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EDITORIAL OFFICE

DEPT. OF ORTHOPAEDICS,
MGM MEDICAL COLLEGE,
INDORE (M.P.) - 452 001
MOB : 98267-23412, 9827023412
e-mail : drsunil_rajan@rediff.co.in

Appeal From Editorial Board

Accept our greetings for the forth coming festival season.

We regret for the delay in publishing this volume of MP chapter Orthopaedic journal. We would like to appeal to the respected members of MP chapter to please send the articles and case reports for the next volume of the journal as we have noticed lack of interest in sending the articles as well as case reports by the members of association - that was the reason for the delay in the publishing this volume.

we also appeal to send a soft copy of the article as well as the photographs to be published with the article so that the printing quality and the clearity of the clinical photographs and the X-rays published with the article can be improved. If members have any problem to make the article they can freely contact the members of editorial board any time. We will be pleased to help and guide.

Waiting for the your suggestions and response for the improvement and up-gradation of the journal.

Dr. Sunil Rajan
Editor
ORTHOPAEDIC JOURNAL OF
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EDITORIAL

Implant Arthroplasty For Upper Limb

Pertinent And Feasible Remedy In Perspective

* *Prof. Prakash P. Kotwal* MS (Orth), FAMS, FIMSA

** *Dr Manish Kumar Varshney* MS (Orth), DNB (Orth), MNAMS, MRCS (Glasgow)

With the promulgation of modern operative orthopaedics the quest to comprehensive treatment for terminal joint involvement has sought increased usage of arthroplasty. This approach has been fairly well-accepted for lower limb; however such widespread experience has been lacking for upper limb till late. The evolution of upper limb arthroplasty has been slow paced but reported success by dedicated centers expedited the development of promising conscientiously designed implants. Considering the cost of these implants, activity profile of indwelling population and available expertise certain critical issues needs to be analyzed. Should arthroplasty be offered to all patients with terminal joint involvement? Do we have enough armamentarium to cater for differing requirements? What should we (both surgeons and patients) expect from this pproach?

Corresponding Author

Prof. Prakash P. Kotwal
Head, Department of Orthopaedics, All India Institute of Medical Sciences,
Ansari Nagar, New Delhi
India, 110029.
Phone: 91-11-26593341, 26588407 (O)
91-11-26594519 (R)
FAX: 91-11-26588641, 26588663
e-mail: prakash_kotwal@hotmail.com

Arthroplasty of shoulder is fairly accepted however the choice between total shoulder arthroplasty and hemiarthroplasty is a bit arbitrary and is strongly biased by surgeons' preference. Classical indications have been gleno-humeral arthritis (osteoarthritis, rheumatoid or post-traumatic) and osteonecrosis, which has now been extended to rotator cuff arthropathy, capsulorrhaphy arthritis and symptomatic anterosuperior shoulder deficiency with the advent of improved implants and reverse total shoulder arthroplasty. While total shoulder arthroplasty has shown consistently good results for treatment of primary shoulder arthritis compared to hemiarthroplasty the latter has the advantage of being less time consuming, cheaper and technically easier and is preferred for other indications. Joint stuffing, impingement and subscapularis rupture are primary concerns with total shoulder arthroplasty. Bone to bone repair of subscapularis provides best option for subscapularis repair. Various modifications of hemiarthroplasty with biological resurfacing of glenoid using tendo-achilles graft, fascia lata, anterior capsule or menisci have further extended the indications for use to even young active patients. Other good indications for

achieved with 'sloppy' hinge prosthesis are better than unlinked prosthesis as bone can be liberally resected without compromising the stability. Unlinked device relies on soft-tissue balancing to maintain congruency and hence better range of motion; however the increased constrain required for such designs leads to greater aseptic loosening and failure. Semiconstrained 'sloppy' hinge linked prosthesis has been most commonly used. Results have been better for inflammatory arthropathy than for post-traumatic or traumatic indications; however encouraging results have been also seen for ankylosed or stiff elbow. The results of TEA in young patients (<40 years) have not been poor than in older patient population as has been contemplated. Deliberation should be given to patient selection however, as no prosthesis has been shown to tolerate strenuous activities. Non-compliant, young, trauma patients or stiff elbow that exceeds the limited loading can expect early failure and revision due to metal-to-bushing wear, metal-to-metal wear or metallosis.

The role for arthroplasty in wrist is not well established, and the indications are less well defined. The standard procedure for the painful arthritic wrist remains radiocarpal arthrodesis. With technological and surgical advancements, wrist arthroplasty is being used more frequently. The ideal patient for a total wrist arthroplasty is one with painful bilateral wrist disease with relatively good wrist alignment and motion. A wrist arthroplasty can help the patient compensate for the lack of motion in other joints and thus better preserve function. The initial metal-and-plastic design of Mueli went into disrepute following high revision rates of 75% due to soft tissue imbalance, flexor tendon rupture, carpal tunnel syndrome and centering of implant. The modified version by Voltz in 1973 though an improvement was complicated by dislocations and tendon imbalance. The trispherical implant of Figgie and Ranawat had not been widely studied but tends to solve various problems causing failures in previous implants. Present implants are a modification of universal total wrist implant that tends to recreate the radioscapholunate articulation and requires minimal bone resection. There are primarily three concerns with the use of wrist arthroplasty. First is centering the implant as the center of rotation of wrist changes with flexion-extension movement. This could not be recreated by any prosthesis available however introduction of double off-set stems offer partial solution. Fixation is the second problem and though various designs use the ball and socket non-constrained mechanism, often anchorage of the mechanism lead to high load transmission and loosening of prosthesis. Lastly tendon balancing is nearly impossible to determine pre-operative unless specifically investigated for pre-operatively. Flexor and extensor tendons serve as distinct leverarms by virtue of differing power and hence tend to dislocate the prosthesis if not appropriately centered. Despite all these wrist arthroplasty though having limited indications appropriately relieves the pain and provides adequate short-term stability. Distraction of collapsed joint restores myotendinous balance and function but remains a highly technical procedure.

Metacarpophalangeal joint is the commonest joint affected in rheumatoid hand and serves the best indication for MCP arthroplasty. MCP arthroplasty is a well established procedure and is backed by tremendous evolution concerning implant design and technique. Initial stimulus to small joint arthroplasty provided by Brannon (1959) with the use of metallic hinged prosthesis soon waded into metallo-plastic designs due to early failure; which hitherto were plagued with breakage and erosion problems. The silicone-elastomer rubber implants (Swanson, Sutter and Neuflex) have

produced acceptable functional results for decades however survival analysis demonstrated late failure (fracture) to the extent of around 40% at 17 years, loosening (due to constraint), and inflammatory reactions. Functional results however do not correlate with implant failure and are better than 'mechanical' results. Improving rubber quality and adding titanium grommets did not show distinct initial improvement. Surface replacement cobalt-chrome arthroplasty is preferred at some centers and is being constantly improved for constraint due to higher dislocation rates. Newer pyrolytic carbon prosthesis (elastic modulus close to human cortical bone) have shown promising short to midterm results but long term results are awaited. For early rheumatoid arthritis polyethylene-metacarpal and titanium-phalangeal base and stem is under evaluation. Ceramic unlinked semi-constrained implants have been developed following initial success in total hip replacement however clinical results are awaited. Improvement in understanding of biomechanics and hence impact on radial reconstruction and centralization of tendons have further improved the results. Technically the silicone-elastomer spacer insertion is less demanding but a thorough understanding of mechanics and anatomy, familiarity with the rheumatoid problems is essential for good outcome.

Surgical management of PIP conditions such as arthritis, instability, stiffness, deformity, and pain remains a challenge to the orthopaedic community. The evolution of PIP arthroplasty is similar to MCP arthroplasty however the silicone implants are not favored for lack of stability and required resilience. The principal shortcoming of previous metallic, metalloplastic, and single component polymeric plastic-hinged designs was the amount of bone resection required for implantation. The rationale behind new-generation arthroplasty of the PIP joint is that a minimally constrained, unlinked prosthesis with an anatomic center of rotation would balance forces acting across the joint. The surface replacing Co-Cr-UHMWPE prosthesis had been in vogue for long however may not be suitable for extensive bone loss. The newer semiconstrained (Saffar and DJO3s prosthesis) and fully constrained (Digitos and WEKO prosthesis) does not require preservation of collateral ligaments and can be implanted in unstable joints respectively. Patient selection and technical mastery however is critical for a good outcome.To conclude, implant arthroplasty is a feasible option for upper limb provided a good patient selection and implant selection is given proper consideration. Important to this end is the technical know-how and familiarity with the prosthesis designs and indications which require experience that comes with good surgical volume.

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ARTICLE

COMPARATIVE STUDY OF PROXIMAL FEMORAL NAIL AND DYNAMIC HIP SCREW IN THE TREATMENT OF SUBTROCHANTERIC FRACTURES OF FEMUR

DR. RAVI. S. PANDEY, DR. R. VERMA, DR. A. GOHIYA, DR. S. TANDON
PROF. A. MEHROTRA, PROF. N. SHRIVASTAVA

ABSTRACT

INTRODUCTION : Subtrochanteric fractures have long been recognized as the most difficult of the injuries to treat because most of the fractures are unstable, cortical diaphyseal bone is involved which has poor vascularity and poor healing capacity as compared to the cancellous bone of trochanteric area. There is high stress in this area and powerful muscles pull the fragments in different directions, therefore non-operative treatment often fails. An interest in the end result and functional outcome of subtrochanteric fractures treated with proximal femoral nail or dynamic hip screw, to fulfill the main aim of fracture management i.e. restoration of optimal function in the shortest time by the most reliable and safest method in our hand; is the original impetus of our study.

PATIENTS AND METHODS : 40 patients with subtrochanteric fracture of femur reporting at the orthopaedics department of Gandhi Medical College, Bhopal between Dec. 2006 to July 2008 were treated either with dynamic hip screw or proximal femoral nail. 9 patients with follow-up of less than 6 months were excluded from the study. The present study thus comprised of 31 patients of subtrochanteric fracture of femur. Pre-operative data, intra-operative observations and postoperative data were recorded and the two group were compared for statistical significance.

OBSERVATIONS AND RESULTS : 14 patients who were treated with dynamic hip screw (Group I) and 17 patients who were treated with Proximal Femoral nail (Group II) were comparable with regard to all their pre-fracture variables including their age, gender, side of affection, injury operation interval, mode of trauma, fracture classification, mobility scores and ASA physical status score. The mean operative time in Group I (93.57 min) was significantly higher than in Group II (80) with a P value of 0.02. Average blood loss in Group I (207.14 ml) was 2.8 times higher than in Group II (72.35 ml) with a P value of 0.036. 93% patients in Group I required blood transfusions as compared to only 23% in Group II ($P<0.001$). Difference in the postoperative Parker-Palmer mobility score in the two groups was significant (Group I = 7.82, Group II = 7.21) ($P = 0.045$). The union in Group II (18.25 weeks) was significantly faster than in Group I (20.57 weeks) ($P = 0.039$). The final results graded as excellent, good fair and poor were similar in both the groups with no statistical differences ($P = 0.79$).

CONCLUSIONS : Proximal Femoral nail for subtrochanteric fractures is a technically demanding procedure and has a steep learning curve. Its application produces minimal amount of surgical trauma to the patients & require less blood transfusion. With proximal femoral nail fixation, there is early functional recovery & return of the patients to pre injury status in majority of patients.

KEY WORDS : Subtrochanteric fracture, Dynamic hip screw, Proximal femoral nail

INTRODUCTION

Subtrochanteric fracture have long been recognized as the most difficult of the injuries to treat because most of the fractures are unstable, cortical diaphyseal bone is involved which has poor vascularity and poor healing capacity as compared to the cancellous bone of trochanteric area. There is high stress in the area and powerful muscles pull the fragments in different directions, therefore non-operative treatment often fails[7,19,22]

The goal of treatment of these fractures is stable fixation with restoration of optimal function in the shortest time by the most reliable and safest method available in our hand. To achieve this objective, several intramedullary devices have been developed with advantages of preserving periosteal blood supply, a reduced requirement of supplemental fixation and use of load sharing implant[2,6,16,30,37]. SCS (Sliding Compression Screw) has been used to treat intertrochanteric fractures for several decades with a high success rate[39]. In literature SCSs used to treat Subtrochanteric fracture were reported to have high success rete[9,20]. Less data is available for PFN as an alternative as most of the studies are retrospective and lack a control group[5,10].

This study is being undertaken to compare the efficacy of Dynamic hip screw and Proximal femoral nail in the management of subtrochanteric fracture of femur in a randomized series of 31 patients.

MATERIALS AND METHODS

40 patients with subtrochanteric fracture of femur reporting at Gandhi Medical College and associated Hamidia Hospital, Bhopal between Dec. 2006 to July 2008 were treated with either Dynamic Hip Screw or Proximal Femoral Nail. 9 patients had follow up of less than 6 months were excluded from the study. The present study comprised of 31 cases of subtrochanteric fracture of femur. All skeletally mature patients with non-pathological, non-compound subtrochanteric fracture of femur were eligible for inclusion. 31 patients were randomly assigned to have fracture fixation either by dynamic hip screw (Group I) or proximal femoral nail (Group II).

The preoperative parameters that were recorded include the age and sex of the patients, side of fracture, medical history and anaesthesia risk. The fracture was classified according to AO classification.

The estimated blood loss, operative time, average drain volume and intra operative complications were recorded. The data pertaining to the type of fixation which included the length of lag screw, length of barrel plate, number of cancellous screw, number of cortical screws, interfragmentry screw, bone grafting nail length and diameter were recorded.

Surgeries were performed using image intensifier. Closed reduction was achieved, if possible, on fracture table. If that was not possible, an open reduction was performed. The operative technique for fixation with PFN was the same as described by Simmermacher et al and for DHS it was the same as that describe by Baumgaeratener et al.

The rehabilitation protocol was same for both the groups. Patients were reviewed at 4 weekly intervals for follow up till union and final follow up. Standard radiographs AP and lateral view of leg were taken at each visit till union and final follow up. The union was assessed clinically by loss of tenderness and fracture mobility and radiologically by disappearance of fracture line and appearance of callus across the fracture site[8,29]. Non-union was defined as the fracture site still remaining unhealed after 1 year of treatment or the need for repeated surgeries to achieve union[32,39].

All the patients were evaluated clinically and radiologically with respect to criteria modified from Harris Hip Scoring System (1969)[25] and criteria mobility score of Parker and Palmer, which uses a nine-point scale. Functional outcome was assessed by the postoperative mobility scores and functional indices were then compared to the pre-injury values.

The Student-t test was used to compare the two group with regards to age, sex, side of affection, fracture classification and ASA score. Mobility scores, operative time, duration of hospitalization, number of units of blood transfused and union time were assessed by f-fest. Fischer exact test was used to compare the two groups with regard to need for an additional procedure and number of unit of blood transfused. Wilcoxon Matched Paired Signed Ranks test was used to compare mode of trauma, associated injury and illness and injury-operative interval. Differences were considered significant at $p<0.05$

OBSERVATIONS AND RESULTS

14 patients who were treated with dynamic hip screw (Group I) and 17 patients who were treated with Proximal Femoral naii (Group II) were comparable with regard to all their prefracture variables including their age, gender, side of affection, injury operation interval, mode of trauma, fracture classification, mobility scores and ASA physical status score.

However, there were some significant differences between the two groups with regard to intraoperative data. The mean operative time in Group I (93.57 min) was significantly higher than in Group II (80 min) with a P value of 0.02. Statistical comparison was not possible in the type of reduction (open or closed). Most of the reductions in Group II were easy (n=7) or moderately difficult (n=9). Reduction was difficult in only one patient. In Group I the reductions were easy in only 4 cases, moderately difficult in 5 cases and difficult in another 5 cases (P=0.047). Average blood loss in Group I (207.14ml) was 2.8 times higher than in Group II (72.35 ml) with a P value of 0.036. 93% patients in Group I required blood transfusions as compared to only 23% in Group II (P<0.001). No patient in Group II required secondary procedure. 5 patients in Group I required secondary procedure in the form of interfragmentary screws which was statistically significant (P=0.011). There was no significant statistical difference between the two groups with regard to general complications. The medical and local complications were similar in both the groups. However the patients in Group I had a significantly longer hospital stay (2.9 weeks) as compared to Group II (2.6 weeks) (P=0.048).

The average duration of follow up was about 8 months. One patient in Group

II was noted to have non-union. Two patients in Group I were noted to have varus collapse while another patient was found to have cut out of lag screw. One patient in Group II had deep infection which finally needed implant removal after fracture union. Overall, both the groups had two major re-operations. The pain scores were similar in both the groups (P=0.2). However, the difference in the postoperative Parker-Palmer mobility score in the two groups was significant (Groupl = 7.82, Group II = 7.21) (P= 0.045). The union in Group II (18.25 weeks) was significantly faster than in Group I (20.57 weeks) (P= 0.039). The final results graded as excellent, good, fair and poor were similar in both the groups with no statistical difference (P= 0.79).

DISCUSSION

The objective of treatment of subtrochanteric fractures is the restoration of optimal functions in the shortest possible time by the safest & most dependable method of treatment The morbidity and mortality together with prolonged hospital stay make conservative treatment unacceptable

The subtrochanteric fractures are particularly difficult to treat firstly because of constant pull of the strong abductors of the hip and being a highly stressed region in the body. Secondly, the subtrochanteric area of the femur is mainly composed of cortical bone which is often comminuted in these cases. The vascularity of cortical bone and the surface available for healing are less.

The mean age of the patients was slightly lower in this series than those reported in much of the western literature >33. The difference from the western literature is because life expectancy is slightly higher in the western countries and it is also probably a reflection of improper mechanization and undisciplined traffic.

Males in the study considerably outnumbered females, the M:F ratio being 2.4:1. This was similar to many reported series. Males were predominantly affected probably because road traffic accidents were the commonest cause and males are more commonly involved in outdoor activities. Mortality in old patients who already have a lot of medical problems is expected to be higher. However there was no death reported in this series.

The average injury operation interval in Group I and Group II were 11 and 12 days respectively. Patients having greater injury-operation interval had difficult open reductions of fracture and a longer hospital stay

In present series some of the benefits of a minimally invasive surgery namely decreased blood loss & faster rehabilitation were obvious. The average blood loss with PFN was significantly less than that seen during DHS. It was lower than reported in literature Only 23% of patients in the present series required postoperative blood transfusion that is comparable to 19 % of Fogagnalo et al. 15% by Christophe Sadowski et al.

Significant difference of the two was observed in the operative times of the two groups, one treated with PFN and other DHS (P<0.05). Baumgaertener (1998) reported that intramedullary devices are associated with 23% less surgical time and 44% less blood loss as compared to extramedullary devices.

Incidence of femoral shaft fractures has been reported by different authors. In this series no femoral shaft fracture either intraoperative or postoperatively was found. Rate of postoperative infection in literature is significantly low when compared to DHS. However in the present comparative study, no difference was found between the two groups when compared for general and local complications. Average pain score in the

groups treated with DHS and PFN was not statistically significant (P>0.05). This matched with the study of Saudam, M Lubbe et al (2002) who compared pain, social functioning score, and mobility score between the two groups and found no significant difference and concluded that there was no advantage to an intramedullary nail versus a sliding compression hip screw for low-energy subtrochanteric fractures

The union in Group I (18.25 weeks) was significantly faster than in Group II (20.57 weeks) . The literature reports varying rates of union ranging from 3 months (P.B While et al, 1983) to 6.5 months (Banquet A et al, 2000). The final results graded as excellent, good, fair and poor were similar in both the groups with no statistical difference (P= 0.76).

The present study had certain limitations. First, none of the patients underwent dual-energy-x-ray absorptiometry for estimation of bone density as the facilities are not available at our centre. Second, in many fractures open reduction had to be performed because of longer injury operation interval as either they presented very late or there was delay in procurement of appropriate implant by the patient.

The results of the present study suggest that treatment with PFN may lead to less surgical trauma, less surgical time, less blood loss and a speedy recovery. Nevertheless, a routine use of PFN is not recommended in all subtrochanteric fractures. PFN is a technically demanding procedure with a steep learning curve. However, more randomized studies with larger sample size and a longer duration of follow up are needed to decide for the ideal implant to treat these fractures

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ARTICLE

Leg Length Discrepancy After Total Hip Replacement

Dr. Saurabh Jain, Dr. Sunil Rajan, Dr. Prof. P. Bhargawa

ABSTRACT

INTRODUCTION

In spite of improvements occurred in implant design, materials and fixation techniques, among many complications following total hip replacement (THR), leg length discrepancy (LLD) is very common but least explored. It can lead to serious complications converting an excellent surgery with rigid fixation to poor functional results. The desirability of lengthening of shortening, clinical and radiological method of assessment and their relation, correlation with functional outcome etc are some most controversial questions about LLD which are being effort to be answered in this study.

MATERIAL & METHODS

108 cases of THR with any type implant and demographic and equivocal post-op protocol were assessed clinically (true and apparent) and compared with radiologically (pelvic, femoral and combined) measured LLD and finally, functional results correlated with measurement of Harris hip score.

RESULTS

Overall prevalence of LLD was above 90% but clinical and radiological assessment correlated poorly. Clinically lengthening (83%) was more common than shortening, with maximum lengthening in the range 1-10 mm. Radiologically combined (60%) variety outranged femoral while least being pelvic. Only 50% has LLD in range of 1-10 mm on radiologically assessment, but more than 90% cases has excellent to good functional results.

CONCLUSION

LLD though inevitable but controllable complication following THR, effects adversely on functional outcome above the cut off limit of 2.0 cm. Preoperative templating and intra operative measurements by careful positioning and orientation of components can decrease LLD and improve the functional outcome.

KEY WORDS

Total hip replacement, leg length discrepancy, clinical and radiological assessment, functional outcome.

INTRODUCTION

"The successful reconstruction of the arthritic hip by total hip replacement is perhaps this century's most innovative and significant development in orthopaedic surgery,"[1,2] Now total hip arthroplasty is most commpnly performed adult reconstructive procedure[3], averaging nearly 2,00,000 total hip arthroplasties every year in India. Giving the aging of the population that is expected to occur over the next several decades, the number of patients requiring the treatment will increase tremendously[3].

Despite the exceedingly high rate of success of total hip replacement in both short and long term follow up studies, numerous potential complications resulted from this type of reconstructive surgery. As with any other case, total hip replacement has its own problems like dislocation, infection, periprosthetic fracture, trochanteric non-union, thromboembolism, heterotrophic ossification etc[4,5]. With the advancements in implant designs, materials, fixation techniques, modern operation theatre facilities and antibiotics, the incidence of complications like infection and loosening is brought well under control[2]. But the leg length inequality after total hip replacement which was previously given secondary consideration as compared to other complications having still higher incidence and its effects over functional outcome are not fully recognized. But the fact existed that an otherwise excellent clinical and radiographic result could be perceived as a failure with associated leg length discrepancy with marked differences [6,7,8]. The topic of asymmetry of lower limb length after total hip replacement has been a subject of controversy, particularly in areas of incidence, methods of assessment and their accuracy, clinical significance and degree of acceptable range[7,8]. This forced us to look into significance of the leg length inequality after total hip replacement so that the results of the study can be further utilized to continue the expansion for vision of the future.

MATERIAL AND METHODS

The retrospective study was carried out in the Department of Orthopaedics and Traumatology, Mahatma Gandhi Memorial Medical College and Maharaja Yashwant Rao Hospital, Indore including all case of Total Hip Replacements done from June 95 to Oct 2007.

66 males (75 hips 7 bilateral and 2 revision) and 28 females (33 hips 4 bilateral and 1 revision) i.e. a total of 108 cases in 94 patients (11 bilateral and 3 revisions) were reviewed retrospectively after total hip replacement for the true leg length discrepancy, apparent leg length discrepancy, radiological leg length discrepancy and functional results.

The youngest patient was of 23 years and eldest being 74 years with average age of 44.3 years. Out of these 62 were Cemented arthroplasties and 46 were Non-cemented total hip replacements among these 5 were metal-on-metal.

Patients were operated for primary osteoarthritis or secondary due to trauma. Patients with congenital hip malformations or co-existing diseases directly or indirectly affecting acetabular asymmetry or lower limb length were excluded.

The cost of implant was the predominant variable irrespective of the clinical indication[2,3,9] for choosing between a Cemented and a Noncemented Hip System.

All patients had been followed by the same defined set of protocol during the pre and postoperative period, The patients were generally given a combination of both

Spinal and Epidural anaesthesia. General anaesthesia was also given in some patients. All the patients were operated in the lateral position. Usually a posterolateral approach was followed; elsewhere a lateral approach was used. Intra operative leg length equalization was assessed by the both clinical flexion test and assessing the transition after trial reduction.

All patients under went same set of post operative programme of mobilization and physiotherapy.

Clinical measurement

Clinical measurement was done by measuring true and apparent leg lengths.

1. **Apparent measurement**[2,3,6,7,9,10] was measured from the central fixed point on the truck from Xiphisternum to the sharp bony point of the medial malleolus. The prerequisite was that the patient should be lying supine in comfortable posture with limbs parallel to each other.

2. **True measurement**[2,3,6,7,9,10] was measured from the anterior superior iliac spine to the medial malleolar tip when both lower limbs were kept in identical position and pelvis being squared. The pelvis was squared when the line joining the tips of the two anterior superior iliac spines is horizontal cutting the central line at right angles or the anterior superior iliac spine is equidistant from the umbilicus.

The metal end of the measuring tape was used for the purpose of localizing the bony points, as the fingertips can be misleading[2,3,6,7,9,10].

Radiological assessment

Routine standing Antero-posterior roentgenogram of whole pelvis with maximum internal rotation of hip in extension was taken. The difference in distance between the line joining lower ends of the ischial tuberosities and line joining lesser trochanter on both sides at the level of lesser trochanter was measured. This difference in the distance to both sides corresponds to the radiological leg length discrepancy. In order to neutralize the potential problem of femoral rotation the most medial portion of lesser trochanter was selected. This method has been recognized as the most reliable measure to assess anatomic leg length disparity[2,3,6,7,9,10,11].

The radiologically determined leg length discrepancy was graded as femoral, pelvis or combined. At the beginning three lines are drawn on a standing AP X-ray. Joining the tangent to both ischia, first base line is drawn. A second line is drawn across the roof of the acetabulum and the third line between the lesser trochanters. A line representing axis of the pelvis is also drawn[2,3,6,7,9,11,12].

a. **EQUAL LIMB LENGTH** All lines parallel

b. **FEMORAL LEG LENGTH DISCREPANCY** Ischial and acetabular line parallel, the trochanteric line divergent.

c. **PELVIC LEG LENGTH DISCREPANCY** Acetabular and trocahnteric line parallel, the ischial line divergent.

d. **COMBINED LEG LENGTH DISCREPANCY** - All lines divergent.

All measurements were done by the same investigator and the measurements were re-measured on three occasions and the mean was taken to minimize the bias. The magnification correction was done by measuring the distance between the diameter of the head of the prosthesis on the radiograph and dividing this by the true diameter of the femoral head[2,3,6,7,9,11,12].

Functional Outcome Assessment

This was done by calculating Harris Hip Score and graded as follows[2,3,6,7,9]:

Excellent	90 points
Good	80-90
Fair	70-80
Poor	< 70

Clinico-Radiological Correlation

Clinico-radiological correlation was founded out by doing the statistical analysis and calculating the coefficient of correlation between the two and the 'p' value[2,3,6,7,9,13]. Changes were considered significant when the 'p' value is < 0.5. The coefficient of correlation r ranges from 1 to +1, -1 showing a perfectly negative relation and vice versa.

RESULTS

All 94 patients (66 males & 28 females) of Total Hip Replacement (108 hips) operated between June 94 to Oct 2007 formed the study group. Out of these 11 were bilateral & 3 underwent revision. The age of patients ranged from 23 to 74 years with mean age of 44.3 years and maximum 33% in age range of 40-50 yrs. Male to female ratio in the study series was approximately 3:1.

Table no. 1 : Age sex distribution

Range	Male hips	Female hips	Total	Percentage
20-30	13	5	18	16.6%
31-40	13	6	19	17.5%
41-50	29	6	35	32.4%
51-60	15	10	25	23.14%
>60	5	6	11	10.1%
Total	75	33	108	

Among all the cases, 62 were Cemented and 46 cases were of Non-cemented total hip replacements among these 5 were metal-on-metal. Of the revisions done, 1 was revised by using cemented implant the cost being the crux factor, while the rest of the 2 were revised by the non-cemented total hip replacement. Coming to the bilaterally done replacements, one was bilateral metal-on-metal, 5 had bilaterally done Noncemented in comparison to 3 with cemented hip replacement done on both sides. Two patients had both cemented and non-cemented hip replacements done on either side. Nearly all types of implants were used.

Clinical Assessment

True leg length discrepancy On assessing true leg length disparity on overall discrepancy was found in about 93 cases (86%) of the subjects. In the rest of the 15 cases limb length was equal. Lengthening was much more common found in 86 (79.6%) as compared to shortening which was found in only 7 (6.6%) cases. Maximum lengthening found in our study was 3.2 cm and the maximum shortening of 1.2 cm with average of 8.3 mm. Most of the true leg length lengthening noticed was in the range less than 1 cm i.e. in 56 (68%) cases out of 86 lengthened subjects. Limb length was equal or was less than 5mm in all the cases of metal on metal total hips replacement, although the numbers of cases of these were not sufficient to make it as statistical significant. 7 (6%) subjects has limb lengthening more than 2 cm.

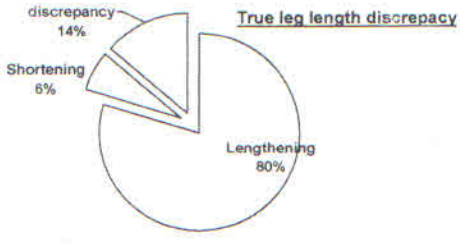
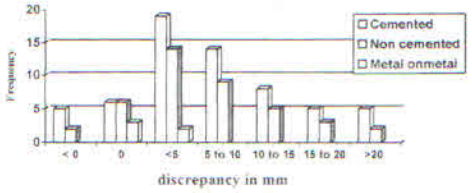


Table no. 2 :
Magnitude of true leg length discrepancy

	Shorten	Equal	Lengthen					
In mm	<0	0	<5	5-10	10-15	15-20	>20	Total
Cemented	5	6	19	14	8	5	5	62
Non cemented	2	6	14	9	5	3	2	41
Metal on metal	-	3	2	-	-	-	-	5
Total	7	15	35	23	13	8	7	108

True leg length discrepancy



Apparent leg length discrepancy

was found in about 57% cases out of which also lengthening was seen in 52% as compared to shortening. The cases found with equal limb length was also much higher on assessing the apparent leg length disparity verifying the effectiveness of secondary compensatory mechanisms. Only 1 case has apparent leg length discrepancy more than 2 cm.

Apparent leg length discrepancy

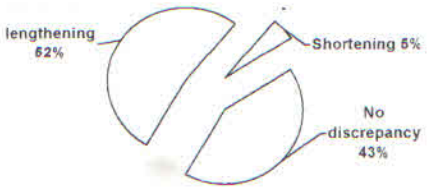
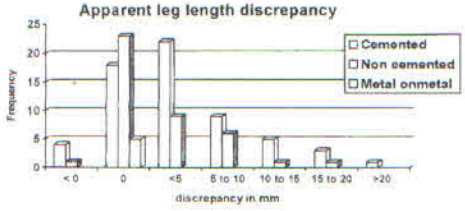


Table no. 3 :
Magnitude of apparent leg length discrepancy

	Shorten	Equal	Lengthen					
In mm	<0	0	<5	5-10	10-15	15-20	>20	Total
Cemented	4	18	22	9	5	3	1	62
Non cemented	1	23	9	6	1	1	-	41
Metal on metal	-	5	-	-	-	-	-	5
Total	5	46	31	15	6	4	1	108



Radiological Assessment

On measuring the limb length differences on a standing AP x-ray of the pelvic the overall incidence of discrepancy was found to be in 97 (>90%) cases and lengthening was found in 89 cases outranging shortening by 82%. A short number of case i.e. 8 (7.5%) and 11 (10.1%) out of 108 were found shortened or equalized respectively after the surgery. On measurement of the amount of the radiological discrepancy, lengthening was more common in the same range group as found clinically. Among all the type of replacements, metal on metal was found to have least discrepancy as compared to cemented and non-cemented total hip replacement although a short series of these cases make the results insignificant. 16 cases (15%) has discrepancy of more than 2 cm on radiological assessment.

Radiological leg length discrepancy

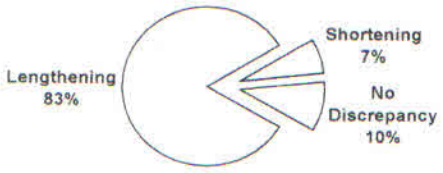
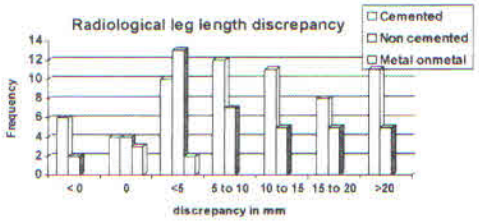


Table no. 4 :
Magnitude of radiological measured leg length discrepancy

	Shorten	Equal	Lengthen					
In mm	<0	0	<5	5-10	10-15	15-20	>20	Total
Cemented	6	4	10	12	11	8	11	62
Non cemented	2	4	13	7	5	5	5	41
Metal on metal	-	3	2	-	-	-	-	5
Total	8	11	25	19	16	13	16	108



On subtyping these radiologically found discrepancies, the combined (71 cases) variety was far much more common that other pelvic (4 case) and femoral (22 cases) type, stating clearly that the cause of discrepancy is most commonly due to both the factors i.e. acetabular as well as femoral. Out of the further two also the femoral being second most and pelvis being the least. Average lengthening on radiological assessment in the series was 9.1 mm with maximum lengthening was 31 mm.

Table no. 5 :
Types of radiological measured leg length discrepancy

	Shorten	Lengthen					
In mm	<0	<5	5-10	10-15	15-20	>20	Total
Pelvic	-	2	1	1	-	-	4
Femoral	2	9	6	4	1	-	22
Combined	6	14	12	11	12	16	71
No disparity	-	-	-	-	-	-	11
Total	8	25	19	16	13	16	108

Correlation between clinical and radiological assessment :-

Radiological assessment agreed with the clinical method that discrepancy does exist, but the amount of the difference detected by the radiography was frequently higher than that found clinically. On comparing true and apparent leg length disparity it was found that the differences were lower in the apparent measured group suggesting the phenomenon of effective compensatory mechanism. Differences of more than 20 mm were found in 7 cases only on clinical assessment as compared to 16 cases on radiographic measurement. The coefficient of correlation between the clinical and radiological assessment was +0.3, suggesting a positive correlation but of weak strength.

Comparison of Cemented, Non-cemented and Metal-on-metal :-

Out of the all type replacements done in the study, metal-on-metal has least differences in limb length after operation. Leg length disparity of more than 2 cm was found in 11 cases on radiological assessment in cemented hip replacement as compared to 5 cases in Non-cemented hip replacement and none in metal-on-metal.

Functional assessment : -

In about more than 90% cases showed excellent to good results out of these 6 cases has even discrepancy more than 15mm. Excellent result was attained in 73 cases. Poor results were seen only in 4 cases but all these cases had the leg length difference exceeded by 15 mm.

Complications :-

Leg length discrepancy has been associated with the complications like neuralgia, dislocation, gait disturbances, foot drop and pelvic tilting. All these complication were higher as the differences in the limb length increased from less than 5 mm to more than 20 mm.

Table no. 6 :
Complications in relations to leg length discrepancy

	Shorten	Equal	Lengthen					
In mm	<0	0	<5	5-10	10-15	15-20	>20	Total
Sciatic neuralgia	-	-	-	-	-	1	2	3
Foot drop	-	-	-	-	-	1	2	3
Dislocation	-	-	-	1	1	1	2	5
Limp	-	-	-	1	2	3	2	9

Discussion

Total hip replacement is now commonly performed operations for an individual with a painful, disabling arthritic joint that no longer responsive to conservative treatment to relieve pain, to provide motion and stability. The current status of Total Hip Replacement has evolved as a result of many improvements in implant designs, the availability of

suitable components, materials and manufacturing techniques, a better understanding of Hip mechanics and the need for resurfacing the acetabulum[1,2,3].

Despite high success rates of total hip replacement procedures, among all known complications leg length inequality after total hip replacement has very high incidence but been given secondary consideration as compared to other complications as its biomechanics and clinical significance and effect on functional outcome are still quite confusing and frequently matter of debate. The variety of opinion is mainly due to differences in definition, inaccurate methods of assessment and lack of consensus in acceptable limits. But limb length discrepancy, an unfortunate technical miscure may lead to a disgruntled patient and a dissatisfied surgeon, is accepted by all[2,3,6,7].

Prevalence

Historically limb length inequality has been received only sporadic consideration in literature. Studies were started way back in 1977 when ***Visuri T, Salenius P, Laurent LE***[14] studied complications of THR in series of 189 cases, and reported incidence of leg length inequality of more than 2 cm to be 8%. In 1978 ***Williamson and Reckling***[15] evaluated consecutive 150 total hip replacement and found 144 were lengthened with an average of 1.6 cm, with 27% demonstrating clinical symptoms necessitating a lift on contralateral side. In 1983 ***Love and Wrigth***[16] reported that in 18% of the patients has lengthening in their series greater than 1.5 cm. In 1986 and 1987, ***JA Rand***[17], ***Iistrup and Wahlstrom O***[18] have noted the mean limb length discrepancy of nearly 1.0 cm and lengthening in 50% and 80% of the patients respectively. ***Turula et al***[19] and ***Woolson et al***[20] in 1986 have presented more favorable results utilizing a comprehensive approach to limb length discrepancy in total hip replacement involving extensive preoperative planning coordinated with intraoperative evaluation. They reported only 2.5% of patients were lengthened greater than 6.0 mm. Our study resembled much with the study of ***Edeen J, Sharkey PF, Alexander AH***[21] as both of us assessed leg length by orthoroentgenography and clinical measurements. They reported average inequality of 9.7 mm in their series as compared to 9.1 mm in our study. In both study about 30% of patients were aware of this inequality; the average leg-length inequality in this group was 14.9 mm in their series while it was 16.1 mm in our study.

Clinical assessment

Pre as well as postoperative determination can be done clinically by direct measurement of bony points. ***Maloney WJ, Keeney JS***[22] in 2004 stated the importance of physical examination to determine true and apparent leg length, and radiographic evaluation to assess leg length to preoperatively template the surgical procedure so that discrepancy can be minimized. However obesity and previous surgery in the area of the superior iliac spine may cause difficulty in palpating the extract bony points. We and ***Edeen J et al***[21] both determined leg length clinical measurements in addition to radiological assessment. The average inequality was 9.7 mm in their series while in our series it was 9.1 mm.

Clinical method is quick, easy, reasonable and practical method to assess discrepancy. In our study, clinical assessment is done by measuring true leg length disparity measured by differences in the distance between medial malleolus and anterior superior iliac spine on both sides. An overall discrepancy was found in about 93 cases making around 86% of the subjects. In the rest of the 15 (13.8%) cases limb length was equal. Lengthening was much more common found in 86 cases

making about 80% as compared to shortening which was found in only 7 (8%) cases. This was in accordance with the studies done earlier. Maximum lengthening found in our study was 3.2 cm and the maximum shortening of 1.2 cm and average was 0.6 cm. On measuring the magnitude of the leg length disparity we found than most of the lengthening noticed was in the range less than 1 cm i.e. in 58 subjects making 68% of cases out of 86 subjects, which were lengthened. 7 (5%) subjects has limb lengthening more than 2 cm which effected the functional results inversely as these cases has Harris hip score less than 40.

On assessing functional leg length discrepancy ***Ranawat CS, Rodriguez JA***[23] found 14% patients had pelvic obliquity and functional leg length discrepancy 1 month after surgery in a study of 100 patients with total hip replacement. They suggested causes were tightness of periarticular soft tissue with resultant pelvic obliquity and degenerative conditions of the spine with contracture.

None of the other studies showed the importance of assessment of functional leg length discrepancy to known the effect of compensatory mechanism. In our study we measured the differences in the distant between medial malleolus and xiphisternum to calculate apparent leg length disparity. The incidence of apparent discrepancy was found in about 57% cases out of which also lengthening was more common by 52% as compared to shortening which was found in 5% cases. The number of cases found with equal limb length post operatively increased to 43% as compared to 13% equal limbs found on true leg length assessment, verifying the effectiveness of secondary compensatory mechanisms. Thus true leg length discrepancy was effectively compensated by secondary pelvic tilt and other mechanisms. Although the leg length discrepancy persisted on apparent measurement also, but it was of lesser magnitude. Only 5 cases were found to have the disparity of more than 15 mm as compared to 15 patients found on true leg length discrepancy.

Radiological assessment

Clinical method of assessment is unreliable and inexact. Accurate determination of the discrepancy is the key solution to all related problems. This to supplement the results of clinically measured leg length discrepancy, radiological assessment is necessary ***Williamson JA, Reckling FW***[15] using radiological evaluation in 150 patients found, 144 limbs were lengthened with average if 15.9 mm. They also noted that less lengthening was observed if the greater trochanter osteotomy done. In contrary ***White TO, Dougall TW***[24] in a series of 200 patients, using by radiological measurements, lengthening index and statistical analysis validated functional outcome score (Harris hip score and the SF36 Health Survey) stated that no statistical association exhibited between leg length discrepancy after hip arthroplasty and functional outcome or patient satisfaction. ***Woolson ST, Hartford JM, Sawyer A***[20] determined preoperative radiological leg length discrepancy and amount of femoral head to be resected in 351 patients (408 hips). Using this leg length equalization method 97% of the patients had a postoperative discrepancy of 1 mm.

In our study on measuring the limb length differences on a standing AP X-ray of the pelvis the incidence of discrepancy was found to above 90% and lengthening outranged shortening by 82% 11 cases out of 108 were found equalized after the surgery. On measurement of the amount of the discrepancy, unlike aggregation of subjects in range less than 1 cm by clinical method, the severity of the problem is equivocal and comparable in all the range groups by radiological assessment. On subtyping these discrepancy on

radiological bases, the combined variety was far much more common that other pelvic and femoral type, stating clearly that the cause of discrepancy is most commonly due to both the factors i.e. acetabular as well as femoral. Out of the further two also the femoral being second most and pelvis being the least.

Correlation

Our study resembled much with the study of ***Gofton's***[25] study done in 1985 on 10 patients stating radiological assessment agreed with the clinical method that discrepancies do exist, but the amount of the difference detected by the radiography was frequently higher than that found clinically. ***Turula et al***[19] in 1986 in 55 patients also reported same with mean radiologic LLD to be 8.7 mm in unilateral and 11.6 mm in bilateral differing significantly from the clinically measured values (2.8 mm and 4.2 mm, respectively). According to ***Edeen J, Sharkey PF, Alexender AH***[21] clinical measures of leg length inequality correlated poorly with values determined orthoroentgenographically. But these studies as well as our study was in contrast to ***Hoikka V et al***[26,27] in 1991 who measured good correlation between clinical and radiographic evaluation of leg length inequality and pelvic tilt in 36 patients. They concluded intraoperative alteration of leg length correlated well with changes in pelvic tilt but not with changes in radiographic leg length inequality suggesting that aim should be at correction of preoperative pelvic tilt observed during clinical and radiographic examination. Our study although discrepancy was found to be more than 90% by both the methods, but disparity of more than 20 mm was found in 7 cases only in clinical assessment as compared to 16 cases on radiographic measurement. The coefficient of correlation between the clinical and radiological assessment was found to be +0.3, suggesting a positive correlation but of weak strength.

We also tried to measure the leg length discrepancy intraoperatively by the flexion test, chief drawback being the subjective nature of the test. Studies using special instrument to measure leg length intra-operatively showed a more favourable outcome ***Jasty, Murali, Webster, William, Harris, William***[28] in 1996 85 patients using special calipers showed reduced incidence and magnitude of this problem. ***Williamson JA, Reckling FW***[15] in 1978 reported slights less lengthening if the greater trochanter osteotomy done. ***Ranawat CS, Rao RR, Rodriguez JA, Bhende HS***[23,29] designed a new technique using a vertical Steinmann pin at the infracotyloid groove of the acetabulum and showed significant correlation when this was correlated with the postoperative radiographic measurements. ***Shiramizu K et al***[30] designed a L-caliper to estimate limb lengthening during THA and evaluated its accuracy and compared it with previous device, the straight caliper. The radiographic measurement was significantly improved using the L-shaped device ($p < 0.0001$) concluding method as extremely accurate in predicting changes in limb length due to surgery. ***Base WJ***[31] found significant decrease in the incidence of inequality when a measuring device used intra operatively. ***Affatato S Toni A***[32] used an ultrasound system while ***Edward DeMaya***[33] in 2000 invested a pair of laser diodes with success for the same.

We also compared different types of replacement and found that out of the all type replacements done in the study, metal-on-metal has least differences in limb length after operation. None of the cases with metal-on-metal replacement has disparity more than 5 mm as compared to the 50% and 64% cases of Non-cemented and Cemented replacement respectively, although the number of cases of these group were not so sufficiently large to make it of statistical significance. On comparing Non-cemented and cemented replacement, Noncemented

have found to have better restoration of leg length. ***Girard J. Lavigne M, Vendittoli PA, Roy AG***[34] in a series of 120 found the leg lengthening of 2.6 mm (-6.04 to +12.9) in conventional total hip arthroplasty (THA), whereas shortening of 1.9 mm (-7.1 to +2.05) in the surface replacement arthroplasty (SRA) group. Leg-length inequality was restored within 4 mm in 42 (86%) of the SRA and 33 (60%) of the THA patients. Restoration of the normal proximal femoral anatomy was more precise with SRA. The enhanced stability afforded by the use of a large-diameter femoral head avoids over-lengthening of the limb or increase in offset to as occurs sometimes in THA. They also concluded in patients with significant pre-operative deformity, with lower pre-operative femoral offset, significant shortening of the leg was still possible with SRA. ***Silva M, Lee KH, Heisel C, Dela Rosa MA***[35], ***Schmalzried TP***[36] in 2004 compared the metal-metal surface replacement with cementless total hip replacement. In both group average limb length inequality was of approximately 3 or 4 mm, but horizontal femoral offset is essentially unchanged by hip resurfacing while horizontal femoral offset can be increased reliably with a contemporary total hip replacement. Thus concluding that arthritic hip with limbs that are more than 1 cm shorter or that has a comparatively low horizontal femoral offset may be better served by a contemporary total hip replacement. ***V. Khanduja, V. Tek and G. Scott***[37] stated decrease in inequality from mean pro-operative value of 0.71 cm to a mean of 0.11 cm post-operative by using a femoral component retaining the neck. 24 (23.5%) had an equal leg-length post-operatively while 95 (93.1%) had a leg-length inequality between 1 cm and 1 cm.

Boisgard S et al[38] reported leg length discrepancies in 8 patients with 6 shortening and 2 lengthening in 53 cases of wagners revision total hip arthroplasties in 53 cases and concluded that functional outcome was similar to results reported in the literature. We also found no significant disparity in functional outcome after revision surgery but number of case was too low to comment. ***Peter F. S.***[39] minimized leg length inequality by placing patient in supine position and hip capsular sparing surgical approach which allows checking leg lengths by feeling the patients heels and ankles.

Functional results

All patients were assessed functionally by Harris hip score. A about more than 90% cases showed excellent to good results. Excellent results were attained in 73 (70%) cases. Poor results were seen only in 4 cases when leg length differences exceeded 15 mm. As the leg length differences increased from <5 to more than 20 mm the results graded poorer and poorer.

Complications like neuralgia, dislocation, gait disturbances, foot drop and pelvic tilting were all found more when the disparity was more than 15 mm. Partial sciatic palsy with severe neuralgia and foot drop was seen in 3 cases which improved fully in 6 months. Limping though most common complication associated with disparity in our study was found in 9 cases but recovered with due course of time. And only 2% of the patients had subjective symptoms after 6 months follow-up. Dislocation was found in 5 cases all having disparity more than 15 mm.

Matta JM, Shahrdar C, Ferguson T[40] in 2005 concluded that tissue sparing anterior approach allowing implantation of the femoral and acetabular components without detaching muscles and tendons restores leg-length and decreases the rate of hip dislocation. ***Williamson JA, Reckling FW***[15] found partial sciatic nerve palsies in 3.3% cases of their study series, which in all instances resolved or improved. ***Schmalzried TP, Amstuz HC, Dorey FJ***[36] on reviewing 3126 total hip

replacement found neuropathy in 53 (1.7 %) patients over-all and after 1.3% of the primary arthroplasties, but he accounted limb-lengthening only partially responsible for this increased prevalence on neuropathy. ***Pritchett J***[41] in 2004 concluded severe neurological deficit and persistent pain after total hip replacement in 19 cases when limb lengthened by 1.3 to 4.1 cm arfter excluding other causes. ***Gore Dr, Murray MP, Gardner GM, Sepic SB***[42] reported increasing neck length and a more distal position of the greater trochanter were among the measurements favorable to the patient function. More superior placement of the center of the prosthetic head in the pelvis was associated with a more superior position of the lesser trochanter and shortening, which related adversely to function.

D' Amico M et al[43] showed in a series of 90 patients 79% patients presented with LLD had pelvic obliquity and posture unbalancing needing re-balancing by the use of simple underfoot wedge which improved or resolved by time. ***Brand RA, Yack HJ***[47] concluded in their study that leg length discrepancies commonly seen after total hip reconstruction would likely cause no substantial changes in hip forces. J. ***Rosler, C***[44] concluded that deterioration in parameters of gait was observed following cranialisation of the center of rotation of the femur, whereas neither medial movement of the center of rotation nor leg lengthening by up to 1 cm had any effect on gait parameters. In a study ***Bhave A, Paley D, Herzenberg JE***[45] concluded that lengthening of the shorter limb of patients who have limb-length discrepancy can normalize gait symmetry of quantifiable stance parameters and eliminate a limp. ***Kou-An Lai, Chii-Jen Lin, I-Ming Jon, Fon-Chin Su***[46] showed cases with THA and leg-length equalization walked faster and had gait parameters with better bilateral symmetry than the untreated subjects.

It is necessary to restore leg length to normalize hip biomechanics. Leg length inequality < 1 cm, are common and usually well tolerated. More significant discrepancies can risk a nerve and are common cause of litigation. As leg length discrepancy cannot be eliminated after hip arthroplasty, it can be minimized through a series of steps both preoperatively and intraoperatively like physical examination to determine true and apparent leg length, and radiographic evaluation to both assess leg length and to preoperatively template the surgical procedure.

Summary

Limb length discrepancy either lengthening or shortening is not uncommon after total hip replacement and may cause substantial problems for patients but in most of the cases the symptoms are controllable and manageable.

We reviewed 108 total hip replacement to investigate the limb length after total hip replacement by clinical as well as radiological assessment and correlated with functional assessment as done by Harris hip score. The overall prevalence rate of discrepancy was very high found to be >80% by both clinical as well as radiological assessment. Lengthening outranged its counter part shortening by >80% but most of the lengthening was in the desirable range of <10 mm with an average of around 8.3 mm. Finally we concluded that although such high incidence rate of leg length discrepancy has made it inevitable but it is controllable and manageable. A slight lengthening is favorable for the better stability and biomechanics of the hip as most patients has preoperative shortening either due to pathology or previous surgery, but excessive lengthening may lead to problems. Both the clinical assessment method and radiological evaluation method are shown to be accurate. True measurement gives us reasonable estimation of leg length while apparent gives us the amount of compensation achieved. Radiological

assessment agreed with the clinical method that discrepancy does exist but the amount of the difference detected by the radiography was frequently higher than that found clinically. Radiological method also stated that most common type of discrepancy is of combined type i.e. both femoral as well as pelvic components are held responsible. Thus although clinical assessment has got much chance of relative error, radiological one also gives as way to evaluate the cause of the discrepancy. Among the different type of replacements metal-on-metal has least discrepancy followed by Non-cemented and highest in Cemented replacement suggesting that the modularity of head can be used in a way to restore the leg length.

Excellent to good results are obtained in more than 90% of cases as the magnitude of the lengthening remained less than 1 cm. As the range of the discrepancy increases from less than 1 cm to more than 2 cm the results gradually graded poorer and poorer. All the complains like neuralgia, limping, back and hip pain although increases as discrepancy increases, but in due course of time all these subjective complaints improved or recovered. In patients with excessive discrepancy causing symptoms a temporary heel lift be used on appropriate side to gain a satisfactory gait pattern. Preoperative planning with due regard to templating and intra operative measurement by careful positioning and orientation of the components can decrease the incidence of leg length discrepancy and increase the functional results. Thus it is rightly said about discrepancy it is better to prevent rather than rent and repair.

We would like to state with a note of caution, that though the results in rehabilitating a patient are dramatic, the procedure is demanding, new concepts are emerging and more work to be done so that we can provide years of trouble free life.

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ARTICLE

FAILURE OF NEEDLE BIOPSIES IN MUSCULOSKELETAL TUMOURS CAUSES AND PREVENTION

Dr. Alok C. Agrawal, Dr. M. Indoriya, Dr. (Prof.) H.K.T. Raza

INTRODUCTION

Needle biopsies for Musculoskeletal Tumours are an acceptable mode of obtaining pathological tissue for diagnosis. The needles available for soft tissue biopsy are the Vim-Silverman liver biopsy needle or some variant of a Trucut needle. Needles available for bone biopsy include the Ackermann needle, Jamshidi needle or the Patiala bone biopsy needle . The common causes cited for a negative histopathological report are : Wrong placement of needle, Non-representative tissue obtained, Insufficient tissue obtained and Crush artifact in tumours with little or no supportive stroma i.e. Ewing's sarcoma. To get a more representative tissue in a needle biopsy one has to use an Image Intensifier, USG , CT Scan or MRI guided needle biopsy depending on the site of tumour, cost and availability of infrastructure. We have done this study with the aim of finding out the causes of failure of needle biopsies done either by clinical experience or under image intensifier guidance and to compare the results with those of the Gold Standard (Open incisional biopsy).

MATERIAL AND METHOD

22 cases with suspected musculo-skeletal tumours, presenting to us were taken for needle biopsy following other necessary investigations and imaging studies. In each case, a clinically guided needle biopsy was done by the first author who was also the surgeon for the definitive surgery planned later. After the clinically taken needle biopsy, the second surgeon entered the O.T. and took a 'C' Arm image intensifier guided needle biopsy from the site discussed on X-ray of the part with the operating surgeon. Both the biopsy tissues were labelled and sent for histopathology to the same Pathologist aware of the study but not aware of which bottle contained tissue from which biopsy. The bottles were randomly labelled 1 and 2 and the record was kept in a biopsy register in the theatre regarding which bottle had clinically taken biopsy and which was containing tissue taken under image intensifier. The reports were compared with an open biopsy report. If both the reports were negative, background information of patient's history, clinical examination and X-rays were supplied to the pathologist. This study discusses the results, complications and causes of failure of needle biopsies.

OBSERVATIONS AND RESULTS

The observations are discussed in the following self explanatory tables:

Table 1

List of cases that presented with suspected musculo-skeletal tumours on whom image guided and clinically guided biopsy was done

No	Provisional Diagnosis	No. of Cases	Percentage
1	Osteogenic Sarcoma	8	36.3
2	Chondrosarcoma	2	9
3	Chondromyxoid Fibroma	1	4.5
4	Ewing's Sarcoma	1	4.5
5	Metastases	3	13.6
6	Solitary Bone cyst	5	22.7
7	Other's (Suspected bone lesions)	2	9
	Total	22	100

Table 2

Sex distribution of musculoskelatal tumours or tumourous lesions

S. No.	Final Diagnosis	Male	Female	Total
1	Qsteogenic Sarcoma	4	4	8
2	Chondrosarcoma	2	-	2
3	ChondromyxoW Fibroma	1	-	1
4	Swing's Sarcoma	1	-	1
5	Metastases	3	-	3
&	Solitary Bone cyst	1	4	5
7	Normal Bone	1	1	2
	Total	13	9	22

Table 3 Types of Needle use

S. No.	Name of needle	No of cases
1	Jamshidi Needle	9
2	Vim-sHvermann Needle (Liver biopsy needle used for soft tissue infiltration of malignancies or soft tissue sarcoma)	13
	Total	22

Table 4 Age wise Distribution of Cases

S. No	Age distribution (Years)	Total No.	Percentage
1	1 - 10	-	-
2	11 - 20	7	31.8
3	21 - 30	4	18,1
4	31 - 40	4	18.1
5	41 - 50	1	4,5
6	51 - 60	3	13,6
7	61 - 70	2	9
8	71 - 80	-	-
9	81 - 90	1	4.5
	Total	22	100

Table 5 Site of Tumor

S. No	Site of Tumor	No. of Cases
1	Femur	12
2	Tibia	4
3	Humerus	3
4	Scapula	1
5	Radius	1
6	Llium (Pelvic bone)	1
	Total	22

Table 6 Types Of Anaesthesia Used During Biopsy

S. No	Type of Biopsy	Total No. of Biopsies	Anaesthesia Used	
1	CNB (Image guided / clinically guided)	22 + 22 = 44	44	-
2	Open	4	-	4
	Total No. of Biopsies	48	44	4

Table 7 Intraopearative Complications Reported During Biopsy

S. No	Type of Biopsy	Total No. of Cases	Avg. Blood loss	N.V. damage	Incidence of broken needle	Damage to Jamshidi needle
1	CNB	18	0.2 - 0.5 ml	-	3 case (+) VIM Silever-mann needle	2 cases
2	Open	4	15 - 30 ml	-	-	

Table 8 Sensitivity Of Image Guided Core Needle Biopsy

Total no. malignat cases in whom CNB (Image guided) was done	No. of cases coming with conclusion of tumour by image guided biopsy	Sensitivity of image guided biopsy
12	8	66.6

Table 9
Histopathological report of failed core needle biopsy cases followed by open biopsy

No. of cases where Sensitivity of image both image guided and clinically guided core needle biopsy failed	Final diagnosis / Report on open biopsy	
	with conclusion of	guided biopsy
	Final Diagnosis	No. of Cases
	Osteogenic sarcoma	1
4	Perosteal osteogeric sarcoma	1
	Chondromyxoid fibroma	1
	Ewings Sarcoma	1

RESULTS

Out of the 44 needle biopsies done 22 bone tumours, 6 had a negative report. There was failure of image guided and clinical guided needle biopsy in one case each, while in 4 cases both the modalities failed, making the failure rate 13.6%. No difference was found in clinical verses image guided needle biopsy of the appendicular skeleton.

DISCUSSION

The periphery of a lesion usually contains the most viable tissue which is the best tissue on which the diagnosis should be based. One should avoid Codman's triangle which usually contains reactive bone only, soft areas in the tumour as it will be predominantly necrosed tissue and taking biopsy only from the pseudo capsule surrounding the tumour. It is essential to biopsy the osteolytic regions, which are the most significant zones for the pathologist.

The causes of failure of needle biopsy as observed by us were as follows:

1. Failure of image guided needle biopsy due to use of wrong needle i.e. soft tissue needle used in bone tumour.

2. Missing the target in a case of chondrosarcoma of the acromion and the spine of the scapula in a clinically guided core needle biopsy.

3. Failure of both clinical and image guided biopsy was seen in 4 cases due to use of wrong needle, needle placement in reactive zone under image guidance, only fluid aspiration in a case of Simple Bone Cyst and missing the target while avoiding neurovascular structures in forearm in a case of Ewing's sarcoma.

We would like to conclude that there is no difference in a CNB done clinically or under image intensifier control as far as the appendicular skeleton is concerned. This should be done using the right type of needle with formal discussion with the operating surgeon. For other lesions i.e. spine, sacrum, acromion, scapula, etc an image guided biopsy will be more sensitive & specific in determining the diagnosis.

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ARTICLE

Laminectomy Vs Fenestration For Prolapsed Lumbar Intervertcbral Disc

Dr. Sharma S.K, Dr. Singh Vivek, Dr. Sharma Jay

ABSTRACT (Summary)

BACKGROUND: Lumbar disc prolapse is a very common problem and this can be treated by laminectomy, fenestration, microendoscopic discectomy and or conservatively. Laminectomy or fenestration is the good spinal procedure being done successfully for prolapsed intervertebral disc disease.

AIMS: We report the technique and outcome seen in 21 cases of prolapsed lumbar intervertebral disc who underwent laminectomy or fenestration for continued lumbar disc prolapse

SETTING AND DESIGN: The study was carried out at the Department of Orthopaedics, R. D. Gardi Medical College, Ujjain.

MATERIAL AND METHOD: 21 patients with prolapsed lumbar intervertebral disc who were seen and registered at the institution between May 2007 and February 2009. Data were collected. Laminectomy was done in 13 cases while fenestration was done in 8 cases. Outcome assessment was done by the Revised Oswestry Disability Index.

RESULTS: 21 cases (17 males, 4 females) underwent surgery, followed up from 2 to 20 months with an average of 11 months. Fifteen patients had an excellent outcome, 4 patients good outcome, 1 patient fair outcome and 1 patient poor outcome due to recurrence. Complications included dural puncture (1), superficial wound infection (1), and recurrence (1).

CONCLUSIONS: Laminectomy & Fenestration with discectomy are safe and effective procedure for the treatment of prolapsed lumbar intervertebral disc. Fenestration was done on single level PIVD and Laminectomy for multilevel discs. The post operative rehabilitation is faster in fenestration as compared to Laminectomy. The hospital stay was lesser and the technique was easier also.

Introduction

The surgical treatment of prolapsed lumbar intervertebral disc has evolved since the initial report of lumbar discectomy by Mixter and Barr in 1934. The standard operations include Laminectomy, fenestration, hemilaminotomy and microdiscectomy. Laminectomy and fenestration are the widely accepted surgical procedures for lumbar disc prolapse with which all other techniques are compared. The minimally invasive techniques which have been used to treat contained lumbar disc prolapse and discogenic back pain include chemonucleolysis with papain, various modifications of percutaneous discectomy, percutaneous laser discectomy, percutaneous endoscopic discectomy and intradiscal electrothermy. However they are mainly intradiscal procedures with a posterolateral approach to intervertebral disc and cannot be used for extruded disc fragments. Laminectomy or fenestration is a procedure which directly deals with offending prolapsed or extruded disc fragment and decompresses the nerve root. In addition lateral and foraminal stenosis can also be tackled. The advantages of minimally invasive techniques like fenestration have included smaller incision, less peri-operative pain, early ambulation, short hospital stay and early return to work. Laminectomy provides good surgical exposure for multiple level disc excision in lumbar canal stenosis. We report our results in 21 patients who underwent laminectomy (13 patients) and fenestration (8 patients) for prolapsed lumbar intervertebral disc.

Materials and Methods

Twenty one patients with prolapsed lumbar intervertebral disc who were seen at our institution between May 2007 and February 2009 were included in the study. Data were collected prospectively. Pre-operatively all patients had a trial of conservative therapy before surgery was offered. This included a minimum period of 2 months of physiotherapy, analgesics, Lumbosacral traction, caudal epidural steroid injection and rest. All patients had a pre-operative MRI of the lumbar spine. Patients showing compression of cord or root in MRI and having severe radicular pain with or without neurological deficit were selected for study.

Operative technique: Well prepared patients was taken in the operation theatre and procedure was performed under General Anasthaesia in prone position over the 2 bolsters. Painting and draping of lumbosacral spine done under all aseptic precautions. Level of disc was confirmed with a 18 gauge needle under C-Arm image intensifier. Midline incision of one and half inch long given on lumbosacral spine. For fenestration the desired level paraspinal muscles were elevated and retracted laterally. The interspinous ligament was cut and the interspinous retractor applied. This made ligamentum flavum to be stretched in between two laminae. Forward and backward rongers were used to nibble the ligamentum flavum from superior to inferior and from one side to other. This made a wide exposure of spinal cord which was retracted to one side and the disc space was identified by a 24 gauge needle. A cruciate incision was given by 11 no. knife. The disc material was evacuated with disc forceps. Curettage done with due care not to injure the roots and dura. The same thing was done on other side, also by retracting the cord to opposite side. Saline irrigation and suction made the disc space cleaned.

For multilevel discs the spinous process was sacrificed along with the interspinous ligament one above and one level below. Retractors applied at the spinous process. This made the two level ligamentum flavum stretched. Ligamentum flavum of the interlaminar area removed, lamina cut then the lower ligamentum flavum was removed. This

made a long and wide exposure of the cord. Superior and inferior disc space was identified one by one and disc removed in the same manner as previous. Hemostasis was achieved by using petties, suction and bipolar cautery. The canal was probed with an infant feeding tube superiorly and inferiorly for identification of canal stenosis.

Muscles were approximated by vicryl and thick lumbar fascia was sutured. Skin was sutured with nylon. Suction drain was used infrequently. Cleaning and dressing done and anasthaesia is withdrawn by anasthetist. Patient is allowed to sit on second post operative day. In cases where fenestration was done pt allowed the activity of daily living on 3^{r0} day with gradual increase in the physical activity. The pain was more at back in cases of laminectomy so only turning on bed allowed on 2nd post operative day. Sitting only allowed on 7th day in the bed. Tenth day out of bed for activity of daily living. After 2 weeks or 15th day allowed for other physical activities. Outcome assessment done by Revised Oswestry Disability Index on 6 weeks, 3 months and at 1 year.

Observations

TABLE -1 :

AGE INCIDENCE

Majority of patients (10) were in age group of 31-40 years of age.

AGE	No. OF PATIENTS
00-10	NIL
11-20	NIL
21-30	5
31-40	10
41-50	3
51-60	2
61-70	1

TABLE -2 : SEX INCIDENCE

TOTAL NO.OF PATIENTS	MALE	FEMALE
21	17	4

Out of 21 cases 17 cases were males.

TABLE -3 : OCCUPATION OF PATIENTS

OCCUPATION	NO. OF PATIENTS
HOUSEWIFE	4
LABOURER	10
AGRICULTURE	4
SEDENTARY WORKERS	3
TOTAL	21

Majority of patients 10 out of 21 were labourers.

TABLE-4 :
SURGERY PERFORMED ON THE PATIENTS

SURGERY	NO. OF PATIENTS
LAMINECTOMY	13
FENESTRATION	8

Results

Revised Oswestry Disability Index Scale was used after the surgery and the outcome are as following-

TABLE-5 : Results

% Disability	Interpretations	No. of patients	Result Considered
0-20 %	Minimal disability	15	Excellent
21-40%	Moderate disability	4	Good
41-60%	Severe Disability	1	Fair
61-80%	Crippled	1	Poor
81-100%	Bed Bound	-	-

TABLE-6 : COMPARISION OF RESULTS

Result Considered	Laminectomy Group-No, of Patients	Fenestration Group- No. of Patients
Excellent	8	7
Good	3	1
Fair	1	-
Poor	1	-
TOTAL	13	8

Twenty one patients underwent discectomy surgery at the institution between May 2007 and February 2009. There were 17 males and 4 females. The age group ranged from 22 years to 65 years. All patients had a postcrolateral disc herniation and of these 2 patients also had associated lateral recess stenosis. L4-5 was the most commonly involved levels. All patients were ambulated within 2 days of the surgery and were discharged within 12 days of the surgery. Duration of post operative follow ranged from 2 months to 20 months with a mean follow up of 11 months.

During surgery dura was accidentally cut and repaired in one case. There was one case of superficial wound infection which was treated with antibiotics. One case had recurrence of disc prolapse 11 months after the surgery who refused revision.

Outcome assessment was done for 21 patients using the Revised Oswestry Disability Index. 15 patients had excellent outcome, 4 patients had a good outcome, 1 had a fair outcome while 1 patient had a poor outcome. Thus, overall success rate was 90.4% in our series. The operative time was 90-120 minutes.

Discussion

The relationship between lumbar disc herniation and the syndrome of lumbago/sciatica has been well recognized since the 1930's. Mixter and Barr's classical paper "Rupture of intervertebral disc with involvement of spinal canal" opened an era of systematic diagnosis and operative treatment of lumber disc prolapse. Their operative approach was an extensive Laminectomy. Since then it has been a constant endeavour to achieve the decompression of the offending nerve root by various operative techniques and innovations. Laminectomy is the oldest & most commonly performed procedure for the disc excision. Laminectomy is indicated for multiple disc excision in lumbar canal stenosis when good exposure is required. It is a safe and easy procedure for multi level discs. The direct visualization of disc space with good surgical exposure makes it a widely accepted procedure. Love described extradural removal of herniated disc and devised interlaminar fenestration for treatment of lumbar disc prolapse. Interlaminar fenestration or laminotomy is a minimally invasive procedure in which a small hole is created in lamina and disc is excised. It is established that this procedure reduces the incision size, blood loss and morbidity. Laminectomy and fenestration became standard with which other procedures on prolapsed lumbar disc started being compared.

The indications for laminectomy and fenestration are postero-lateral disc herniation with or without lateral recess stenosis, foraminal and extra-foraminal disc herniations. They have also been successfully used for recurrent disc prolapse. Hence disc excision through fenestration and laminectomy are the procedures which can be performed by majority of Orthopaedic surgeons even in peripheral centers.

In the study of Sangwan et al., the assessment at follow-up showed excellent results in 17 patients, good in 6 patients, fair in 2 patients and poor in 1 patient. In the study by Mahopatra et al, out of 67 cases, laminectomy was performed in 37 cases while fenestration was done in 30 cases. The study of Mahopatra et al. concluded immediate and last postoperative results were better with early mobilisation and less back pain in the long run after fenestration than wide laminectomy, though there was not much differences in the relief of sciatica. In our study, in the laminectomy group, 8 patients had an excellent outcome, 3 patients had a good outcome, 1 patient had a fair outcome and 1 patient had a poor outcome while in fenestration group 7 patients had excellent outcome and one had good outcome. None had fair or poor

outcome in fenestration group. Results of our study are comparable to the other studies.

There have been several percutaneous systems introduce for lumbar disc prolapse such as chemonucleolysis, percutaneous lumbar discectomy and automated and percutaneous laser assisted discectomy.The advantages cited for these techniques have been surgery under local anesthesia, early mobilization, non disturbance of posterior structures such as laminae, facet and ligamentum flavum, less manipulation in the intraspinal space thus reducing the possibility of epidural fibrosis. They need lots of expertise, experience and expensive equipments which are not available at every center. The indications for these procedures are discogenic back pain and sciatica secondary to contained disc prolapse. These procedures cannot be used in cases of extruded disc fragments causing compression of the nerve root and they do not address the concomitant bony and ligamentous compression of the nerve root. The results of these procedures have been very variable and satisfactory results have ranged from 29 to 92%.

The advantages of fenestration over standard laminectomy include smaller incision, lesser post operative pain, early ambulation, short hospital stay, shorter time to return to work and lesser cost of treatment.The patient's ability to return to the previous employment is a measure of success of the surgical procedure. Fifteen patients in our study returned to work in less than one month after surgery. Four patients returned to change their original work while 2 patients had to change their nature of work. In the study of Sangwan et al., seventeen patients returned to work in less than one month after surgery. Eighteen patients returned to change their original work while 8 patients had to change their nature of work. Bookwalter *et al* [24] reported that 40% of their patients returned to work in fewer than 5 weeks after microdiscectomy while Casper *et al* [25] reported a mean return-to-work time of 18.6 weeks. In this study the average low back pain outcome score improvement was of clinical significance in both patient groups and there was no difference between the two groups. However, patients in the fenestration group required less postoperative analgesia during their hospital stay. The authors concluded that fenestration is as effective as laminectomy for the treatment of uncontained or large contained disc herniations.

The complications reported in patients undergoing MED include wound infections (0-0.8%), discitis (0-0.8%), dural tears (2.3-7.1 %) and recurrent disc prolapse (2.6-2.9%). The complications reported in large series with patients undergoing microdiscectomy are also similar and include wound infections (0-7.2%), discitis (0-0.8%), dural tears (0-6.7%) and recurrent disc prolapse (3-14%). In our series, Complications included dural puncture (0-4.7 %), superficial wound infection (0-4.7%), and recurrent disc prolapse (0-4 %).The complications seen in our series is comparable to the other MED series.

Conclusions

We conclude that the procedure of fenestration and laminectomy for disc excision under direct vision offers the complete visualization of nerve roots and complete removal of the offending disc along with loose fragments. Fenestration is a short procedure with minimal tissue damage leading to quick rehabilitation as compared to laminectomy where laminae were removed after a wider exposure and longer bed rest. The hospital stay was longer with laminectomy disc excision. The bed was occupied longer, as it was shorter in cases treated with fenestration. In comparison to microdiscectomy, disc excision by fenestration has yielded almost

comparable results. Further microdiscectomy is the procedure which needs greater know-how and expertise in instrumentation and techniques and is less cost effective. In the peripheral institutions laminectomy or fenestration with disc excision is quite a reasonable method to surgically treat the indicated cases of prolapsed disc.

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ARTICLE

A study on serum parameters and bone density in patients above 50 years with fractures

Dr. K. K. Pandey, Dr. A C Agrawal

ABSTRACT (Summary)

Introduction

Once unknown, later taken for granted as an inexorable sequel to the process of aging, osteoporosis in now regarded as a disabling or morbid condition of importance as to deserve more study, mainly because of the increase in the number of the older persons and the economic implications. It is also known that there is a change in serum parameters like serum calcium, serum phosphorus, serum alkaline phosphatase and serum acid phosphatase after trauma. It was hence decided to study bone density with serum parameters which are commonly done as a preoperative work up of elderly patients with fracture. In our study Bone densitometry was measured indirectly by the digital X-Ray radiogrammetry (Pronosco-X-Posure system).

MATERIAL AND METHOD

We conducted this study in the Department of Orthopaedics and Traumatology, NSCB Medical College, Jabalpur on 36 elderly patient above 50 years with fractures of their long bones, spine or pelvis, who got admitted between Nov. 2005 and July 2006. History of bone disease, diseases impacting on bone metabolism and those using drugs that affect bone including, bisphophonates, oestrogen, calcitonin, steroids, tamoxifen, and raloxifene were excluded. Other exclusion factors included prolonged hospitalization or immobilization and limited use of one or both arms within 6 months of the study. We divided our elderly patients with fracture into three groups : 1- Normal ,2-Osteopenic and 3-Osteoporotic group according to T-score value based on WHO criteria. . We took the mean of serum parameters among these groups and compared their value in these elderly patients with fractures and tried to find out any correlation with T-score and Z-score. We also studied the cases according to the fracture pattern and age group with 10 year intervals. For correlation we used Pearson's correlation coefficient. Each participant was given both written and oral information about the study. The study is conducted in accordance with the revised Helisnki Declaration, the International Conference on Harmonisation's (ICH's) guidelines for good clinical practice, and local regulations. For serum parameters we used automatic blood cell counter for Hb, total leukocyte count (TLC) and differential leukocyte count (DLC) and ESR. We used randox auto analyzer for blood

sugar, blood urea, serum protein, serum creatinine, serum protein, serum calcium, serum alkaline phosphatase, serum phosphorus, serum acid phosphatase and lipid profile including cholesterol, LDL, HDL and triglycerides.

Observations

This study was done on 36 patients who presented with fractures between 50-90 years. There were 18 male patients and 18 female patients.
Maximum male patients had fractures between 50-59 years.
Maximum female patients had a fracture between 60-69 years.

Mean age distribution for fracture was 63.36 years. The most common type of fracture was fracture neck of femur - 16 cases (more in male). Colle's fracture was more in females i.e. 7 out of 9 cases. Other fractures found were Intertrochanteric fractures, fracture of shaft of femur and vertebral fractures. The Correlation between serum parameters and T score, Z score in elderly normal, osteopenic and osteoporotic patients above 50 years and there mean is described in the following 3 tables.

Table-1

Correlation between serum parameters and T score in elderly normal, osteopenic and osteoporotic patients above 50 years

Cases / Serum Parameter		Normal	*Osteopenic*	Osteoporotic	Total
Hb	r	-0.12704	0.351736	0.052652	-0.01705
	p	>0.05	>0.05	>0.05	>0.05
Sugar	r	0.108085	-0.3224	0.268714	0.189286
	p	>0.05	>0.05	>0.05	>0.05
Blood urea	r	0.420091	0.146758	-0.06232	-0.26395
	p	>0.05	>0.05	>0.05	>0.05
Protein	r	0.21914	-0.12103	0.34787	-0.12876
	p	>0.05	>0.05	>0.05	>0.05
Ca	r	-0.19247	-0.16114	0.333041	-0.19329
	p	>0.05	>0.05	>0.05	>0.05
Alk PO_4	r	-0.15614	0.510812	0.162933	-0.12649
	p	>0.05	>0.05	>0.05	>0.05
Phosphorus	r	-0.85265	0.340606	-0.16244	0.14743
	p	>0.05	>0.05	>0.05	>0.05
Acid PO_4	r	0.961447	0.299183	0.446874	0.030136
	p	>0.05	>0.05	>0.05	>0.05
HDL	r	-0.84661	-0.0451	0.064164	-0.2207
	p	>0.05	>0.05	>0.05	>0.05

Table-2

Correlation between serum parameters and Z score in elderly normal, osteopenic and osteoporotic patients above 50 years with fracture

Cases / Serum Parameter		Normal	Osteopenic	Osteoporotic	Total
Hb	r	-0.04737	0.720846	-0.17126	-0.05595
	p	>0.05	<0.05*	>0.05	>0.05
Sugar	r	0.067179	0.44353	0.159615	-0.01431
	p	>0.05	>0.05	>0.05	>0.05
Blood urea	r	0.181791	-0.29733	-0.05767	0.141673
	p	>0.05	>0.05	>0.05	>0.05
Protein	r	-0.43029	-0.2747	-0.29696	-0.24294
	p	>0.05	>0.05	>0.05	>0.05
Ca	r	-0.24895	-0.70391	-0.27911	-0.24386
	p	>0.05	<0.05*	>0.05	>0.05
Alk PO_4	r	0.036152	0.017645	-0.175	0.088
	p	>0.05	>0.05	>0.05	>0.05
Phosphorus	r	-0.38396	-0.12309	-0.09494	0.075262
	p	>0.05	>0.05	>0.05	>0.05
Acid PO_4	r	0.94877	0.210053	-0.02502	-0.14998
	p	>0.05	>0.05	>0.05	>0.05
HDL	r	-0.90555	-0.64751	-0.417	-0.36612
	p	>0.05	>0.05	>0.05	>0.05

Table-3

Mean (±SD) of serum parameters studied in elderly normal, osteopenic and osteoporotic patients above 50 years with fracture

Cases / Serum Parameters (Normal Range)	Normal	Osteopenic	Osteoporotic	Total
Hb (12-16 gm %)	10.39±1.57	9.41±1.52	10.4±1.38	10.11±1.5
Sugar (80-120 mg%)	123±85.51	105.26±50.14	95.54±32.25	105.18±53.66
Blood urea (20-40 mg%)	22.13±10.59	24.03±13.07	30.7±12.53	26.58±12.35
Serum Protein (5.5 – 8 mg%)	5.8±2.12	5.6±1.8	6.5±1.2	6.1±1.6
Calcium (8.5-10.5 mg%)	9.2±1.4	9±1.6	9.4±0.99	9.2±1.3
Alk PO_4 (30-150 IU/L)	79.6±37.3	131.4±105.07	138.1±85.8	120.0±83.7
Phosphorus (2.5 – 4.3)	3.8±1.2	4.0±1.1	3.3±.96	3.6±1.0
Acid PO_4 (0 – 5.5 mg%)	3.3±1.0	2.5±0.5	3.3±1.1	3.14±1.0
HDL (> 60 mg%)	34.3±5.8	36.6±7.18	57.5±65.03	45.3±43.44

DISCUSSION

Post menopausal osteoporosis characteristically affects women, between 10 and 20 years following menopause. Because women have a lower peak bone density than men and also suffer the increased bone loss at the time of the menopause. Men may rarely be affected. The senile osteoporosis is more common in women than men. However this preponderance is not as great as for post menopausal osteoporosis. [1]

In our study osteopenia was found in 50% of elderly female patients with fractures and in 38.9% of elderly male patients with fracture and Osteoporosis was found in 33.3% of elderly female patients with fractures and in 22.2% of elderly male patients with fracture.

Our study showed that normal male patients lied in 50 59 year age group, osteopenic male patients lied in 60-69 years age group and osteoporotic patients lied in 70-79 years age group maximally and normal female patients lied in 50-59 years age group maximally and osteopenic and osteoporotic patients lied in 60 69 years age group as a majority.

It was found that 90% of fractures were the result of a fall, in elderly women whose proximal femoral bone density is well below the fracture threshold. In our study all the patient have got fracture due to fall while slipping in floor of toilet or road. Gristo et al recommended aggressive diagnosis and treatment of visual disorders, physical therapy for impaired mobility and improving the home circumstances. [2] Contrary to the common belief that females get osteoporotic fast after menopause and are at a risk of getting fractures more frequently. Our study clearly shows that there is no difference between both sexes as far as the mean age of fracture is considered in the subjects studied.It has been found that life time risk of any fracture in white woman aged more than 50 years is 75%, 16% sustain a vertebral fractures, 17% a hip fracture, 42% a fracture of humerus, wrist and knee.[3] In our study in women over 50 years with fracture, fracture Neck femur occurs in 27.8%, fracture colle's in 38.19% and vertebral fracture in 22.2% cases . In men over 50 years with fracture, fracture neck femur occurs in majority of cases (61.1%). In old age Hb is reported to fall progressively in men. In one study this was found to be to a mean level of 13.4g% at 65, 12.9g % at 75 and 12.2g% at over the age of 85. By contrast in older women the level tends to rise, so that a difference of 2g% in young age groups is reduced to 1g% or less in old age. In our study mean level of Hb is 10.11 ± 1.5 g%. which is low from normal range in both male and female groups. The normal serum value of calcium is 8.5-10.5 mg%. In our study 31% patients had serum calcium less than 8.5mg%. In our study TLC, DLC, ESR, blood sugar, blood urea, serum creatinine, serum protein, phosphorus and serum acid phosphatase, cholesterol, triglyceride and LDL level are within normal range in more than 90% of cases while serum HDL is less than normal in more than 90% of cases. In elderly, patient with fracture, T score and Z score have positive or negative correlation with Hb, sugar, protein, calcium, phosphorus and acid phosphatase ,Blood urea, Alk PO_4 and HDL but all these correlations are very weak and did not showed any significant finding ($P>0.05$). There is observed significant negative correlation between serum calcium and Z-score in osteopenic group of elderly patients with fracture. There is significant negative correlation between Z-score and Hb in non osteoporotic group of elderly patients with fracture. Rest of the serum parameters do not significantly vary with change of Z and T score.

The predominant feature of osteoporosis is the lack of abnormal haematological and biochemical findings.

Classically, the serum calcium, phosphate and alkaline phosphatase and urinary hydroxyproline values are normal. Elevation of serum alkaline phosphatase value only occur following fracture or when there is associated osteomalacia in some patients.[4,5] But in our study among elderly patients with fracture, alkaline phosphatase is elevated only in 19% of cases.

The prospective study at J.A. group of Hospitals, GR Medical College, Gwalior between 1993-1997 by Varma HS in polytrauma patients following admission in the orthopaedic ward showed that there is a general trend of rise in serum calcium which peaked at the end of the 1st week and then gradually came down to normal. The serum calcium then went to a higher peak at the end of sixth week. The value of serum alkaline phosphatase showed a gradual rise with peaking at the end of the sixth week. The changes in the plasma activity continued during healing phase and seems to reflect accurately the osteoblastic activity. In the trauma patients the serum phosphorus values, though raised, failed to show any definite pattern change.[6] But in our study serum calcium level is below normal range in 31% of cases and alkaline phosphatase above normal range in 19% of cases. In rest of the patients serum calcium and alkaline phosphatase remain normal at the time of admission.

Results of our study is consistent with the findings of Hosking et al (1978) who in their studies about change in serum alkaline phoshatase after femoral fracture found that in majority of their patients the levels were normal on admission and started rising after 7-9 days reaching maximum within a month after fracture. In our study in 83% of cases serum alkaline phosphatase remains normal on the day of fracture. [6]

Darty et al showed that the immediate post traumatic period is eturn to normal associated with a decrease in serum phosphorus values along with massive urinary phosphorus excretion. Finsterer O. (1983) also found hypophosphatemia during 1st 4-5 days after trauma. However T Aisdall et al (1921) found increased serum phosphorus values till 7 weeks after injury which return to normal between 8-9 weeks after injury. S.K. Lal (1976) also found increases in serum phosphate value from 10th day onwards but in our study, in 72% of cases, phosphorus remains normal in elderly patients with fracture on the day of fracture. S.K. Lal (1976) reported that there was an initial increased in the ESR values immediately after trauma.[6] In our study ESR is elevated in 65% of elderly patients with fracture.

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ARTICLE

Ligamentous Injuries of the Digits

Dr. Shailesh Gupta

ABSTRACT (Summary)

The ligamentous injuries of digits with or without dislocation of the digits are common injuries seen in day to day practice .Most of the time all grades of ligamentous injuries are treated as sprained finger .Awareness got tremendous boost in the mind of doctors as well as in public when one of the star player got the treatment for the same. Often the ligamentous avulsion with a small bony fragments are looked as small fracture with no or symptomatic treatment.

Any joint to work normally needs stability .The digits of the hand require painless & stable movements to perform day to day task as well as special task & the stability is provided by ligamentous complex.

EKLAVYA in MAHABHARAT has already proved the importance of thumb as an important organ of hand. any instability of thumb joint results in weakness of radial support to perform specific & routine task.

Negligence in the part of diagnosis & treatment may cost heavily to the patient as well as to the doctor. Proper treatment at the acute stage gives very satisfactory results. The accurate diagnosis of which injury will require conservative/operative treatment is essential & most of them can be treated nonoperatively.

To diagnose accurately & treat properly one has to understand the basic anatomy of the finger joints which is provided by primary stabilizers (radial , ulnar collateral ligaments & volar plate) & secondary stabilizers (joint capsule , accessory collateral ligaments & extrinsic /intrinsic tendons) with there functional significance.

The history is important part which gives clue to the direction of force exerted on the digits at the time of injury. Some times the position of digits point towards the diagnosis .so one should never forget the classic pattern of evaluation learned in undergraduate time (history, inspection ,palpation). Similarly ecchymosis, swelling gives the similar clue . Once the history & inspection is completed gently palpate the finger & finger joint for the site of maximum tenderness.

As a routine practice it is better to order an x ray before doing stress test & look for some fracture or bony avulsion fracture because doing the stress test may cause displacement of undisplaced fracture & you must see whether the joint is reduced in a congruent way or not ? After x ray look for joint stability by giving gentle radioulnar stress in full extension & 30 flexion & feel for any firm or soft end point latter signifies the complete rupture. Some times you may need to give local anesthesia to do this.

With the help of clinical & radiological evaluation one can classify the injury in to 3 grades-

Grade I

only microscopic rupture of ligaments with good stability with pain & tenderness .

Grade II

partial rupture with good stability.

Grade III

complete rupture with opening of joint more than 30 degree on stress test.

Management

The natural history of ligamentous injury of digits is towards stability & fibrosis & patient from the outset should be explained that they will have persistant pain upto a year time.

Grade I & II :

Buddy taping & early mobility

Acute Grade III :

Splint immobilisation for 2-3 week followed by ROM exercises. When there is displaced avulsion fracture it need to be fixed by one of the variety of technique available (pull out suture over the button, mitek etc)

Subacute Grade III :

Ligamentous repair by lateral approach with the retraction of lateral band dorsally and end to end repair of ligament by figure of 8 suture technique with PDS II suture is treatment of choice for mid substance tear & for tear at proximal or distal attachment, pullout suture of prolene over the button is the treatment of choice. Post operatively finger is immobalised in splint for 3 weeks followed by range of motion exercises.

For chronic grade III :

Ligamentous reconstruction by tendon graft is usually required. Any of the tendon material (palmeris longus, planteris etc) available can be used with ½ of its thickness sufficient for the making the new ligament.

Thumb ulnar collateral ligamentous injury(UCL) : Acute stable with less than 30 degree laxity - conservative treatment by 4 weeks of thumb spika cast application followed by intermittent splint for 2 weeks & ROM exercises.

Acute unstable with more than 30 degree laxity- Because of possibility of development of stener's lesion (interposition of adductor aponeurosis between the two ends of the ligaments) which blocks the healing between the two ends, hence surgery is treatment of choice.

The surgery is performed by lazy S shaped incision over the ulnar side of MP joint. Adductor apponeurosis with stener lesion (if present) identified. Aponeurosis is cut parallel to EPL tendon then ligament & joint capsule exposed & repaired by 4-0 ethibond in mid substance tear & pullout suture by 3-0 prolene or my mini mitek in cases of proximal & distal attachment tear. It is advisable to stabilize the MP joint by k wire, after closure thumb spika cast is given for 4 weeks followed by gradual ROM exercise programme

In chronic cases - ligamentous reconstruction by tendon graft using palmaris longus or plantaris is the treatment of choice.

Thumb radial collateral ligamentous injury(RCL) This is much less common as compared to Ulnar collateral

ligamnentous injury of thumb.

Treatment

Acute stable with less than 30 degree laxity - conservative by 4 weeks plaster cast followed by rehabilitation.

Acute unstable with more than 30 degree laxity - surgical repair by same technique as described for ulnar collateral ligament repair by mirror image incision on radial side with same type of rehabilitation programme as UCL. .

Chronic unstable- ligamentous reconstruction by tendon graft technique .

In all these injuries if they are associated with compounding , they should all be taken to the operating room for debridement, I/V antibiotics & managed accordingly.

The importance of adequate & proper rehabilitation cannot be under estimated.

A proper physiotherapy is also one of the key to success in all these cases.

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CASE REPORT

Uncommon complication of Kuntcher's nailing

Dr. S.K. Lunawat

Abstract

Kuntcher's nailing is a time tested surgery for fracture shaft femur.

Proximal migration of nail in is well known after fracture unites and patient starts weight bearing.Here a complication is reported where distal migration of K-nail into knee joint occured.

Key words:-Fracture shaft femur,K-nailing,Migration into knee joint

Introduction:

Fractures of the shaft of femur are among the most common fractures encountered in orthopaedic practice. Fractures of femoral shaft often are the result of high-energy trauma.Several techniques are available for treatment and orthopaedic surgeon should be aware of advantages, disadvantages, and limitations of each to select the proper treatment for each patient. The type and location of fracture, the degree of comminution, age of patient,patient's social and economic demands etc. influence the method of treatment.

Intramedullary fixation are either open or closed nailing.Kuntcher nailing is gold standard and popular treatment option since 1970,before interlocking nail came into vogue.Proximal nail migration,bending of nail,breaking of nail are known complications of this procedure.In this case report we present a complication of distal migration of nail in knee joint,after K-nailing in comminuted lower third fracture shaft femur.

Case report:

A 62 years old male has fracture shaft femur middle and lower third junction with comminution(Fig.1) following road traffic accident(Pedestrian hit by two wheeler) in April 2009. He was treated with open Kuntcher's nailing and circlage s-s wiring(Fig.2).Four months post-op he presented with pain and restricted movements in ipsilateral knee.On examination the knee movements were painful with crepitus present and limitation of movements.X-ray examination showed migrated nail in knee joint distally(Fig.3).

Corresponding Author

Dr. S.K. Lunawat - Professor,Orthopaedics, M.G.M.Medical college Indore.
46,Bhagwandin Nagar,
Indore-452001(M.P.),India.

Pre operative X-ray

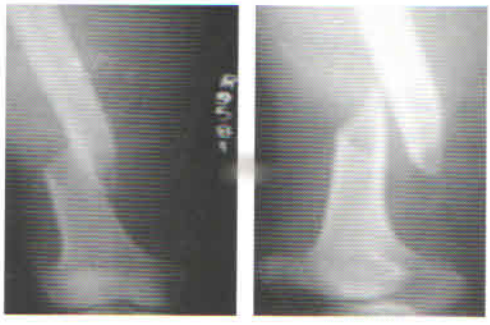

Figure 1

Immediate post operative X-ray

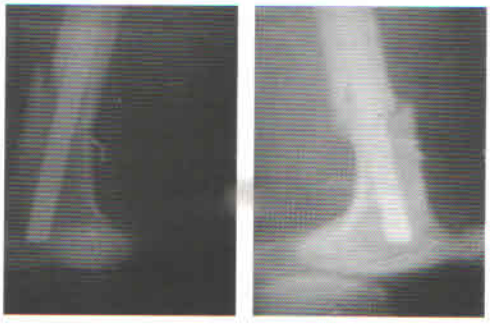

Figure 2

4 months follow up

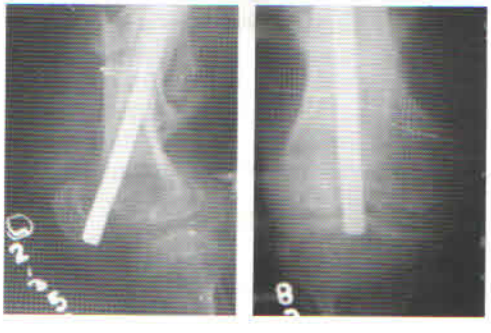

Figure 3

Post operative X-ray after removal of K-nail and s-s wire

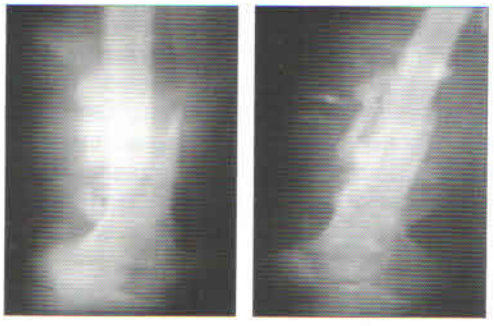

Figure 4

Discussion

This patient's fracture pattern was long spiral fracture at junction of middle and lower third with comminution.This site is not an ideal indication for K-nailing but due to economic and infrastructural short comings such fractures are treated by intramedullery nailing in our setup.Moreover patient had comminution detected during surgery,so intramedullary nailing and s-s wiring was done.In spite of instructions the patient started weight bearing in 2-3 weeks time post operatively.When he presented with knee pain 4 months later,X-ray revealed breakage of s-s wire and distal migration of K-nail in knee joint.Proximal migration is known due to weight bearing but why distal migration should have occurred is the question?.Retrospectively when the X-rays were reviewed,there seems to be an intercondylar fracture line visible i.e. fracture extending into the joint in lower third femur and that explains why K-nail migrated into knee joint.We removed the s-s wire and K-nail and kept the limb on Bohler Brown splint with upper tibial skeletal traction for three weeks.Position of fracture was alright and fracture united uneventfully.

Summary

Although proper implant selection and thorough preoperative screening of X-ray for nature and extent of fracture line is important in addition good patient counseling regarding weight bearing is equally necessary otherwise we can come across such uncommon implant related complications.

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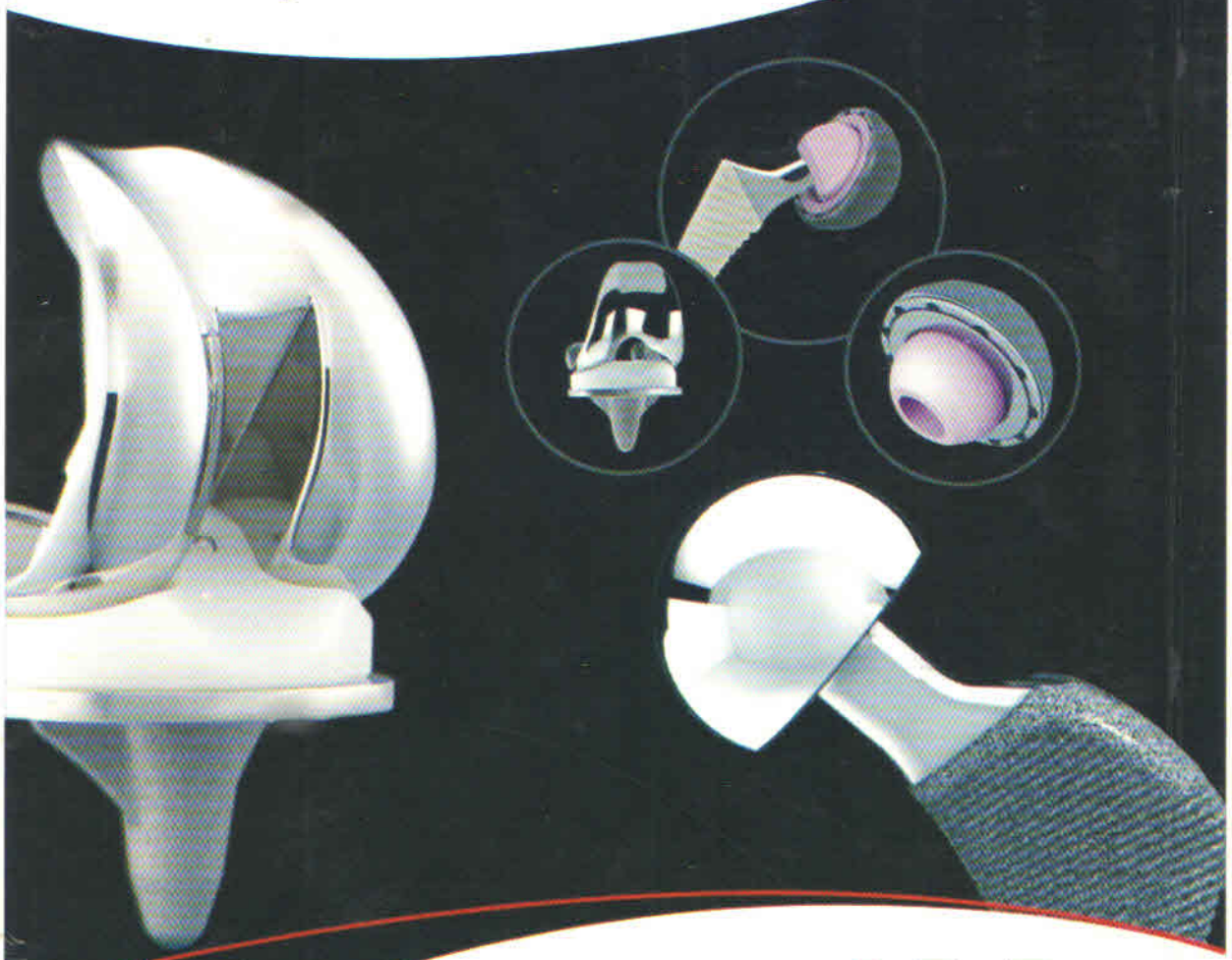

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Digant Sharma
Mob. 9755487377
E-mail : sharmadig@yahoo.co.in

Vyanktesh Kokate
Mob. 09322825916
E-mail : vkokate@jnjin.jnj.com

Authorised Distributors, Rajat Sales, 5, Khatipura, Indore (M.P.)
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