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LUPIN PHARMA

LUPIN

For The Management of Osteoporosis

For The Management of Osteoporosis

℞ CORCIUM Fit

Coral calcium, Vitamin D3, Zinc gluconate, Pine bark extract

℞ CORCIUM PLUS

Coral calcium, Folic Acid, Vitamin B6, Vitamin B12 (as Cyanocobalamin) (Cap)

℞ CORCIUM K2

Coral calcium, Calcitriol, Vitamin K2 (Tab)

For the maintenance of joint health

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℞ MOVNWALK

℞ Lupoxa

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Why to publish?

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For most of us, publication is important for appointment, promotion and career advancement. For the faculties in the medical college, publications are made mandatory for the promotional graduation from Assistant Professor to Associate Professor and Associate Professor to Professor. But emphasizing only on this superficial individual gain, we tend to neglect the most crucial role and importance of need for research, scientific writing and publication in medical field. Let us analyse the importance of publication in a wider sense, rather than just individual personal importance, which seems to be less important for most of us.

What is difference between the modern day medicine and old school of medicine? The old school of medicine is based on speculation and observation, whereas the modern medicine is based on the evidence and results. The modern medicine has grown to it today's position because of research, which remains the basic difference between the two schools.

So, how this research is done and how it has affected the modern day medicine? To do a research, we take a problem prevalent in the society, identify its cause, plan the strategies to solve it, do scientific evaluation of outcomes and finally collect the evidences of outcome. Then we use this evidence to solve similar problems. This is what we call as 'Evidence Based Medicine'. Thus with proper research we get evidence to treat similar problems, which is the basis of Evidence Based Medicine and with use of this Evidence Based Medicine we solve similar newer problems. Thus we can create further evidence for newer problems.

Developed countries, with proper research, have formed and created their own database and evidence based medicine for their own problems. Medical treatment in these developed countries is thus based on this data base and their evidence. But in developing countries like ours, we lack in proper research, scientific writing and publishing, hence do not have our own evidence based medicine. Hence we rely or look for the data, literature and evidence from the west for our own problems, which are different from the developed countries.

Does this evidence of the developed countries, really hold true or correct for our problems of developing countries? The answer is obviously a big NO. Reasons are many. We tend to forget that the two systems in developed and developing countries are totally different. Firstly, due to different demographic and climate patterns, our set of problems are different than those of west like nutritional deficiency and infections are more prevalent in ours whereas in developed world they have obesity or other issues. Secondly, in developed countries the diagnosis and treatment is early and prompt, whereas in developing countries like ours, the presentation is delayed and neglected. Patients are aware and educated in west, whereas our patients are illiterate and less demanding. The infrastructure and health system in developed countries is organized with state of art facilities and no financial issues. Whereas our health system is disorganized and there is gross imbalance which is divided into rural/urban, public/private along with other pathies of treatment, which is further complicated by lack of basic amenities and overburdened infrastructure. Further, the needs of our patients are also different, our patients wants to sit cross leg, kneel or squat, which is hardly done in west. Safety norms, insurance and proper documentation grossly lack and are neglected in developing countries. Research, which is given high priority and importance in west, is hardly done in developing countries like ours.

Thus in nutshell, the developed countries, which have difference in problems, infrastructure, health sector and needs of society from developing countries, with proper oriented research have formed the database

and evidence for themselves. Hence evidence based medicine of the developed countries cannot be fully and correctly applied to developing countries like ours.

So the question arises what needs to be done. The answer is simple, conduct proper research on our problems & form our own data base. This further give rise to a new question, that who will do this research for our problems? Obviously, we need to do it. We have clinical problem at hand, have the intellectual capacity, have huge number of patients, we know the technical know-how, have infrastructure to do but what needs to be added is only the will to do. We need to overcome our inhibitions. Start from identifying and picking simple, commonest, day to day problems like result of alternate vs daily dressing, early and late removal of wires in supracondylar humerus fractures or above elbow slab vs below elbow slab for distal radius fracture rather than taking special topics to study, like metal ion in serum after replacement, which may not be feasible at our centres. To overcome the problems of restricted resources and infrastructure, we can judiciously use our resources and clinical material and can share along ourselves, knowledge, data and infrastructure. We also need to be organized with proper record keeping and documentation.

Once we complete our research, the next important part is to communicate and share it with others, which is equally important as doing the research. This can be done by publications or presentations. This communication of the research provides satisfaction, is a good clinical practice, improves quality of clinical work and skills, increases knowledge, teaches about literature survey, gives appreciation & publicity, keeps alive as a researcher, motivate others to do research and finally helps in career advancement also.

Publication as a means to communicate your research has certain advantages over presentation in conferences. It has larger coverage, available to all at any time / anywhere, it is documented evidence, is available both in print and electronic form and can be retrievable beyond your life. Further the publication forms the evidence based medicine, which is necessary for growth of science. Whereas the presentation in conference, as a means to communicate your research, has lesser coverage i.e. only audience of hall and that too during the event which present only in electronic form, which is difficult to retrieve after the event.

To conclude, the scientific publication is an art which comes by practice, which is like having a baby, the gestation period is long and difficult, but at the end you have something to show.

Dr. Saurabh Jain
Editor, OJMPC

Systematic review of nerve injury following total hip replacement with posterior or lateral approach

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Abstract

Background: Total hip replacement, is common surgical procedure, performed through posterior or lateral approach but it is yet not clear which method is safe and provides reduced risk of nerve injury. Nerve injury after total hip replacement can be severely debilitating leading to poor outcomes. Thus we performed this systematic review with the aim to assess the risk of nerve injury after THR by different surgical approaches and to evaluate the adverse effects and the functional outcomes of nerve injury after THR

Material & Methods: A thorough literature search was conducted of Cochrane Bone Joint and Muscle Trauma Group, Cochrane Database of the Systematic Reviews, Cochrane Central Register of Control Trials, MEDILINE, EMBASE and CINAHL from their inception to 29 May 2014. Grey literature was located via the website www.opengrey.eu, conference proceedings and trial registries. Prospective and retrospective case series and case control studies were included in the systematic review. The inclusion criteria were adult population of 18 years and above with total hip replacement for osteoarthritis, dysplastic hip, acetabular fracture or revision total hip replacement. The exclusion criteria were patients below 18 years of age, with pre-operative nerve palsy or with previous medical conditions like stroke and low back pain. Cadaveric and biomechanical studies and studies conducted in non-English languages were excluded. Authors independently selected the studies using inclusion and exclusion criteria, assessed risk of bias and extracted the data.

Results: A case control study, two prospective case series and two retrospective case series were included in this systematic review. The studies selected overall reported 97 patients with nerve injury following 36735 total hip replacements (prevalence 0.2%). Only one out of the five selected studies reported, stated statistically significant effect of outcome of nerve injury after THR, following posterior approach compared to lateral approach.

Conclusion: The systematic review results revealed an overall very low quality of evidence and could not offer support for any particular surgical approach to reduce nerve injury during total hip replacement. The systematic review underlined the need for further studies to properly establish the risk factors associated with different surgical approaches to improve evidence based knowledge and reduce patient disability.

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Introduction

Total Hip Replacement (THR) is considered as a gold standard of treatment for hip arthritis, eliminating severe pain and maintaining mobility [1]. Nerve injury is a significant and debilitating complication after total hip replacement. In early studies the clinical incidence of nerve injury varied from 0.3% to 4% in primary THR [2,3]. However,

electromyographic (EMG) studies indicated the incidence of nerve injury in up to 70% of cases [4]. Thus prevalence of nerve injury reported by different studies previously are variable as the subclinical nerve damage occurs more often and only the severe form of nerve injury after THR presents clinically. The range of nerve injury varies from transient blocks in conduction to irreversible damage secondary to the mechanical disruption of axons and endoneural sheath [5].

Traditionally sciatic nerve injury is commonly associated with posterior approach for THR and the exact cause is unknown and many mechanisms have been described [6,7]. But other nerves can also be injured like femoral nerve, peroneal nerve, obturator nerve or superior gluteal nerve. Superior gluteal nerve injury after THR is associated with weakness of hip abductor mechanism but electromyographic (EMG) studies show that most of these injuries are subclinical [8]. The most common risk factor for injuring femoral nerve during THR is during placement of anterior acetabular retractor, whereas risk of obturator injury is when cement, screws or reamer penetrate the anterior quadrant of the acetabulum which is perceived as persistent pain in groin or thigh, hip adductor weakness, referred knee pain, visible cement or intra-pelvic screw [4,9-10].

Thus these variations in nerve injury following THR stimulated us to undertake this systematic review to assess nerve injury following THR in patients suffering from osteoarthritis, dysplastic hip, fracture of hip, osteonecrosis and in also revision THR and to determine the risk of nerve injury with different surgical approaches and to evaluate the adverse effects and functional outcomes after the nerve injury.

Material and Methods

Systematic review was done to assess the incidence of nerve injury after THR, its relation with surgical approach and functional outcome.

Human studies with THR done on patient with age more than 18 year for osteoarthritis, dysplastic hip, acetabular fracture or revision THR were included. Studies with THR on patients with preoperative nerve palsy and previous medical conditions like stroke and low back pain influencing the diagnosis of nerve injury after THR were excluded from the study. Cadaveric, biomechanical and studies in non-English language were also excluded.

A comprehensive electronic database literature search was conducted of Cochrane Bone Joint and Muscle Trauma Group, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), The Campbell Collaboration Library of Systematic Reviews, National Institute of Clinical Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN), healthcare databases, trials, MEDLINE, EMBASE and CINAHL, for studies to be included. Current Controlled Trials (www.controlled-trails.com) and WHO International Clinical Trials Registry Platform (www.who.int/ictrp/en) were also searched to identify completed and ongoing clinical trials. All Empirical research studies were searched for existing literature about nerve injury following total hip replacement with posterior and lateral approach without any date limit. Specific empirical study designs were not searched.

Grey literature search was conducted on www.opengrey.eu (searched 25 May 2014). In addition, Google Scholar (www.scholar.google.com), websites for orthopaedics and professional societies, e.g British Hip Society, British Orthopaedics Association and American Academy of Orthopaedics Surgeons were also searched. Hand searching of key orthopaedic journals was conducted for 3 months (March 2014 to May 2014) to pick up studies which had not yet appeared in indexed databases. These journals are Journal of Bone and Joint Surgery (British and American), Journal of Arthroplasty, Hip International, Clinical Orthopaedics and British Medical Journal.

The advance literature searches was done for truncated key words with asterisk (*) to include all variant endings. The MeSH terms were combined with Boolean logic using the operators AND, OR. Where OR was used to combine related terms, AND was used to combine all the components of PICOS (Higgins & Green, 2011). Keywords searched words or

search were Total Hip Replacement*, Posterior*, Lateral*, Hardinge*, Nerve Injury* and Peripheral Nerve Injury*.

After the comprehensive literature search all the long-listed articles were catalogued and relevant search results were screened and were grouped into the following categories, namely 'accept', 'reject' or 'not sure', by consensus of two reviewers, depending on the inclusion and exclusion criteria. Accepted article were included whereas rejected articles were excluded and the articles in the 'not sure' group were sent to a third independent reviewer, specialized in hip surgery for comment, further planning and for acceptance or rejection.

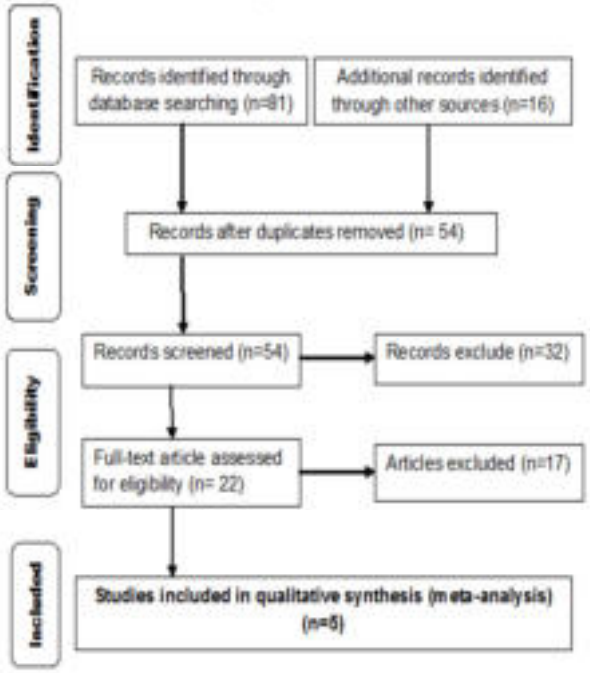
The data from the accepted study was extracted by two independent reviewers using a pre-developed and tested data extraction form describing the study design following 'PICOS' – population characteristics, intervention data, comparison, outcome and study design characteristics. The third independent reviewer was consulted for any disagreement for the final decision. Data extracted from these studies were collected considering ethical approach.

Results

The search resulted in identification of 81 potentially eligible studies from the electronic databases. An additional 16 articles were identified through citation tracking. Searches of clinical trial databases did not identify any on-going trials. A total of 54 titles and abstracts were reviewed and 22 articles were selected for full text assessment after excluding the remaining 32 articles on reading the abstract (fig 1). After applying the inclusion and exclusion criteria only 5 studies with sample size of 36735 total hip replacements (THR) were included in this systematic review (table 1) [11-15].

We were unable to interpret average and range of patient age as not all the included studies in the systematic review described the patient characteristics in detail. Osteoarthritis (46%) was the single most common underlying indication for THR in patients who were subsequently diagnosed with nerve injury post-operatively. Other indications were developmental hip dysplasia (19%), post-traumatic arthritis (10%), rheumatoid arthritis (10.6%), osteonecrosis (6%) and post infection arthritis (2%).

Fig 1. Flowchart showing how the studies were included



All the studies assessed risk factors of nerve injury following THR. Hurd et al had compared the post-operative sciatic nerve injury after THR with standard posterior approach to posterior approach with routine gluteal maximus release assessing nerve injury clinically as well as by electromyogram (EMG) and Magnetic Resonance Imaging (MRI) of hip to record the compressions of nerve [12]. Farrell et al and Weale et al had studied the risk factors and prognosis of motor nerve injury after primary total hip replacement by clinical examination and electrophysiological study [11,14]. Farrell also recorded the time of recognition of nerve injury, severity of the nerve injury (complete or incomplete), clinical presentation of the injury and the anatomical distribution such as sciatic or peroneal component of the nerve involved and possible etiology of nerve injury and also assessed functional status, anatomical distribution and possible etiology of nerve injury after THR [14]. Navarro et al and Nercessian et al had compared the incidence of nerve injury in posterior and lateral approach for primary as well as revision THR with nerve assessment clinically and EMG [13,15]. Navarro et al also assessed the sciatic nerve tension by palpation

of nerve intra-operatively, whereas Nercessian et al also reported nerve injuries in upper limb caused due to traction or compression during positioning of patients although we excluded these injuries as they did not contribute to our review [13,15].

Inconsistencies were observed in reporting nerve injuries among the different approaches. In total of 36735 THR, 97 patients sustained nerve injury (prevalence 0.2%). Incidence of nerve injury in lateral approach including transtrochanteric approach was 0.16% (62 patients), where in rest 35 out of 36735 THR (prevalence 0.09%) is via posterior approach. As per Hurd et al 3 out of 804 patients (0.3 %) had sciatic nerve injury in control group i.e. with routine posterior approach whereas no patient had nerve injury in gluteal maximus tendon release group [12]. Study by Farrell et al reported posterior approach had higher risk of nerve injury compared to anteriolateral approach (p value=0.032), while other studies were unable to report any significant difference in incidence of nerve injury between the two approaches [11-15].

Only two studies Hurd et al and Farrell et al reported recovery in post-operative period which was 33 to 36%, with Farrell et al mentioned 14 patients (36%) recovered completely to preoperative level, 10 patients (24%) had partial recovery and 17 patients (41%) had no recovery in average time of 21 months, whereas Hurd et al described that only 1 patient (33%) regained full strength in affected muscles [11,14].

Discussion

Nerve injury is a significant and debilitating complication after THR. The nerve injury varies from just neuropraxia with transient conduction block to severe irreversible damage due to the mechanical disruption [5]. The incidence of nerve injury after THR ranges from 0.3 % to even 70%, when subclinical cases are also included [1-3]. Traditionally sciatic nerve injury is commonly associated with posterior approach is the mostly injured nerve [4,5].

Due to variations in nerve injury following THR, we performed this systematic review to assess nerve injury following THR and its relation to the approach. To make the results critical and reproducible, careful selection of articles was done. Cadaveric, biomechanical and non-english studies were excluded as they do not simulate the operating conditions and other languages are beyond the scope of this systematic review. Randomised control trials were not present as evident by the literature searches as it is difficult to conduct due to ethical reasons, analysing the adverse effects of two surgical approaches of total hip replacement.

After literature search five studies were selected, one was case control study (Hurd et al 2006), two prospective case series (Weale et al 1996, Navarro et al 1995) and two retrospective case series (Farrell et al 2005, Nercessian et al 1994) which analysed 36735 THR in 36593 patients [11-15]. 97 (0.2%) patients had nerve injury after THR and incidence of nerve injury in lateral approach including transtrochanteric approach was 0.16% (62 patients), and in posterior approach was 0.09% (35 patients).

All were single centre studies, with one conducted in the UK (Weale et al 1996) and other four conducted in USA (Hurd et al 2006, Farrell et al 2005, 1996, Navarro et al 1995 and Nercessian et al 1994). All the studies were conducted in teaching hospitals conducted between 1994 and 2005, but as the studies included retrospective as well as prospective data the period THR ranged from 1970 to 2004 [11-15].

Weale et al (1995) concluded that nerve injury after THR is underestimated, as only clinical diagnosis is made instead of clinical as well as electrophysiologically by electromyography (EMG) examination. Hence the incidence of nerve injury reported by Weale was high to be 20% after THR in direct lateral approach, but none with posterior approach when they used both clinical and electrophysiological evidence for diagnosis [11]. According to them the increased nerve injury in lateral approach is because posterior approach is more anatomical than direct lateral approach which requires less traction during operation hence reducing the chance of nerve injury.

Table 1: Study characteristics **[11-15]**

Author year Country	Method	Inclusion Criteria	Exclusion Criteria	Patient Characteristics	Surgical Intervention	Assessment of Nerve Injury	Outcomes
Hurd et al (2006) USA	Case control study	Primary total hip arthroplasty (THR)	None mentioned	308 male patients and 383 female patients.752 Total hip arthroplasty in 691 patients (bilateral hip replacements in some patients) with gluteal maximus tendon release with posterior lateral approach (Group A). Control group consisted of 804 hip replacements for 723 patients (Group B).	Group A: THR with Posteriolateral approach with gluteal maximus tendon release (N=752) Group B: THR with posteriolateral approach (N=804)	Clinical Examination, Magnetic resonance imaging (MRI) scan Electromyography (EMG)	Group A: No nerve injury Group B:3 patients sustained sciatic nerve injury
Farrell et al (2005) USA	Retrospective case series	Primary total hip arthroplasty (THR)	None mentioned	18 male patients and 29 female patients identified with nerve injury after primary total hip arthroplasty. 1 patient lost in follow up. Mean age=57 (Range 20 yrs-89 yrs) 27,004 Primary THR performed between 1970 and 2000 Patient distributions in each group were not defined.	Group A: Anteriolateral approach (N=not mentioned) Group B: Transtrochenteric approach* (N= not mentioned) Group C: Posterior approach (N= not mentioned) *Transtrochanteric approach is a variant of lateral approach.	Clinical Examination and Electromyography (EMG)	Group A: 22 patients sustained nerve injuries Group B: 9 patients sustained nerve injuries Group C:16 patients sustained nerve injuries
Weale et al (1996) UK	Prospective case series	Primary total hip arthroplasty	Neurological disease, sciatica	Group A: Posterior approach group (n=22) Group B: Direct lateral approach group (n=20)	Group A: Primary THR with Posterior approach Group B: Primary THR with Lateral approach	Group A: Preoperative and Postoperative EMG Group B: Preoperative and Postoperative EMG	Group A: No nerve injury Group B: 4 patients sustained nerve injuries, 1 of them sustained two injuries

							2 obturator nerve injuries, 1 femoral, 1 posterior tibial and 1 common peroneal nerve injury
Navarro et al (1995) UK	Prospective Case Series	Primary Total Hip arthroplasty, Revision Total hip arthroplasty	None mentioned	1000 patients with 472 male and 528 female patients	Group A: Direct Lateral approach Primary=282/630 Revision=178/370 Group B: Posterior Approach Primary=348/630 Revision=192/370	Clinical examination	Group A: 5 sciatic nerve palsy Group B:1 femoral and 2 sciatic nerve palsy
Nercessian et al (1994) USA	Retrospective Case series	Total Hip arthroplasty	Neurological disorders, Stroke	42 patients with nerve injuries included 12 males and 30 females with average age of 58 yrs (range 27-81 years). Primary diagnosis were osteoarthritis in 20 patients, inflammatory arthritis in 15, congenital dislocation of hip in 5 and miscellaneous pathologies in 2. Out of 7133 consecutive patients who underwent THR, 42 subsequently sustained nerve injury and the study analysed the risk factors for the different surgical approaches.	Group A: Primary THR with transtrochanteric approach Group B: Primary THR with posteriolateral approach Group C: Revision THR with transtrochanteric approach	Clinical examination Nerve conduction test	Group A: 9 peroneal nerve palsy Group B: 13 nerve injuries (4 sciatic, 7 peroneal, 1 lateral femoral cutaneous and 1 femoral nerve injury) Group C*: 12 nerve injuries (8 peroneal nerve injury, 1 sciatic, 1 femoral and 1 obturator nerve injury) *some upper limb nerve injury were reported in post THR patients

Farrell et al (2005) reported that the risk of nerve injury is significantly higher in posterior approach compared to lateral approach (p=0.032) [14], whereas Nercessian et al (1994) reported more incidence of nerve injury in trans-trochanteric or lateral approach (21 patients out of 34) [14,15]. Navarro et al (1995) conceded that in both primary and revision total hip replacement there is no statistical difference between approaches for the risk of nerve injury, rather it is anatomical variation and complexity of the hip reconstruction that is associated with the risk of nerve injury [13]. Hurd et al 2006 and Farrell et at 2005 both the studies reported recovery after nerve injury in 33% to 36% cases to preoperative level muscle power which took an average of 21.1 months [12,14].

Despite the many potential causes of sciatic nerve palsy listed in literature, large reviews show that in about 50% of cases, the cause is unknown. Hurd et al (2006) proposed the unexplained sciatic nerve palsy after THR is due to transient compression between ischial tuberosity and femoral insertion of gluteal maximus or stretch during operation. Subclinical intraoperative sciatic nerve palsy is due to positioning of leg in relation to hip joint in flexion, adduction, internal or external rotations during femoral preparation. They further concluded that release of gluteus maximus tendon during posterior approach and correct positioning of the limb with hip in extension and abduction will reduce the chance of nerve injury. Similar findings are seen by Stone et al [16].

Jolles et al also performed similar systematic review evaluating the risk of complications after THR, but only on osteoarthritis patients. Since we include other patients also in our study, hence our study overcomes the limitations of the previous systematic review and improves the quality of evidence [17].

Our study is limited by not assessing medico-legal aspects and disability claims following nerve injuries. Further studies are required to assess the cost impact of disability following nerve injury, chances of recovery after nerve injury and disability prior to total hip replacement. The strength of this systematic review is a comprehensive database search along with additional grey literature search, identifying all the existing published studies applying advanced search techniques without date and design limitation. Our systematic review could be used as the basis of explaining the chance of nerve injury during THR while taking consent from patients and could be also used for further studies to find correlation between surgical approaches and nerve injury.

Conclusion

Our systematic review results revealed an overall very low quality of evidence and provided insufficient support for either posterior approach or lateral approach for total hip replacement to avoid nerve injury. There is no substantial evidence to argue for a change of current practice in preference for a particular surgical approach for total hip replacement to reduce risk of nerve injury. Hence the choice must be based on individual patient and surgeon's experience. Further research is required to establish the risk factors of nerve injury associated with different surgical approaches for total hip replacement.

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Outcome of Locking Compression Plate in Treatment of Tibial Plateau Fracture

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Investigation preformed at Shri Aurobindo Medical College, Indore

Abstract

Background: Modern locking plate systems, provides increased angular stability, has low implant profile, improved design matching the peri-articular bone surface, as well as is compatible with the minimal invasive techniques. We performed this prospective study to evaluate the functional and radiological outcome of management of tibial plateau fractures using locking compression plate.

Material & Methods: 30 patients of tibial plateau fractures were surgically managed using locking compression plate and were evaluated by Rasmussen's criteria, clinically and radiological for union.

Results: Average age was 46.13 years and average fracture union time was 13.62 weeks. All patients had excellent (53.3%) to good (46.7%) results with none of the patients having poor or fair results. Average Rasmussen's clinical score was 27.56. Three and one patients had articular depression and increased condylar width respectively, but both the depression and increase in width was less than 5 mm.

Conclusion: Locking plate in treatment of tibial plateau fractures ensures stable fixation with maintained reduction, thereby providing early rehabilitation and good functional outcome however, injury severity continues to represent the decisive predictor for outcome.

Keywords: Tibial Plateau Fracture, Locking Compression Plate, Proximal Tibia Fracture.

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Introduction

Aim of treatment in intra-articular proximal tibial fractures is to obtain a stable congruous joint permitting early range of motion [1]. Various treatment modalities have been used over the years, with varied results. More recent techniques such as the use of locking plates are constantly gaining popularity amongst orthopaedic surgeons.

Modern locking plate system provides increased angular stability, has low implant profile and has improved design and contour to anatomically fit the bone surface. These systems are also well compatible with the minimal invasive techniques [2,3].

The biomechanical advantages of locking plate constructs are realized specially in complex fracture rather than relatively straightforward simple fracture patterns [3,4]. Locking plates in treatment of complex tibial plateau fractures holds many potential advantages, like increased holding power in osteopenic bone, unicortical purchase in periarticular region and ability to successfully and stably bridge severely comminuted meta-diaphyseal shaft areas [5,6]. Thus we evaluated the functional and clinical outcome of tibial plateau fractures treated with locking plate.

Material and Methods

This prospective study included 30 patients of tibial plateau fractures treated by locking plate, done at our centre after obtaining approval from institutional ethical committee. All patients of tibial plateau fractures presenting within two weeks of injury with age more than 18 years were included in the study. Patients with compound fracture, any other associated lower limb fracture, with neurovascular injuries or pathological fractures were excluded from the study.

All patients were subjected to a same protocol of investigation, temporary slab, ice fomentation and limb elevation to decreased swelling. All patients were operated under spinal anaesthesia under C-arm in supine position. All patients were treated by anatomically contoured locking plate via minimal invasive technique. The side and number of plates to be used was decided as the fracture pattern, which was classified according to the Schatzker's classification using plain radiographs and three dimensional reconstruction CT scans, which was done when needed. The depressed fracture was elevated in all cases.

Postoperatively patients were given long knee brace support for two weeks, but isometric quadriceps exercises and intermittent knee range of motion were encouraged from the third day. Mobilization was started as soon as pain permitted; first with non-weight bearing, crutch support walking, followed by toe-touch crutch support walking and then progressive weight bearing depending upon tolerance and radiographic evidence of fracture healing. Patients were followed up regularly at intervals until fracture healing was seen. Radiological evaluation was done for union and functional assessment was done according to the Rasmussen's Knee score.

Results

30 patients of tibial plateau fracture with mean age 46.13 years (range 30 to 49) were included in the study. 25 were males and 5 were females. As per the Schatzker's classification, fracture was type I in 3 (10%), type II in 7 (23.3%), type III in 1 (3.3%), type IV in 5 (16.6%), type V in 4 (13.3%) and VI in 10 cases (33%). The mean delay in surgery was 5.3 days (range 3 to 8 days). 4 (13.3%) cases were treated with bone grafting at the time of primary fixation to elevate the depressed fragment (one of type III and 3 case of type II).

All fractures united in mean duration of 13.62 weeks. 11 (36.7%) fractures united between 9-12 weeks, 16 (53.3%) fractures united between 13-16 weeks and 3 fractures united between 17-20 weeks. But this difference was not statistically significant ($p>0.05$).

At 1 year follow-up, 16 (53.3%) and 14 (46.7%) had good and excellent Rasmussen's Clinical Score respectively (fig 1 & 2). None of the patients had poor or fair results. Average Rasmussen's Clinical Score was 27.56. There was no statistically significant difference ($p>0.05$) in Rasmussen's Clinical Score when compared to age of patient, gender of patient, mode of injury, duration from injury to surgery, fracture union time and bone grafting.

3 patients had articular depression and 1 patient had increased condylar width as seen on x-rays at final follow up of one year, but both the depression and increase in width was not more than 5 mm in all these cases ($p<0.05$). None of the patient had developed arthritic changes by 1 year follow-up. 3 (10%) had complications, one each with wound dehiscence, implant prominence and surgical site infection, which was treated accordingly.

Discussion

Tibial plateau fractures are result of axial compressive forces alone or combined with varus or valgus stress on the knee joint. These fractures are serious injuries, associated with significant early and late complications. Prompt diagnosis, thorough pre-operative assessment of the bony and soft-tissue trauma, adequate soft-tissue monitoring and resuscitation, anatomic reduction and sound fixation allowing early joint movement, and intensive rehabilitation are mandatory for good clinical results [1,2].

Locking plates have advantages over normal compression plates as they provides angular stability by locking mechanism, low implant

profile design matches the anatomic contours of the bone surface and can be done with the minimal invasive techniques [3-6]. All these features make locking plates pretty advantageous in tibial plateau factures, particularly because the tibia being an uneven and subcutaneous bone is associated with severe soft tissue injury as well.

We evaluated the functional and radiological outcome of management of 30 tibial plateau fractures treated by locking plate. In our series, all fractures united in mean time of 13.62 weeks. Average Rasmussen's Clinical Score was 27.56, at final follow of one year; all patients had good to excellent functional outcome. Most of the studies on locking plate fixations for tibial plateau fractures are not comparable due to the use of different scoring systems and fracture classifications.

Fig 1. Pr-operative AP(a) & lateral(b) X-ray view and immediate post-operative AP(c) & lateral(d) X rays view of type IV fracture showing fixation with lateral locking plate. AP(e) & lateral(f) X rays view and clinical photography (g to i) of the same patient at final follow-up showing excellent outcome and union.

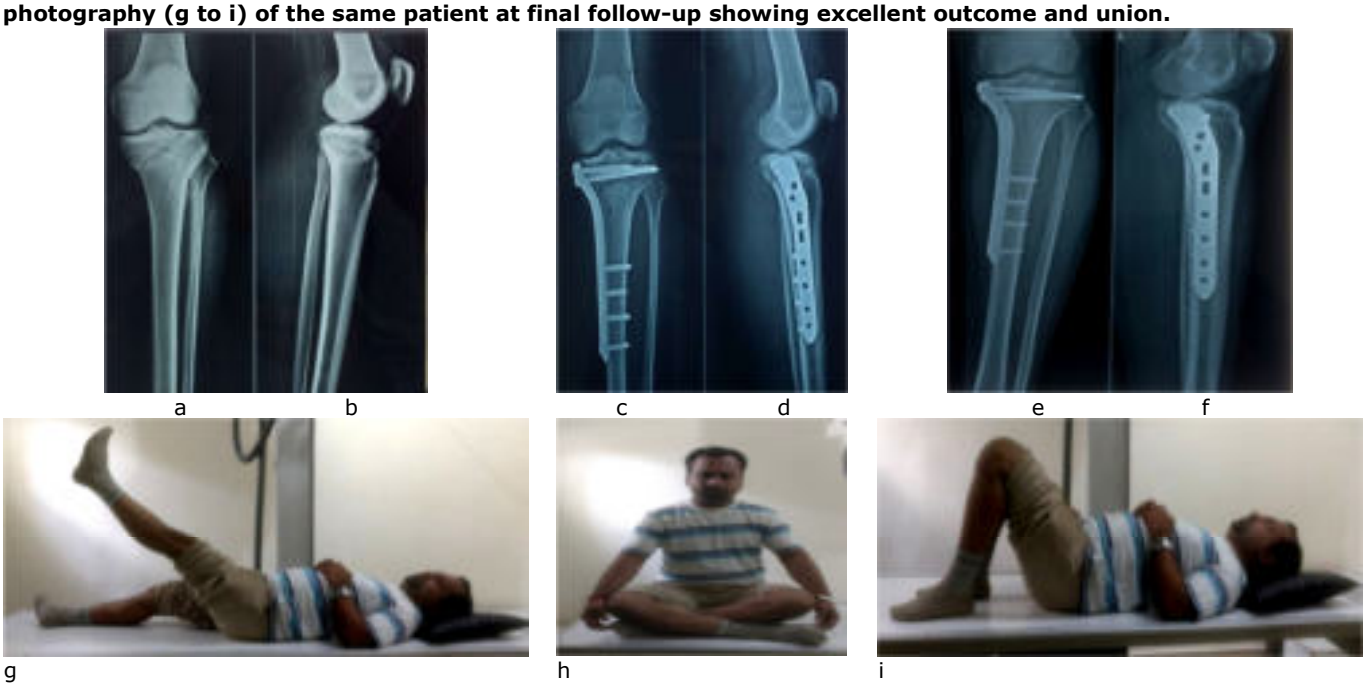
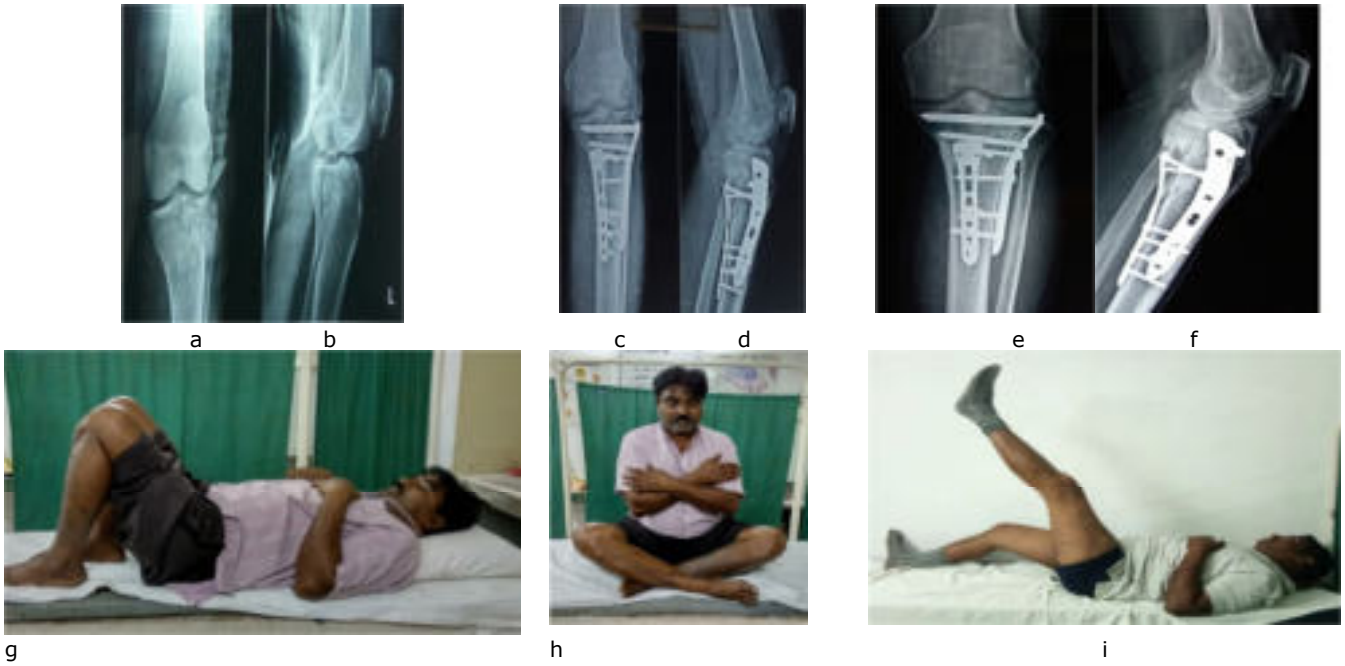


Fig 2. Preoperative AP (a) and lateral (b) X rays view, immediate post-operative AP (c) and lateral (d) X rays view of type V fracture showing fixation with lateral locking plate and posterior medial buttress plate. AP (e) and lateral (f) X rays view and clinical photography (g to i) of the same patient at final follow-up showing excellent outcome.



In our series, only three and one patient had articular depression and increased condylar width respectively, but it was not more than 5 mm in all these cases ($p<0.05$). These were patients of type VI Schatzker, which also had posterio-medial fragment.

Our Study showed that simple fracture patterns like isolated lateral tibial plateau or isolated medial tibial plateau fractures healed faster as compared to complex bicondylar tibial plateau fractures ($p<0.05$). Further, we found, a positive correlation between injury severity and function as the type V and type VI were among the groups with lesser Rasmussen's score. Thus increasing injury severity appears to remain the most predictive factor for outcome. Similar results were seen with other studies as well [4-8].

Conclusion

Locking plate in treatment of tibial plateau fractures ensures stable fixation with maintained reduction, thereby providing early rehabilitation and good functional outcome however, injury severity continues to represent the decisive predictor for outcome. There should be caution in using single lateral plate for fractures associated with posterior column fracture or medial comminution.

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Evaluation of Neurological Recovery in Cases of Thoracolumbar Fracture with Paraparesis after Fixation and Decompression

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Investigation preformed at Gandhi Medical College, Bhopal

Abstract

Background: The recent advances in management of Spinal Cord Injury (SCI) are born on evolving understanding of spinal mechanics, injury mechanics, improved instrumentation, better imaging modalities and better rehabilitative care. However management of thoracolumbar fractures remains controversial for many reasons. The purpose of this study was to assess the neurological recovery of patients with traumatic incomplete thoracolumbar spinal cord injury, who were treated by reduction, posterior stabilization and decompression at our centre.

Material & Methods: 36 patients with incomplete spinal cord injury treated with posterior pedicle screw fixation and decompression were included in the study. These patients were evaluated with American Spinal Injury Association (ASIA) Impairment Scale before and at 1, 2 and 6 months follow up after surgery.

Results: Out of total 36 patients, 22 were male and 14 were female. The mean age was 33.7 years. Neurological improvement in our series was more than one ASIA Impairment Scale (AIS) grade in 24 cases with 3 cases showing improvement of two ASIA grades.

Conclusion: Posterior decompression and pedicle screw fixation is an effective procedure to achieve early mobilisation and rehabilitation and the evidence indicates that it leads to improvement in neurological recovery in cases of incomplete SCI.

Keywords: Spinal Cord Injury, Thoracolumbar Fracture, Posterior Decompression, Pedicle Screw Fixation, ASIA Impairment Scale.

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Introduction

The recent advances in management of Spinal cord Injury (SCI) are based on evolving understanding of spinal mechanics, injury mechanics, improved instrumentation, better imaging modalities and better rehabilitative care. However management of thoracolumbar fractures remains controversial for many reasons. Firstly, to determine which injuries require operative treatment and which require non-operative treatment is difficult; secondly, to determine which is the best approach to be considered for the SCI when treated operatively; and lastly, to determine whether surgical management should have a direct decompression or if indirect decompression is sufficient [1].

Similarly there has never been a clear consensus regarding the effectiveness of decompression and fixation in spinal cord injury. Several authors like Roy Camille (1986), Cotler et al (1986), Transfeldt et al (1990), Anderson et al (1993) and Rahimi-Movaghar et al (2005) have opined that operative intervention has benefits like early mobilisation and rehabilitation thereby

enhancing neurologic recovery [2-6]. Whereas several authors like Bohlman and Eismont (1981), Clark (1981) and Wood et al (2003) have opined that doing surgery has its own harmful effects on patients which outweigh the advantages [7-9].

Currently, the treatment of fractures of thoracolumbar spine is determined mainly by three factors which include, the morphology of the fracture, the neurology of a patient as it is an indicator of functional integrity of spinal cord, and which specific structures are injured [10]. Further till date, the role of decompression in patients with incomplete SCI is supported only by level III and limited level II evidence and there is no definite evidence to support the role of decompression in complete SCI [11].

Hence, in this study we attempt to look for the neurological recovery of patients with paraparesis due to traumatic incomplete thoracolumbar spinal cord injury treated by reduction, posterior stabilization and decompression.

Material and Methods

A total of 36 cases of incomplete spinal cord injury presented to our casualty department during the two years 2017 to 2018 were included in the study. Institutional ethical clearance and proper informed and written consent from all the patients was taken before the study.

All patients between age group 18 to 70 years with traumatic fracture involving thoracolumbar spine with incomplete neuro-deficit (American Spinal Injury Association (ASIA) Impairment grades B, C and D were included in the study. Patients with complete neuro-deficit (ASIA grade A), or pathological fracture were excluded from the study.

In all patients a detailed history and thorough examination was done evaluating pain, tenderness, motor examination, sensory and autonomic examination including assessment of bladder and bowel, etc. Initial ASIA grade was calculated according to American Spinal Injury Association (ASIA) Impairment and recorded and was revised daily.

After routine investigation and fitness, all patients were operated under general anaesthesia in prone position over bolsters, using posterior midline approach to spine. After insertion of pedicle screws posterior decompression was performed using laminectomy and finally fixation and distraction with rods was done to achieve correction of deformity (fig. 1).

Rehabilitation was started pre-operatively unless contraindicated by other injuries. Patients were given appropriate nursing care, active and passive physiotherapy, DVT prevention centripetal massage, bowel care (using biological bulk forming agents like isabgol / psyllium husk, laxatives were given if required), skin care, air/water mattresses (in patients with sensory loss), chest physiotherapy and psychological support. Regular bladder irrigation was done with mild antiseptic solution when self-retaining catheter was there for unavoidable reasons. Regular follow ups were done and at each follow up ASIA grade was analysed and recorded. Patients completing follow up of minimum 6 months were only included in the study.

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 22; Chicago Inc., USA). Chi-square test was used to determine significant differences. Significance level was fixed at 95% confidence interval ($P < 0.05$).

Results

A total 36 patients with incomplete spinal cord injury with mean age 33.7 years (range 18 to 60) were included in study, out of which 22 were males and 14 were females. The most common mode of injury was fall from height found in 58% cases followed by motor vehicle accidents found in 36% cases. The mean injury to surgery interval was 14 days (range 5 to 40 days). Initial neuro-deficit as per ASIA score was D in 18 cases (50%), 8 cases (22%) had grade B and 10 cases (28%) had grade C.

After a follow up of 6 months the neurological status of 24 cases (67%) improved by more than at least one grade and 3 cases had improvement by two grades with p value 0.001 (table 1). Complications were found in 9

patients (25%), which included bed sore (14%), urinary tract infection (5%), deep infection (3%) and chronic backache (3%). All the complications were treated symptomatically.

Discussion

Spinal trauma presenting with neuro-deficit can lead to gross morbidity and disability. In-spite of best treatment by decompression and fixation, the results of neurological recovery are inconsistent and unpredictable [12-13]. Jun et al (2011) showed 92 % improvement of at least one Frankel grade with an average of 1.7 grade improvement in thoracic and lumbar fractures treated using posterior decompression and fusion, whereas Lee et al reported only 53.6 % improvement [14,15]. Spiess et al (2009) reported 43.5% spontaneous improvement of more than one ASIA grade in cases with incomplete spinal cord injury over a follow up period of one year without surgical intervention [16]. Thus it can be seen that historically different studies have observed variable percentage of improvement in cases of spinal cord injury.

In this study, we assessed the neural recovery in 36 patients of incomplete neuro-deficit following spinal trauma, treated by posterior decompression and pedicle screw fixation. Overall 66.7% of our patients had neurological improvement of at least one grade. 3 cases (8.3%) had improvement of two grades which was statistically significant (p = 0.001). Thus our results were better than conservative treatment, but not as good as other surgical treatment studies groups. The probably reason for this difference could be late presentation of patients in our study.

Fig 1. Pre-operative lateral (a) and AP (b) x rays, intraoperative fluoroscopic AP (c) and lateral (d) view and 6 months post op lateral (e) and AP (f) x rays for 45 years patient with fracture L1 treated by decompression and pedicle screw fixation. ASIA grade improved from preoperative grade C to grade D at 6 months follow up.

a b c d e f

Table 1. Neurological improvement in the studied group as per ASIA grade

ASIA grade		Post-operative					
		A	B	C	D	E	Total
Pre-operative	A	-	-	-	-	-	-
	B	-	3	4	1	-	8
	C	-	-	4	4	2	10
	D	-	-	-	5	13	18
	Total	-	3	8	10	15	36

Transfeldt showed neurological improvement in 46.5% cases after delayed anterior decompression in spinal cord and cauda equina injuries of the thoraco-lumbar spine [4]. Anderson showed 92% recovery of incomplete paraplegia due to thoracic spinal injury when treated early with 14 days with surgical intervention [5]. In our series, we could operate these patients with mean delay of 14 days (range 5-40 days), which even after this delay showed 66% neural improvement. This delay is attributable to a number of factors e.g. our patients were from rural background, had poor socioeconomic status, and were referred to our tertiary centre. Further, at our institute level there was delay in obtaining fitness from physician and anaesthesiologist along with late availability of implants. Studies by Anderson et al (1993) and Lee et al (2018) have operated patients within 24 and 8 hours respectively, whereas they have considered patients operated after 24 hours as late group [5,15]. It was not feasible for us to operate patients in such short duration due to various restrictions as mentioned above. In our series also, the patients who were operated early i.e. within a week had better recovery. This confirmed that the early surgical intervention definitely helps in neural recovery.

Our study as compared to larger studies in literature, may project erroneous results because our study is limited by late presentation and small number of patients. However, it still provides an insight into the prevailing situation of the disease process and its recovery pattern in general government hospital with average facilities.

Conclusion

Our study indicates that operative intervention by decompression and pedicle screw fixation done in cases of incomplete spinal cord injury has better chances of neurological recovery, although the definite answer to this question remains uncertain because of the lack of well-designed well executed randomized, controlled trials. But decompression and stabilization of spinal column fractures have several potential advantages: they allow early mobilization to prevent systemic complications of prolonged immobilization such as pulmonary infections, decubitus ulcers, thrombophlebitis etc, reduce the length of hospital stay, and improve rehabilitation.

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Outcome of Fracture Distal End of Radius Treated By Non-Bridging External Fixator

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Abstract

Background: Fractures of the distal radius are among commonly encountered problems, which need optimal reduction and early rehabilitation, to provide early functional independence. Non-bridging external fixation which is relatively easy to apply, versatile, maintains reduction and allows early joint mobilization. Thus we analysed the utility of non-bridging external fixator in fractures of distal end radius in terms of functional and radiological outcome in the rural Indian population.

Material & Methods: This prospective study is done in 22 patients (24 cases) of fresh fractures of distal end radius either extra or intra-articular. All patients were treated with non-bridging external fixator and were assessed for outcome functionally by DASH score, for union and radiological parameters.

Results: Average age of patients was 47.27 years. Mean flexion-extension arc was 147° (73° flexion and 74° extension), mean pronation-supination arc was 164° (79° supination and 85° pronation) and adduction and abduction was 32° and 11° respectively at 16 weeks post-operatively. The average radial angle restored post operatively to 18.93° (range 12.7° to 25°). The average radial length restored to 11.68 mm (range 8 mm to 14.4 mm). The average volar angle restored post treatment was 7.61° (range 3.4° to 15°). The average DASH score at 16 weeks was 9.92 (range 0.9 to 14.2).

Conclusion: Non-bridging external fixator in treatment of the distal radius fractures is an effective method of treatment, which can give excellent results in terms of functional and radiological outcome.

Keywords: Fracture distal end radius, Non-bridging external fixator, Fracture lower end radius.

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Introduction

Fractures of the distal radius involving the metaphyseal-diaphyseal junction are among commonly encountered problems by orthopaedic surgeons. A good outcome demands optimal reduction and maintenance to provide early functional independence without potential complications.

Despite the recognized growth of internal fixation, external fixation has maintained a role in the treatment of distal radius fractures because of its relative ease in application, versatility and reduced effects on the pericarpal soft tissues. The concept of non-bridging external fixator for distal radius fractures was first given by M. M. McQueen in 1998, subsequently procedural and technologic advancements have established its utility [1,2]. Few studies have been done on outcome of non-bridging external fixators in these fractures [3-11].

The purpose of this prospective randomised study was to analyse the utility of non-bridging external fixator in fractures of distal end radius in terms of functional and radiological outcome in the rural Indian population.

Material and Methods

This prospective study for assessment of the outcome of treatment of distal end radius with non-bridging external fixator is carried out from July 2010 to April 2012 at our institute after approval of the Ethical committee. Three hundred and forty nine cases of fracture distal end radius attending the outpatient department were registered, 23 of these cases who met the inclusion criteria were treated with non-bridging external fixator and included in the study. One case was lost at follow up. Thus 22 patients (24 radius – 2 bilateral), who were followed for a minimum of 6 months and whose data have been analysed for final conclusion formed the cohort.

All patients more than 18 years and with less than 3 days old dorsally displaced distal radius fractures either extra or intra-articular with minimum 2 large articular fragments and dorsal angulations of $>10^{o}$ and/or radial shortening of more than equal to 5 mm, simple or grade 1 compound, were included in the study. Patients having associated fracture ulna shaft, tendon injury, carpal injury or neuro-vascular involvement, were excluded from study.

After proper clinical evaluation and standard radiological assessment fractures were classified as per Frykman's classification system, mainly due to its better intra-observer reproducibility as compared with other systems [2].

All patients were admitted and after a preoperative workup, informed written consent and pre-anaesthetic check-up, were posted for the procedure. Standard preoperative surgical protocol and time out under appropriate anaesthesia four Schanz pins (2 pins proximally to fracture in shaft and 2 pin distally in the distal fragment) were inserted dorsolaterally and dorsomedially. Care was taken to avoid tendon injury or penetration. After that fracture was reduced and confirmed fluoroscopically and the fixator frame application was completed (fig 1).

Postoperatively, patient's limb was kept elevated and active finger movements encouraged. Further shoulder, elbow and wrist, active and passive movements were started from day one as per the American Academy of Orthopaedic Surgeons Guidelines [12]. Patients were followed up regularly (2, 4, 6 and 16 weeks). Patients were assessed both clinically and on radiographs. The external fixator was removed at 6 weeks, when bridging callus was seen in at least three cortices in two views and clinically there was no pain / tenderness at fracture site.

Objective clinical assessment included range of motion of the wrist as measured in all the six planes with the help of a goniometer and grip strengths measurement on both sides. Standard anterio-posterior and lateral X-rays were taken at each follow up to assess the position of the fracture fragments, union status and for measurements of parameters by like radial length, radial angle and volar angle. DASH questionnaire was used for functional assessment. Complications, if any were noted and suitably dealt. The data thus obtained were statistically analysed using Chi square and student t-test on SPSS (Statistical Presentation System Software) for Windows version 17.

Results

Out of 22 patients enrolled, 13 were males and 9 females with a dominant hand injury in 16, 4 had injury in non-dominant limb and bilateral involvement in 2 cases. The average age of patients was 47.27 years. Out of 22, 3 (13%) had a Frykman's type I fracture, 9 (41%) had a type II, 4 (18%) had type III, 4 (18%) had type IV injury and 2 (10%) had type VI injury. Four had associated ulnar styloid fracture.

The Flexion-Extension arc at the different follow up was analysed, there was an average change from 73° (36.2° flexion and 32.7° extension) at the 1st follow up at 2 weeks to 147° (73° flexion and 74° extension) at 16 weeks. Similarly the improvement in Pronation-Supination arc was 107° (48° supination and 59° pronation) at 2 weeks,

which improved to 164° (79° supination and 85° pronation) over the period of 16 weeks. Adduction and Abduction improved from 22° and 8° respectively at 2 weeks to 32° and 11° respectively at 16 weeks post-operative (fig 1).

Improvement in range of movement improvement in the patients on 4th week and 16th weeks on applying the paired t-test reveals a statistically significant change in the outcome with less than 0.0001 for Flexion – Extension, 0.004 for Abduction – Adduction and 0.001 for Pronation – Supination (fig 2).

The average radial angle restored post operatively to 18.93° (range 12.7° to 25°). The average radial length restored to 11.68 mm (range 8 mm to 14.4 mm). The average volar angle restored post treatment was 7.61° (range 3.4° to 15°). The radial length and volar angle observations were statistically significant.

The average DASH score at 4 weeks was 24.82 (range 10.3 to 40) and at 16 weeks was 9.92 (range 0.9 to 14.2). The DASH score comparison using the paired t- test reveals a statistically significant change over for 4 weeks to 16 weeks period.

Discussion

Fractures of distal radius are more common injuries predominantly, in females and in 6th decade [3-7]. In our study there is predominance of males and in 5th decade.

We analysed the results of non-bridging external fixator in treatment of the distal radius fractures in 24 cases. The operative protocol and the reduction technique was uniform in all the patients; but the anaesthesia protocol varied as per the anaesthetist preferences, using general anaesthesia, regional nerve blocks or Bier's block. Post-operatively patients getting Bier's block and the nerve blocks had a better immediate pain relief due to the residual effect of the drug, against the patients who received general anaesthesia, who required more analgesics [8]. Bier's block according to the literature is the most preferred modalities of anaesthesia, due to the low cost and excellent post-operative analgesia [9,10].

The flexion-extension arc achieved at the end of 6 weeks and 4 months was 124° and 147° respectively which reveals significant difference of value when compared to 105° and 127° respectively achieved in the study of Lozano-Calderón et al [13]. The results obtained in our study are early results which are clinically comparable with studies having achieved movements at 1 year after the trauma [3,14,15]. Early starting of the range of motion exercises should have an advantageous role in early healing, just as axial micro-motion has in distraction histogenesis. This has also been established in the study of Smith and David Slutsky [15,16].

The radiological assessment in the literature reveals improvement of the volar angle when non-bridging fixators are used [1,17,18]. The present series observations are consistent with the literature and reveal improvement in the radiological parameters [3-11].

The overall functional outcome as assed with DASH scoring system has showed statistically significant improvement, with score improving from 4 weeks to 4 months. The most common complications encountered were wrist pain and radial subsidence. In addition, two cases have pin tract infection and subsequent loosening, which was treated by dressing and antibiotics. The incidence of wrist pain was 18.18% and located on the ulnar side noted during performance of heavy activity. The incidence of pain, as reported in literature varies from 10% to 57% in different studies [12,19,20]. Three of our four patients who had associated ulnar styloid fracture continued to have wrist pain even after 16 weeks on ulnar side.

There was loss of the radial height in 4 patients (range 2 to 6 mm) with maximum of 6 mm shortening in a 75 years old male, graded as grade 3 with articular incongruities according to the Kirk and Jupiter [21]. This patient also had pin tract infection leading to swelling and progressing into Sudeck's osteodystrophy with poor functions requiring additional management. This is probably attributable to the fact that fixator configuration was supported by indigenously single bent rod connecting pins in two planes, and with early rehabilitation, excessive stress

on the pins in osteoporotic bone lead to loosening, fixation failure and radial collapse.

Extensor tendon injuries are common complications of the non-bridging fixators due to the fact the distal pins go through the extensor compartment of the wrist as reported to be 10% by McQueen and 6.7 % by Krishnan [1, 22]. In our study we noted going through the tendons of extensor indicis on one occasion, but the complication was diagnosed on the table by doing passive finger and thumb movement (table 1). These patients developed pain on movement which subsided in 2 weeks. None of the patient had tendon rupture in our study. The reported incidence of tendon rupture in distal radius fracture is 0.9% due to the bony spikes at the distal fracture fragment [23].

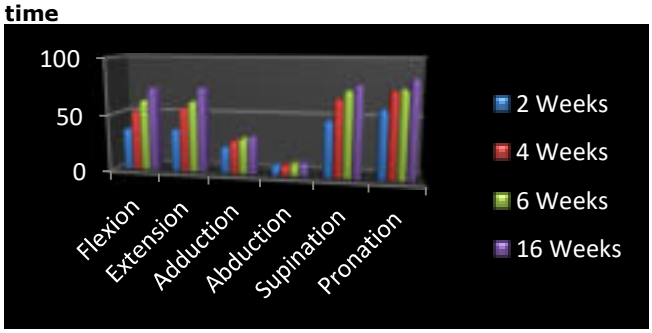
Table 1 – List of complications

Complication	Frequency
Finger Stiffness	1/22
Pin Tract Infection	4/22
Sudeck's Osteodystrophy	1/22
Wrist pain	3/22
Compression neuropathy	0/22
Pin Breakage	0/22
Schanz Pin loosening	1/22
Superficial Radial Nerve Palsy	0/22
Iatrogenic Tendon Injury	1/22
Loss of Radial Length	4/22

Fig 1 – Pre operative AP (a) and lateral (b) view and post-operative AP (c) and lateral (d) view radiograph showing fracture distal end radius which was treated with non-bridging external fixator. Final follow-up clinical photos (e and f) and AP view (g) of the same patient showing excellent results.

a b c d e f g

Fig 2 - Improvement of range of movement with time



In our series, finger stiffness and sudeck's osteodystrophy was seen in less than 5% (one case), who was non-compliant for the physiotherapy, the subsequent stiffness persisted even at 6 weeks. By the 16 weeks follow up the stiffness was reduced but the grip strength was nearly 75% of the dominant hand. The incidence of finger stiffness and Sudeck's Osteodystrophy reported in literature was is 0 to 31% and 0 to 6 % respectively [24,25] which increases with increasing traction.

Conclusion

Non-bridging external fixator in treatment of the distal radius fractures is an effective method of treatment, which can give excellent results in terms of functional and radiological outcome.

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Comparative Evaluation of the Efficacy of Platelet Rich Plasma Versus Triamcinolone in Treating Tennis elbow

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Abstract

Background: Lateral epicondylitis is seen more commonly in non-athletes than athletes. Non-operative methods are the mainstay of treatment being effective in more than 95% of cases. Platelet rich plasma (PRP) has shown promising results in many studies as compared to steroid injection & other modes of conservative management. Hence, this study was done to compare the efficacy of PRP and triamcinolone injection in management of tennis elbow.

Material & Methods: This randomized study was conducted at our center, for a period of two years from Aug 2015 to Sep 2017 on 60 consenting patients diagnosed as lateral epicondylitis. Patients were randomized into Group –1 (30 patients) receiving 2 ml of PRP injection and group –2 (30 patients) receiving 2 ml of Triamcinolone injection. Post therapy assessment was done using with Oxford elbow score.

Results: Average age at presentation was 31.11 year (range 20 to 40). Mean Oxford Elbow Score for both PRP injection group and in triamcinolone group at 6 weeks, 3 month and 6 month improved from pre injection score with p-value less than 0.001. On comparing PRP with triamcinolone, PRP was slight better than the triamcinolone injection and results were better maintained for long term in PRP group.

Conclusion: Lateral epicondylitis or tennis elbow is a painful debilitating condition of elbow, which creates disturbance in functional activities. A single injection of PRP at the site of the elbow pain resulted in relief of pain in patients for longer duration as compared to local steroids or other conservative treatments.

Keywords: Tennis elbow, Platelet rich plasma, Triamcinolone, Lateral epicondylitis

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Introduction

Lateral epicondylitis commonly known as tennis elbow is cause due to overuse or repetitive micro-trauma resulting in a primary tendinosis of common extensor origin [1]. Treatment of tennis elbow by use of NSAIDS, steroid injections and physiotherapy have provided varied results and only short term relief [2,3]. Recently, intra-lesional injection of platelet rich plasma (PRP), which is good source of many growth factors & cytokines like PDGF, TGF-beta, IGF-1, IGF-2, FGF, VEGF, EGF, keratinocyte growth factors & connective tissue growth factors, has found to be effective for treatment of this painful & disabling condition [4]. The mechanism of action of PRP therapy in chronic tendinopathies is varied and hypothesized to include angiogenesis, increase in growth factor expression and cell proliferation, increase the recruitment of repair cells and tensile strength.

Studies on lateral epicondylitis treated with PRP treatment have yielded inconclusive results [5-7]. Hence, we conducted this comparative to evaluate the efficacy of intralesional injection of PRP & corticosteroid in terms of pain relief as assessed by Oxford elbow score.

Material and Methods

This single blind randomized study is conducted at our centre in a period of two years from August 2015 to September 2017 on 60 patients of tennis elbow. Before the study, written informed consent from the patients and ethical clearance from the institution ethical committee was obtained.

Patients of age group 20 to 40 years with pain and tenderness at lateral epicondyle and positive cozen test were diagnosed as lateral epicondylitis and were included in the study. Patients suffering from elbow pain due to other causes like rheumatoid arthritis, osteochondritis dissecans, crystalline arthropathies like gout, radial tunnel syndrome, cervical lesions, shoulder pathology etc were excluded from the study. Patients with history of previous injection, surgery or any local skin pathology at elbow were also excluded.

Patients were randomized using lottery method into two groups consisting 30 patients each, based on which the type of injection was given, group one patients received 2 ml autologous PRP whereas group two received 2 ml of Triamcinolone injection into the most tender point at elbow by peppering technique.

Autologous PRP preparation:

Autologous PRP was prepared using the platelet separation system in accordance with the manufacturer guideline. With an 18 G needle, 10 ml of venous blood collected from the participant's cubital vein and transferred into a 50 ml syringe primed with 6 ml of anticoagulant citrate dextrose solution. The collected blood was transferred into the disposable separation tube and spun using a centrifuge at 3200 rpm at room temperature for 15 minutes. Centrifugal force separates the blood components into three distinct layers based on their particular densities. The heaviest particles, the red blood cells sunk at the bottom of the tube, the least dense constituents the platelet-poor plasma (PPP) move to the top of the tube, while the platelet-rich plasma (PRP) remained at the centre. The whole PPP was extracted into a 30 ml syringe and discarded. Following this, PRP was extracted into a 10 ml syringe. Since an acidic anticoagulant (anticoagulant citrate dextrose solution – solution A [ACD-A]) was added during the collection of venous blood, collected PRP is buffered to increase the pH to normal physiological levels, just before injection. This is accomplished by adding 8.4% sodium bicarbonate solution in a ratio 0.05 ml of sodium bicarbonate to 1 ml of PRP. No activating agent was added to the PRP before administration. The time taken to prepare PRP was about 30 minutes.

After the injection, all patients were given paracetamol / paracetamol with tramadol for the three day, following which elbow range of motion exercises started. Patients were followed by regularly at 2, 6, 12 and 24 weeks Oxford elbow score was calculated at each visit and used for assessment.

Results

60 patients of tennis elbow with mean age of 31.45 years (range 20 to 39 years), with mean duration of symptoms was 7.7 months (range 3 to 12 months) were included in the study. The dominant limb was predominantly involved in 41 cases (68.3%) while, the non-dominant was involved in 19 cases (31.3%) out of 60. All patients in both the groups reported temporary mild pain immediately after the injection.

In group I (PRP group), 12 (40%) of the patients has pain caused by the injection, subsided within 2 days, in the other 18 patients (60%), the mean duration of pain was 4+2 days. Discoloration at the injection site was detected in one patient (3.33%). The pre-injection mean oxford elbow score of 27.4 improved to 32.9, 37.1 and 41.3 at 6 week, 3 months and 6 months post injection respectively. The difference was statistically significant ($p<0.001$) (table 1).

In group II (triamcinolone group), after the first injection pain disappeared within 2 days

in 18 patients (60%) and lasted for 3 days in 12 patients (40%) respectively. The pre-injection mean oxford elbow score of 26.6 improved to 31.2, 35.1and 39.4 at 6 week, 3 months and 6 months post injection respectively. The difference was statistically significant ($p<0.001$) (table 1).

No patient developed infection or other complication.

Discussion

Lateral epicondylitis (LE) or tennis elbow, with an incidence of 4 to 7 per 1000 patients per year, have a substantial impact on daily living [9-12]. Many treatment regimens are available with inconsistent results. NSAIDS and corticosteroids, used in traditional medicine are found to be ineffective in long term. Physiotherapy had shown some improvement though a sub-cohort of patients remains refractory [1-3]. Other options include extracorporeal shock wave, laser treatment, botulinum toxin injection and local steroid injection. Prolotherapy or autologous whole blood or PRP injection therapies have reported promising outcomes for LE and in other sports related tendinopathies [13].

PRP consists of activated platelets which discharge bioactive signalling molecules, including adhesion molecules and several growth factors [14]. We compared the efficacy of intralesional injection of PRP and corticosteroids in 60 patients of tennis elbow in comparable groups with no significant differences between the groups in gender, age and patient profile. Our series has average age of patients 31.45 years, female predominance and mean duration of symptoms of 7.69 months, which was comparable with known series [6,15-21].

Our study depicted improvement in mean Oxford Elbow Score for both PRP injection group and in triamcinolone group at 6 weeks, 3 month and 6 month improved from pre injection score with p-value less than 0.001, thus stating that both PRP and triamcinolone injections works very well. On comparing PRP with triamcinolone, we found that PRP was slight better than the triamcinolone injection and was better maintained in long term in PRP group. This superior effect of PRP was also demonstrated by Bisset et al, who found that the long term results of steroid injection are worse as compared to physiotherapy alone or wait and watch policy [22].

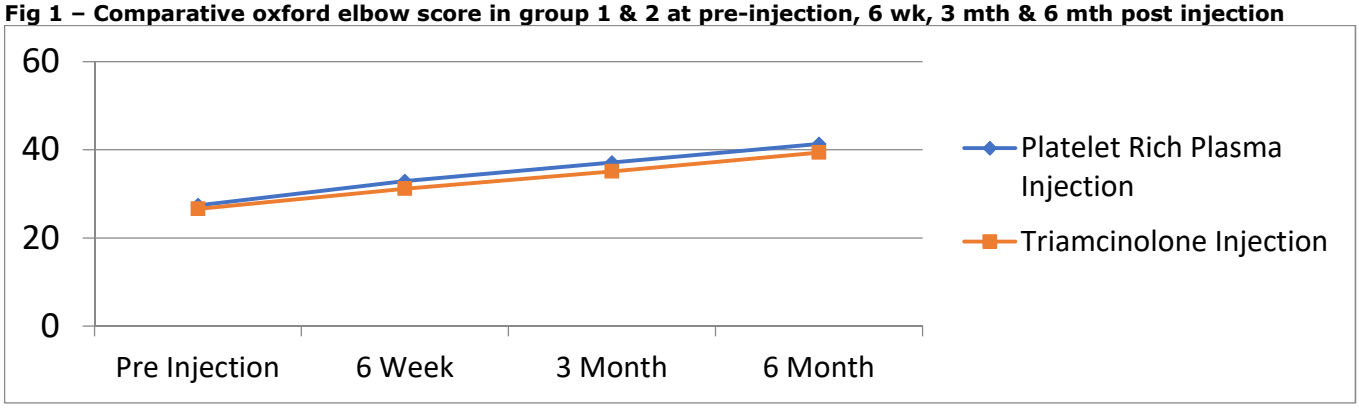
The reported complication in literature by triamcinolone injection are transient pain, skin discolouration tendon ruptures and with the PRP injection complications reported are temporary pain and mild stiffness [6,15-22]. But in both groups, except of transient pain we did not report any other complications.

The effect of corticosteroid for pain relief is by virtue of its anti-inflammatory effect, whereas PRP acts by hitting the area of pathology. Intralesional injection of PRP provides the necessary cellular and humoral response to induce a healing cascade by growth factors in angiofibroblastic degeneration of the common extensor origin at lateral epicondyle [6,23]. Our study is limited by difficult to blind either patient or investigator in regard to withdrawing blood and injecting PRP made from it.

Table 1 – Oxford elbow score in group 1 & group 2 at pre-injection, 6 week, 3 month & 6 month post injection

	Platelet Rich Plasma Injection				Triamcinolone Injection			
	Mean	**% increment**	**P-Value**	**T-Value**	**Mean**	**% increment**	**p value**	**T value**
Pre-Injection	27.4	-	<0.001	0.404	26.6	-	<0.001	0.404
6 Week	32.9	20.07	<0.001	0	31.2	17.29	<0.001	0
3 Month	37.1	35.40	<0.001	0.007	35.1	31.95	<0.001	0.007
6 Month	41.3	50.72	<0.001	0.17	39.4	48.12	<0.001	0.17

Fig 1 – Comparative oxford elbow score in group 1 & 2 at pre-injection, 6 wk, 3 mth & 6 mth post injection



Conclusion

Our study demonstrates the advantages of PRP injection for the treatment of lateral epicondylitis. Its application being minimal traumatic, reduced risk of immune medicated rejection, simple to acquire and prepare and inexpensive are the main advantages.

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Incidence and risk for Bone Cement Implantation Syndrome after hemiarthroplasty

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Abstract

Background: Bone Cement Implantation Syndrome (BCIS) is a highly under-reported rare fatal complication of cementation, characterized by hypoxia, hypotension, cardiac arrhythmias, and cardiac arrest. With aim to alert surgeons about rare, but serious harm due to BCIS and its risk, clinical features, preventive measures and management, we evaluated the incidence and risk factor associated for BCIS in cemented hemiarthroplasty for fractures around hip.

Material & Methods: All patients of fracture neck of femur or intertrochanteric, operated with cemented hemiarthroplasty, who sustained BCIS during or within 24 hrs of the cementation, were included in the study. The BCIS was diagnosed, when the patient had hypoxia (SpO2 <94%) or fall in systolic blood pressure > 20mm. These patients were evaluated for presence of risk factors like age, sex, osteoporosis, use of diuretics, poor preexisting physical reserve, pre-operative cardiopulmonary function etc.

Results: In 430 patients of cemented hemiarthroplasty done for fractures around hip, 13 sustained BCIS. The mean age in these patients was 84.3 years. Severity was grade 1 in 7 patients, grade 2 in 4 patients and grade 3 in 2 patients. All the patients of the grade 1 and grade 2 were revived successfully, whereas none of the patients of the grade 3, could be revived. Age and poor cardiac reserves were most commonly associated with BCIS.

Conclusion: BCIS is a rare, preventable, fatal complication of cementation which can be diagnosed early by constant monitoring. Management is supportive and prevention is best way, by surgical modification with modern cementing techniques, especially in high risk patients.

Keywords: Bone cement, Cement implantation syndrome, Hemiarthroplasty

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Introduction

Fractures around hip in elderly are very common injury, which are usually treated by hemiarthroplasty. Owing to the poor quality of bone in these elderly patients and osteoporosis, this prosthesis is commonly fixed to bone with the help of bone cement. Thus cemented hemiarthroplasty, is a routine surgery done for fractures around hip in elderly patients.

Cemented prosthesis is not free of complications. Bone Cement Implantation Syndrome (BCIS) is among one of the complications which is the most fatal complication of cementation [1]. BCIS has no agreed definition. An adverse, sudden, cardiovascular event, characterized by hypoxia, hypotension, unexpected loss of consciousness, cardiac arrhythmias, and cardiac arrest or combination of these, occurring within minutes of cementation,

prosthesis insertion, joint reduction or occasionally, tourniquet deflation while cemented bone surgery can be referred as 'Bone Cement Implantation Syndrome' (BCIS) [2,3]. Although it is most commonly associated with hip arthroplasty, but it can also occur during cementation in other procedures like knee arthroplasty, shoulder arthroplasty or even during kyphoplasty [4,5]. We conducted this study to evaluate the incidence and risk factors associated for the above catastrophic event and to educate the surgeons regarding risks, clinical features, preventive measures and management of BCIS occurring during hemiarthroplasty.

Material and methods

This prospective study is done at our center in all patients of hip fractures either neck of femur or intertrochanteric treated by cemented hemiarthroplasty in last 5 years. The study was approved by the institutional ethical review committee.

All patients of fracture neck of femur or intertrochanteric, operated between 2014 to 2019 with cemented hemiarthroplasty, who sustained BCIS during or within 24 hours of the cementation, were included in the study. The BCIS was diagnosed, when the patient had hypoxia (SpO2 <94%) or fall in systolic blood pressure > 20mm, intra-operatively after cementation or postoperatively within 24 hours of cementation [2]. Thus any patients having hypoxia and hypotension which may be presented clinically as only transient confusion or as fulminant cardiovascular changes, which may proceed to arrhythmias, shock or cardiac arrest, were included in the study. The patients whose intraoperative and post-operative event was uneventful were excluded from the study.

All patients were operated only after optimizing the patient and obtaining medical and pre-anaesthetic clearance. Written informed consent was also obtained for all patients for cemented hemiarthroplasty by bipolar prosthesis. The hemiarthroplasty was done by standard posterior approach in lateral position under spinal anaesthesia in all the patients. The episodic hypotension following the spinal anaesthesia was well treated and the patient's haemodynamic parameters were well maintained and made stable before the procedure.

Femoral canal preparation was done as per the standards. In all the cases, after head extraction and gradual rasping of the femur canal was done. Following this femoral canal was prepared by thorough lavage followed by drying of canal, remove small debris and application of cement restrictor. The prepared cement after mixing was inserted into the femoral canal in a retrograde manner over a suction catheter to suck trapped air, with help of a cement gun. The cement so inserted was pressurized by the hand and inserted appropriate sized bipolar prosthesis. Any patient sustaining hypotension or hypoxia during this period and after this for 24 hours was labelled as BCIS. The BCIS was graded as per Donaldson severity classification, grading into grade 1 as moderate hypoxia (SpO2 <94%) or fall in Systolic blood pressure >20%, grade 2 as severe hypoxia (SpO2 <88%) or fall in Systolic blood pressure >40% and grade 3 having cardiovascular collapse which required CPR [2].

Any patients sustaining the BCIS, during cementation intra-operatively were intubated and ventilated with 100% oxygen after sealing the surgical site. Cardiopulmonary resuscitation with administration of cardiac massage, CPR, crystalloid, vasopressors like adrenaline and atropine and supportive treatment was done to revive the patient. Patients sustaining BCIS in postoperative period were admitted in ICU, and connected to ventilator. Vasopressors, inotropics and cardiopulmonary resuscitation along with shock or defribrillator were given when needed. Patients who could not be saved underwent autopsy to confirm diagnosis of BCIS.

All those patients who sustained BCIS were evaluated for the presence of risk factors age, sex, osteoporosis, use of diuretics, poor preexisting physical reserve, pre-operative cardiopulmonary function, pre-existing pulmonary hypertension, bony metastases, presence of pathologic fracture, type of fracture, any previously instrumentation of

femoral canal and type of stem used in hip arthroplasty.

Results

A total of 430 patients of fracture neck of femur or intertrochanteric femur treated by cemented hemiarthroplasty were operated at our centre during last five years and included in the study. Out of these patients, only 13 patients sustained BCIS in our study. The mean age in these patients was 84.3 years (range 78 to 92 years). Out of the 13 patients, 11 were male and 2 were female.

BCIS as per Donaldson severity was grade 1 in 7 patients, grade 2 in 4 patients and grade 3 in 2 patients. All the patients of the grade 1 and grade 2 were revived successfully, whereas none of the patients of the grade 3, could be revived. All patients in grade 1 and all patients of grade 2 except one sustained the event in intraoperative period just after the cementing and insertion of prosthesis. In grade 3, out of the two patients, one sustained the event in intraoperative period i.e. during cementation, while the other patient sustained the BCIS episode after, 6 hours of the surgery. Thus total 11 patients had BCIS, intra-operatively during cementation and two had during the postoperative period.

Out of the 13 patients, 9 had fracture neck of femur and 4 had intertrochanteric fracture and none of the patients had a pathological fracture or bony metastasis. The mean preoperative cardiac output in these patients was 43.4 % (range 39 to 58). All patients had normal cemented bipolar prosthesis of 150 mm size length done in the previously unreamed femoral canal.

Discussion

Cemented hemi-arthroplasty is a routinely done procedure for fractures around the hip. Bone Cement Implantation syndrome (BCIS) is a rare fatal complication of cementation, which is highly underestimated and under-reported, as patients who die intra-operatively, are less likely to be reported [6]. Hence, there are not many case series or formal trials published on this topic and only few cases are only reported [1,3,6-8]. Further milder varieties of BCIS are not recognized at all or not systematically collected or published. Thus, due to this underreporting, there is lack of peer-reviewed literature available on this topic regarding incidence, accepted definition, clinical presentation and management recommendations. Hence we conducted this study to evaluate the incidence and risk factors associated with BCIS in 430 patients of cemented hemiarthroplasty done for patients of fracture around hip in a period of 5 years.

The aetio-pathophysiology of bone cement implantation syndrome (BCIS) is unknown with theories being proposed, like systemic toxic effects of methyl methacrylate, embolic episode, histamine release, complement activation, endogenous cannabinoid-mediated vasodilatation or combination of these, but none of them have been proven completely [9-12]. Patho-physiologically, the genesis of BCIS is high intramedullary pressure (often>300mmHg), generated by the expansion of exothermic sealed cement, between the prosthesis and bone, which forces "snow flurry", which contain fat, marrow, cement particles, air, bone particles, and aggregates of platelets and fibrin into blood circulation. The embolic snow flurry within the circulation causes mechanical and mediator release changes via histamine, complement activation, endogenous cannabinoids, vasoactive or pro-inflammatory substances, thrombin and tissue thromboplastin etc, which manifests typical cardiovascular and hemodynamic changes of BCIS [2,9-14].

Numerous patient-related risk factors implicated in the genesis of BCIS include old age, male sex, osteoporosis, use of diuretics, poor preexisting physical reserve, impaired cardiopulmonary function, pre-existing pulmonary hypertension, patent foramen ovale, atrial-septal defect, bony metastases and concomitant hip fractures, particularly pathological or intertrochanteric fractures [2,3,6]. Patients with a previously un-instrumented femoral canal and long-stem hip arthroplasty appear to be associated with a higher incidence of BCIS [15]. We found in our series of 430 cases of cemented hemiarthroplasty, 13 sustaining BCIS, and BCIS was associated with high incidence in

higher age, male gender and poor cardiac reserve patients.

Due to differences in patient's risk factors, susceptibility and response and mediator based effect of BCIS, the degree of cardiovascular compromise is not necessarily proportional to the degree of the embolic load [16,17]. Hence there is wide spectrum of clinical presentation from milder transient hypoxia, hypotension or confusion to fulminant cardiovascular changes, which may proceed to arrhythmias, shock or cardiac arrest. Depending to SpO2 and fall in systolic pressure Donaldson proposed a severity classification, grading BCIS into three grade, grade 1 as moderate hypoxia (SpO2 <94%) or fall in Systolic blood pressure >20%, grade 2 as severe hypoxia (SpO2 <88%) or fall in Systolic blood pressure >40% and grade 3 having cardiovascular collapse which required CPR [2]. In our series, grade 1 BCIS was seen in 7 patients, grade 2 in 4 patients and grade 3 in 2 patients.

First indication of clinically significant BCIS is fall in end tidal CO2 concentration with dyspnoea or altered sensorium, followed by hypoxia and hypotension [18]. Invasive hemodynamic monitoring like oesophageal doppler, intraoperative pulmonary artery catheter or transoesophageal echocardiography can detect impending BCIS at an earlier stage than standard hemodynamic monitoring, but they are not routinely used and where not used by us as well [3,6,8,17,18].

Since amount of debris present in the femoral canal is finite, BCIS is a reversible time-limited process with ceiling effect, which can recover within minutes, even from large embolic loads, if hemodynamic stability is maintained by supportive therapy [19]. The supportive management includes administration of 100% oxygen with airway control, aggressive fluid therapy resuscitation & avoid volume depletion, inotropics and vasopressors [2,6,8]. Prophylactic use of antihistaminics or steroids for treatment of cement embolism could not be found in the literature search [7]. With supportive treatment, we were able to revive all our grade 1 and grade 2 patients, but none of the grade 3 patients could be revived.

Prevention of BCIS is better, and various intraoperative surgical measures can reduce the risk of BCIS. These include medullary lavage, good haemostasis before cement insertion, prevent excessive cement pressurization, using low toxicity monomeric cement, minimizing the length of the prosthesis, vacuum cement mixing, retrograde application with cement gun with a suction catheter, intramedullary plug and venting the medulla [2,3,6,8]. Except for vacuum mixing and venting a hole, we follow all the other modern cementing techniques to minimize BCIS in all our case of cemented hemiarthroplasty.

Multidisciplinary clinical guidance for both anaesthetists and surgeons are issued by National Patient Safety Agency (NPSA) 2009, regarding the use of bone cement during hip arthroplasty, highlighting the joint decision-making, team-working and careful intra-operative monitoring, especially in high risk patients. Further, all hip fracture surgeries should be undertaken or directly supervised by experienced anaesthetists and surgeons, ideally on planned lists, with full involvement of anaesthesia team in the preoperative planning, allowing proper investigation and pre-optimization. All members should be aware of the problem and if severe reaction or cardiopulmonary arrest occurs, everyone should be aware of their defined roles in resuscitating the patient [20].

Conclusion

BCIS is a rare preventable complication of bone cementation characterized by hypotension, hypoxemia, bradycardia, unconsciousness and even cardiac arrest, especially in high risk patients. Constant monitoring and early diagnosis during and after bone cementation is crucial in determining the outcome. Management includes surgical modification with modern cementing techniques and supportive measures along BLS and ACLS guidelines. Further registry-based or multicenter studies are needed on the topic for patient safety.

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Isolated Tuberculosis of Talus: A Case Report

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Investigation preformed at Shri Aurobindo Medical College, Indore

Abstract

Case Report: Osteo-articular tuberculosis continues to be a major global pandemic, with its greatest impact in developing countries. Among osteo-articular tuberculosis, involvement of foot, particularly isolated involvement of the talus is an extremely rare event. We discuss such rare case of a 30-year-old male diagnosed with isolated tuberculosis of right talus treated with surgical debridement and curettage of the talus along with anti-tubercular therapy. After 12 months postoperative, the patient was able to carry out his daily activities without pain.

Keywords: Talus, Tuberculosis, Tubercular osteomyelitis, Osteoarticular tuberculosis

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Introduction

Tuberculosis is still a major health problem in many developing countries. Involvement of the musculo-skeletal system is seen only in 1-3% of all tuberculosis patients. There have been less than fifteen cases of tuberculosis of talus, described in the literature till date, to best of our knowledge [1]. The diagnosis of foot TB is challenging due to vague inconsistent symptomatology and presentation which closely resembles that of other more common disorders affecting this region. Delaying the accurate diagnosis in such cases can lead to late presentation of the disease with sequlaes and spreading the disease to the adjacent joints thereby causing widespread destruction. We here report such a rare patient of isolated tuberculosis of the talus bone treated successfully.

Case Report

A 30 year old male presented in the outpatient department (OPD) at our institute with a 6 months history of swelling and pain in his right ankle joint. Constitutional symptoms like fever, weakness, and loss of weight were absent but there was a positive history of loss of appetite. There was no history of preceding trauma. Pain was mild to moderate, localized to ankle joint more on anterior and medial aspect, gradually increasing and partially and temporary relieved on medication. The pain has now restricted his daily activity of living as well. There was history of complete vaccination done at childhood along with BCG (Bacille Calmette Guerin) vaccination done at birth for which the scar mark was present on left shoulder.

On examination, there was a healed sinus present on antero-medial aspect of right ankle joint. There was mild to moderate tenderness and swelling as well at the ankle. All the movements' dorsiflexion, plantarflexion, inversion and eversion were restricted at their extremes ends and slightly painful. There was no deformity present and toes were normal. Distal neurovascular status was also normal.

Haemogram and ESR were within normal limits. Mantoux test and X-ray chest were normal and sputum for AFB was negative. Human Immunodeficiency Virus (HIV), Hepatitis C Virus (HCV) and Hepatitis B

surfaces Antigens (HBs Ag) were found negative. Plain radiograph of the ankle showed an irregular circumscribed lytic lesion inside the affected part of the talus. MRI of the talus showed necrotic and lytic lesions over the posteromedial aspect with hypo-intense lesion in the T1 images (fig 1).

Patient was planned for surgical debridement and curettage. Under spinal anesthesia and in supine position, the talar lesion was approached via antero-medial approach. The lesion was approached after soft tissue dissection and opening the talus (fig 1). White cheesy material found inside the cavity. The lesion was curetted and debrided and cavity was filled with autologous bone grafts taken from iliac crest. The tissue curetted was sent for histological examination which showed pieces of fibro-collagenous tissue with large number of granulomas showing langhans giant cells, central necrosis and peripheral lymphocytes. Acid fast stain for Koch's bacillus was positive which confirmed tuberculosis of the talus.

A below knee POP cast was applied for one month along with 12 months of anti-tubercular chemotherapy which initially consisted of four drugs (Isoniazid, Rifampicin, Pyrazinamide and Ethambutol) for two months, three drugs (Isoniazid, Rifampicin, Pyrazinamide) for next six months and finally two drugs (Isoniazid, Rifampicin) for rest of four months. Physiotherapy was started one month post-surgery after cast removal and patient was followed up monthly. Partial weight bearing was allowed after one month post-operatively, followed by full weight bearing after two month post-operatively. The patient had no pain while walking and was able to perform daily activities without restrictions at 1 year follow up (fig 2).

Discussion

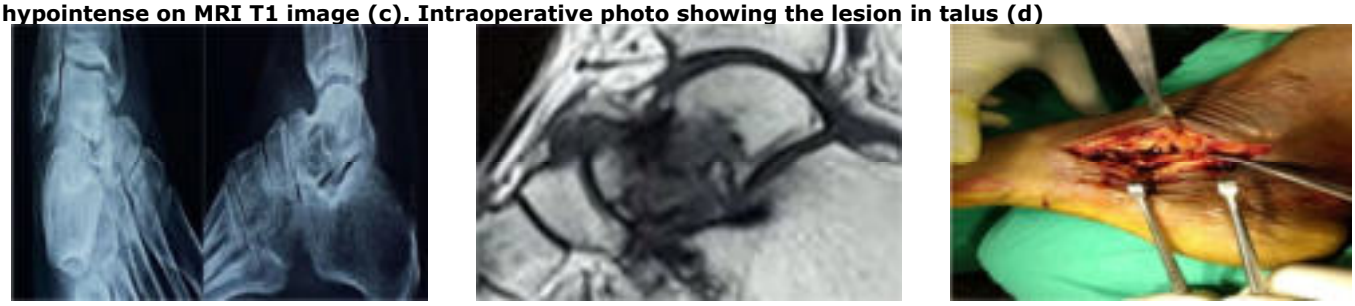
Tuberculosis still remains a major infection, causing death and disability worldwide [2]. Extra pulmonary involvement is noted in 23-30% of patients infected with TB, with only 1-3% having bone and joint disease. Thirty to fifty percent of patients with bone TB have vertebral involvement [2]. Less frequently the appendicular skeleton, usually major weight-bearing joints of the lower extremity such as hip and knee are affected. The ankle and foot are rarely affected and account for only 1% of all TB infections [2,3].

In a report of 74 patients with foot or ankle TB, only one case of talus TB was reported by Dhillon et al [2]. Tuberculosis to talus, symptomatology is frequently led by an insidious onset of pain in the ankle with decreased range of motion and functional disability [4]. Vague and non-specific characteristics of the clinical picture explain the difficulty and delay in diagnosis, as observed by Anderson [3]. Blood investigations and radiographs are also nonspecific which can be normal at the early stage, as in our case. Subsequently signs of bone destruction and osteolysis appear [5].

The CT scan and Magnetic Resonance Imaging (MRI) have roles in making the early diagnosis in such unusual sites. CT scan reveals the extension of lesions and bony destruction. MRI shows bone destruction sites at a precocious stage [5]. Similar MRI findings can also be seen in osteochondritis dissecans of the talus. So confirmation is only by identifying the bacillus from the local lesion or by a histo-pathological study of the sequestra [4].

The aim of surgical treatment is two-fold. Firstly, to confirm the diagnosis by obtaining tissue for bacteriological and histological examination and secondly, to curette the lesion and decrease the bacterial load and fill the defect with bone graft or substitute. This treatment should always be complemented anti-tubercular chemotherapy with initially plaster cast immobilization, followed by physiotherapy [4]. The anti-tubercular regime is continued till 12-16 months which will results in favorable outcome despite the delay in diagnosis. Chemotherapy was instituted for a longer period primarily in consideration of the increased prevalence of tuberculosis in India. The prognosis in this disease and its resolution depends on early diagnosis and treatment.

Fig 1 – Pre-operative AP (a) & lateral (b) radiograph of ankle joint showing lytic lesion in talus which is hypointense on MRI T1 image (c). Intraoperative photo showing the lesion in talus (d)



a b c d

Fig 2 – Post-operative AP (a) & lateral (b) radiograph and clinical photos (c, d & e) after one year of treatment.

a b c d e

Conclusion

Talus tuberculosis is very rare entity and tuberculous osteitis of the talus should be considered in any long-standing inflammatory symptoms in the ankle. The symptoms are often vague, leading to late diagnosis. Rarity of the lesion and atypical presentation makes tuberculosis of the talus a difficult diagnosis on clinical grounds. A normal ESR and negative Mantoux do not help either. This case has been reported to highlight the unusual skeletal manifestations of tuberculosis so as to prevent its misdiagnosis and delayed treatment. In patients with local involvement of the talus but favorable outcome can be achieved with surgical treatment by curettage and debridement and prompt chemotherapy.

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Sprengel Shoulder treated with modified Green's procedure

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Abstract

Case report: Sprengel shoulder or congenital elevation of the scapula is a rare condition of unknown aetiology that results from the abnormal termination of the caudal migration of the scapula. The main clinical changes are the hypoplasia and abnormal positioning of the scapula, causing cosmetic problems and limit the movements of the shoulder girdle. We report such a similar case of 6 years old child presenting with high ridging scapula, who had pain, difficulty in caring school bag and cosmetic deformity. He was successfully treated by modified Green's procedure.

Keywords: Sprengel shoulder, Scapula, congenital elevation of scapula

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Introduction

Sprengel shoulder, which is characterized by congenital high riding scapula, is a rare complex deformity of shoulder griddle [1]. It is diagnosed as upward elevation of scapula in relation to thoracic cage or abnormally high placed scapula. Eulenberg, first described this condition of undescended scapula in 1863, and claimed its cause as traumatic dislocation of the scapula [2]. Later, it was Otto Sprengel who described the pathology and proposed a theory of its existence in 1891. The scapular embryonic primordium appears in 5^{th} intrauterine week at the level of 4^{th} to 5^{th} cervical vertebrae & acquires its final morphology by 8^{th} week of gestation & descends till 12^{th} week over the upper 5 ribs to reach the correct anatomical position. This failure to descend leads to sprengel deformity [3].

The exact cause of the interruption of the normal caudal migration of the scapula during fetal development is unknown, but different theories have been postulated, like cerebrospinal fluid leak through the membranes of the roof of the fourth ventricle into the adjacent tissues of the neck, increased intrauterine pressure, and abnormal articulation of the scapula to the cervical vertebrae with abnormal muscle formation (fibrous, cartilaginous, or osseous omovertebral) [4].

Females are more affected and it is bilateral in about 10-30% with a predilection to left side. It can be part of other congenital anomaly. It is associated with severe cosmetic deformity and functional leads to limitation of shoulder movements [5]. We report such a rare case of isolated congenital sprengel shoulder with was treated by Green's procedure successfully.

Case Report

A 6 year old male child visited to us in outdoor patient department with complains of visible deformity of left shoulder. The child was delivered by full term normal vaginal delivery. He had full immunization completed. Parent and child denied any other complain present, other than the deformity. Familial history was unremarkable for any congenital disorder. On detailed history, the deformity and asymmetry of shoulder folds was observed by the parents at the age of one year of the child but they did not take any treatment. Gradually, the deformity is increasing and has grown to its current size which is not cosmetically accepted

to the parents as well as the child. There is also difficulty in dressing up himself as well as difficulty in carrying his school bag. Child would complain of pain in left shoulder after returning from school.

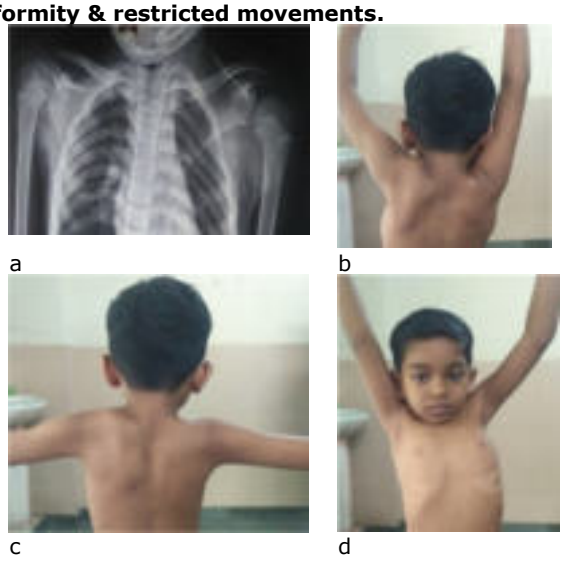
On clinical examination, there was asymmetrical elevation of the left shoulder fold compared to the right side, which was visible both from front and back. Since the deformity was severe, initial inspection gave impression of congenital short neck with torticollis as well, but careful examination after proper exposure showed no torticollis although slight deviation of head towards left side was noted. His neck and its movements were normal. Inspection from back showed that inferior angle of both the scapula was at different level with left side higher up than right. Also the inferior angle of left scapula was medially displaced. Deformity was firm hard in consistency and mobile.

Range of motion on left side, particularly, overhead abduction, external rotation and overhead elevation of shoulder was reduced grossly, compared to contralateral side and rest of the shoulder was normal. He had weakness pectoralis major muscle and serratus anterior muscle as seen as winging of the right scapula. Neurological examination as well as all other systemic examination was found to be absolutely normal.

Routine radiographs were done including a chest radiograph PA view, axillary view and a scapular view. Radiographs showed high riding of the left scapula with superior angle of left scapula reaching almost level of C4 cervical spinal level (fig 1). Also the scapula was medially rotated and adducted. No abnormality was noted in left clavicle or head of humerus. Cervical rib or fusion of cervical vertebrae was absent.

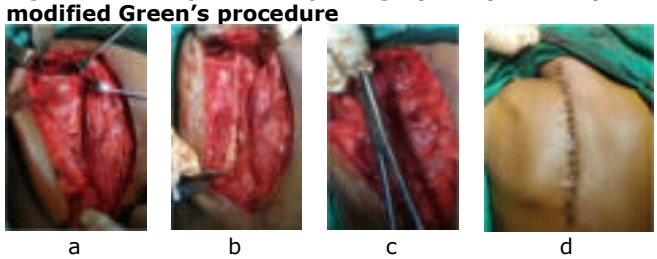
After routine haematological investigations and pre-anaesthetic work up patient was planned for scapulopexy by modified Green's procedure. In general anaesthesia, in prone position the scapula was opened by dorsal midline approach extending from base of neck to inferior angle of scapula. Soft tissue dissected to undermine laterally toward the medial border of scapula. Lateral border of trapezius was identified and was separated from underlying latissimus dorsi by blunt dissection. Using an osteotome trapezius is released from spine of scapula and retracted. Rhomboideus major and minor are released from their insertion at lateral border of scapula. Omovertebral bar was identified and resected, and contracted levator scapulae muscle was released from supraspinous part of the scapula. Scapula was displaced distally into the pocket in latissimus dorsi along the attached muscles and holding scapula in this position trapezius, rhomboideus major and minor are reattached to spine of scapula and medial border of scapula respectively using non absorbable sutures (fig 2). Immediate post-operative radiograph of patient showed descended scapula with its superior angle at C7 level.

Fig 1- Pre operative radiographs AP view (a) of chest and both shoulder showing high riding scapula on left side and clinical photographs (b to d) showing deformity & restricted movements.



a b c d

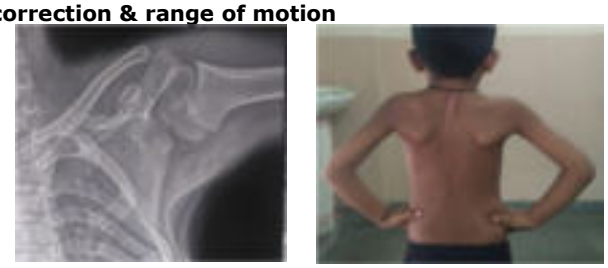
Fig 2- Intraoperative photographs (a to d) of modified Green's procedure



a b c d

Post-operatively, patient was given a shoulder immobiliser for 2 weeks, following which suture removal was done and shoulder range of motion was started. Patient showed good recovery with a 2 month follow up showing both the inferior angle of scapula at same level as well as significantly increased shoulder range of motion (fig 3).

Fig 3 - Post-operative AP (a) X ray of shoulder gridle & clinical photograph (b) showing good cosmetic correction & range of motion



a b

Discussion

Sprengel shoulder occurs due to inadequate caudal movement of scapula during development resulting in an abnormally high placed scapula, which can be unilateral or bilateral [1-4]. This high position of the scapula in the process of skeletal development leads to changes in axial rotation, shape, and size and other musculoskeletal defects including hypoplasia, medialization, and adduction of the scapula, prominence of its upper angle, distal rotation and lateral angulation of the glenoid cavity, changes in the position of the clavicle, omovertral bar (ossified fibrous band between cervical spine with the undescended scapula), anomalies of the cervicothoracic vertebrae and ribs, and muscular hypoplasia or atrophy of the shoulder musculature [6]. Thus although, the deformity commonly occurs sporadically, but it can occur in combination with other congenital anomalies, such as congenital scoliosis, spina bifida, fusion of cervical vertebrae, like Klippel-Feil syndrome, kidney abnormalities and cleft palate [7,8]. But we did not find any associated anomaly with our patient.

This dysplasia of the pectoral girdle results in cosmetic and functional disability and each case needs to be individualized depending on the degree of anomaly as well as associated defects. The cosmetic classification of Sprengel deformity, based on deformity grade was given by Cavendish in 1972, whereas the radiographic classification based on superio-medial angle was given by Rigault [9,10]. Cavendish grade 1 is a very mild deformity that is not noticeable when the patient is dressed. Grade 2 is a mild deformity that is visible as a lump in the web of the neck when the patient is dressed. Grade 3 is a moderate deformity described as an easily visible deformity with the shoulder joint elevated 2–5 cm. Grade 4 is a severe deformity with shoulder joint elevation greater than 5 cm or evidence of the superior angle of the scapula near the occiput with or without webbing. Radiographic Rigault grade 1, is superio-medial angle lower than T2 but above T4 transverse process, in grade 2 the superio-medial angle is located between C5 and T2 transverse process and in grade 3, the superio-medial angle is above C5 transverse process. Our case was Cavendish type 4 and Rigault type 3, which was severe deformity. The CT scan, particularly with 3D reconstruction, is a more useful diagnostic tool for thorough assessment and preoperative planning of the surgical strategy, but in our case we could not do a CT scan [11].

The treatment for Sprengel deformity is done for improvement in appearance and function and depends on the severity of the abnormality. For mild deformities as Cavendish Grades 1 and 2, nonsurgical options including physical therapy, stretching, and continued observation are done to prevent torticollis and increase range of motion. Moderate and severe deformities i.e. higher Cavendish classification grades are candidates for surgical intervention. The optimal age for surgical correction is recommended to be usually between 3 and 8 years [9,12]. Many procedures are described for treatment of Sprengel shoulder like osteotomies, bone resections, muscle releases with repositioning of the scapula, or a combination of these etc, but the hallmark techniques involve caudal relocation of the scapula and resection of the omovertebral bone, if present [12].

Two of the most popular procedures are the Green's and Woodward procedures. Both procedures involve detaching muscles of scapular origin, resection of the elevated portion of the scapula, removal of the omovertebral bone, and mobilization of the scapula to a more caudal position and reattachment of the muscles distally to help secure the lowered scapula. The Woodward procedure adds an osteotomy of the clavicle, whereas the Mears procedure also releases the long head of the triceps and part of the origin of the teres minor muscle, and progressive resection of the inferio-medial portion of the scapula to achieve abduction [13-15]. We contemplated the modified Green's procedure

by Leibovic et al in which the scapula is kept lowered by sutures in pocket made in the latissimus dorsi muscle [16]. This method is usually the treatment of choice which provides excellent repositioning of the scapula to a more normal position and achieves good postoperative results, even with limited supervised physical therapy.

Surgical complications described include scar-related complications, brachial plexus palsy, brachial neuritis, winging of the scapula, re-growth of the resected omovertebral bar, recurrence of the deformity and prominence of the sternoclavicular joint [12-16]. To prevent the complications of brachial plexus palsy, either osteotomy of clavicle or avoiding excessive correction is advised. Our patients at the last follow-up had got excellent cosmetic correction and increased range of motion without any complications.

Conclusion

Sprengel shoulder is a rare congenital deformity, which occurs due to failure of the scapula to descend during intrauterine development. It can lead to cosmetic problems and limitation of movements, but is accurately diagnose by plain x rays. Milder forms can be treated conservatively, whereas surgical correction is needed for severe variety.

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