbeen recognized in any other species .It is believed that the development of spondylolisthesisis related to man's ability to maintain an erect postureand the development of lumbar lordosis, the latterbeing unique to humans.[7] Most patients who present with spondylolisthesisare asymptomatic; however, in the pediatric andadolescent population, spondylolisthesis is the predominantcause of low-back pain and sciatica.[8] Nevertheless, non-operative treatment is successful in the majority ofcases, with surgical intervention being reserved for thosein whom symptoms are refractory to these measures.[9,10] In this small series of 5 cases all the patient were treated conservatively with Vitamin D supplementation andlumbo-sacral brace support along with

Figure 1 : Lateral Radiograph of the lumbo-sacral spine showing grade I spondylolisthesis L5-S1 (arrow) in a spine with Osteomalacia

physiotherapy. Author's observed positive response in all the cases and none of the cases till now have required surgical intervention although the follow up period is small. With the above observation authors propose a hypothesis that spondylolisthesis could be causally related with vitamin D deficiency. However a larger study of spondylolisthesis and having longer follow-up is required to completely validate this hypothesis. We recommend screening patients with spondylolisthesis for Vitamin D deficiency and osteoporosis to detect underlying deficiency which can be a contributing factor to the progression of spondylolisthesis and is easily correctable.Also correction of vitamin D deficiency and osteoporosis before surgery in patients with indications for surgery can reduce the risk of implant failure and be beneficial in improving patient outcomes.

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