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INDEX

Ethics and principles for Orthopaedic Surgeons

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Since, the number of orthopaedic surgeons is increasing, competition to get patient and money is also increasing. Everybody talks about ethics and principles, but nobody follows them. The American Academy of Orthopaedic Surgeons (AAOS) developed The Principles of Medical Ethics for the orthopaedic surgeons for the betterment of the patients.

Orthopaedic surgeon should know that they are the role models for orthopaedic residents and other health care professionals and should by their actions comply with the ethics and principles. Orthopaedic surgeon should follow a reputation for truth and honesty in all professional conducts. They are expected to provide competent and compassionate patient care and maintain the patient's best interest. Orthopaedic surgeon should avoid unethical practice like giving money to Public Relation Officers (PROs) and General Practitioners (GPs) of villages and small towns to get patients. In India, most of the orthopaedics patients are referred by general practitioners, so it becomes inevitable to give money to get patients in private practice. Since, lot of money is involved in orthopaedic surgery, most of the doctors and private hospitals give money to general practitioners to get patients. This malpractice should be stopped, and a healthy atmosphere should be created for the next generation.

Orthopaedic surgeon should promote their own physical and mental wellbeing by maintaining healthy lifestyle. There should not be any conflict of interest with the patient. Orthopaedic surgeon should not involve in any financial interest in medical shops, diagnostic centres, or any pathology lab. Fair charges of surgery and hospital should be taken from the patients for the better patient doctor relationship. Orthopaedic surgeon should continuously maintain and improve the medical knowledge by participating in relevant continuing medical education activities.

Good relationship with other colleagues and staff is essential for good patient care. The professional conduct of the orthopaedic surgeon may be scrutinized by local professional associations, hospitals, organizations, peer review committees and state medical licensing boards.

It is unethical to orthopaedic surgeon to charge extremely high for surgery as it causes burden to the patient and society. Some services should be provided to the needy patient at free of cost. Activities that have the purpose of improving the health and wellbeing of the patient and community in a cost-effective way should be done by the interest, support and participation of the orthopaedic surgeons.

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Reference

1. www.aaos.org codes of ethics and professionalism for orthopaedic surgeons.

A Prospective Analysis of Functional Outcome of Surgical Stabilization of Distal End Radius fractures with Plate Osteosynthesis.

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Abstract

Introduction: Distal radius fractures (DRF) are the most common fractures of the upper extremities and due to population explosion, with an ageing society & enormous increase of high-speed motor vehicle accidents, the number of distal radial fractures can be expected to increase in the coming decades. Plate osteosynthesis has become the standard treatment for comminuted intra articular DRF. Main aim of this study was to analyse the functional outcome in patients stabilized by plate osteosynthesis with minimum follow up of 6 months.

Material and Methods: A prospective study was done on 46 patients with distal radius fractures who were operated with plate osteosynthesis, type of plate was decided as per fracture pattern and followed up at 1, 3, and 6 months and outcomes measured using Modified Mayo score, Grip strength tested by Dynamometer.

Observations: Volar plating was done in 34 patients; dual plating was done in 4 patients dorsal column plating was done in 8 patients. Average time of radiological union of fracture was 10 weeks, average time of clinical union of fractures was 8 weeks, average time to return to normal activity was 3 weeks, average time to return to professional activity was 4 weeks.

Results: According to Modified MAYO score 18 patients had excellent results, 10 had good results, 8 had fair and 4 had poor results. Grip strength was >80% compared to normal side in 29 patients, >60% in 8 patients and, <60% compared to normal side in 3 patients measured with a Dynamometer at 6 months.

Conclusion: Fractures of distal end radius managed with plate osteosynthesis is a good treatment modality with excellent results provided the surgeon has a sound knowledge of literature and a good surgical hand.

Keywords: distal end radius, plate osteosynthesis.

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Introduction

Distal radius fractures (DRF) are the most common type of fracture of the upper extremities and incidence is expected to rise due to a growing elderly population[1]. Especially women have a 15% higher life time risk of DRF, than men of similar age. In addition, DRF in the elderly are often associated with poor bone quality and osteoporosis[2-4]. Historically, DRF were conservatively treated by closed reduction and immobilization or K-wires. Following the introduction of angular stable locking plates and the excellent results using internal fixation, a treatment shift occurred away from K-wires or external fixator to plate osteosynthesis. Thus, displaced DRF (Barton fractures) can be stabilized from plate osteosynthesis. In addition, stabilization by

plate osteosynthesis provides enough stability to enable early active wrist rehabilitation without immobilization. Multiple studies showed a significantly improved functional outcome compared to immobilization and an early mobilization post-surgery has no increased risk of secondary loss of reduction and complications[8-10]. As incidence of DRF rises and the number of patients treated by plate osteosynthesis increases, literature remains interested in the optimal treatment method, clinical outcomes and complication rates[10,11]. Complication rates after palmarly stabilized DRF are reported up to 39% and complication rates after dorsally stabilized DRF are reported upto 28%[(17)] whereas other studies documenting outcome after DRF showed good functional and radiological results[5,8,12-15].

Main aim of this study was to evaluate the functional outcome in cases of fracture distal end radius treated by open reduction and internal fixation using different plates decided according to fracture pattern and to study the complications related to the use of these plates.

Materials and methods

Institutional review board and Institutional Ethical approval was obtained for this prospective follow-up study. All patients treated with plate osteosynthesis from 01 January 2021 to 31 June 2022 that met inclusion/excision criteria, were included in this study and invited in writing and by telephone to attend the follow-up investigation. Three invitation letters were sent to each patient. Failure to reply after the third invitations was classified as a non-responder. Written informed consent was obtained from all participating patients. They were treated exclusively at our hospital, NSCB Medical College and Hospital, Jabalpur.

Indications for surgery included a displaced DRF with a dorsal tilt of more than 15 degrees, an intra-articular step of more than 1 mm, a radial shortening of more than 2 mm or an incongruency in the distal radioulnar joint in the standard radiographs.

Inclusion criteria included patients (aged between 18 years and 55 years) with unstable, comminuted or intra articular and extra articular fractures of distal end radius.

Exclusion criteria included patients aged below 18 years, patients medically unfit for surgery, pathological fractures, compound fractures, patients who are not willing for surgery. and trauma cases > 4 weeks.

From 2021 to 2022, a total of 46 patients were stabilized by plate osteosynthesis. Of these, 34 patients were stabilised with volar plating 8 patients with dorsal plating and 4 with dual plating. Out of 46 patients 40 were followed up for 24 weeks and 6 patients were lost, 4 at 8th week and 2 at 12th week. Therefore, the final analysis totalled 40 patients.

All procedures were performed using either general or regional anesthesia in a supine position, with fluoroscopic assistance and a pneumatic arm tourniquet of 250 mmHg. A standard Modified Henry's approach between the flexor carpi radialis tendon and radial artery was chosen for volar plating. The flexor carpi radialis tendon was retracted ulnarly and the forearm fascia was dissected. The pronator quadratus was incised radially and elevated of the radius.

For dorsal approach about 8 cm midline incision taken (halfway between radial and ulnar styloid) which can extend proximally or distally as needed subcutaneous fat incised in line with skin incision to expose extensor retinaculum, extensor retinaculum incised over the extensor digitorum communis and extensor indicis proprius (fourth compartment) tendons are mobilised radially and ulnarly to expose the underlying radius and joint capsule, the joint capsule is incised longitudinally on the dorsal radius and carpus dissection is continued below the capsule (dorsal radiocarpal ligament) toward the radial and ulnar sides of the radius to expose the entire distal radius in dorsal approach.

The fracture was reduced under image intensification and, when necessary, temporarily fixed with K-wires. The plate was placed and initially fixed with a bicortical screw through the gliding hole. After ensuring exact

positioning of the plate under image intensifier, the remaining plate holes were filled with angular stable screws. Care was taken that the screws at the articular surface were placed subchondrally to prevent dorsal protrusion. Screw length was taken 2 mm shorter to prevent protrusion.

In 34 patients volar plating was done in 8 patients dorsal plating was done and in 4 dual plating was done. Routine antibiotics and anti-inflammatory drugs were given. Check x-ray were taken on 3rd postoperative day after Check Dress 1. Sterile dressings were done on 3rd and 5th postoperative day. Sutures were removed on 10th to 15th post operative day and patient were discharged with below elbow pop slab. Patients were assessed clinically and radiographically at 8 weeks, 12 weeks, and 24 weeks to assess the fracture union and the progress of patients recovery were documented. All patients started hand therapy of the free joints (shoulder, elbow, fingers) for both upper extremities on the first postoperative day. After slab removal the wrist was then included in physiotherapy programme.

Outcome evaluation each of the patients, who returned for the follow-up investigation, underwent a standard X-ray of the wrist in two planes (anteroposterior and lateral view. Range of motion (ROM) was measured in palmar flexion, dorsi flexion, supination, pronation, radial- and ulnar deviation at the follow-up investigation. Demographic data included age, gender, injured hand, mode of injury and interval between surgery and follow-up. In addition functional outcome analysed with Modified Mayo score and Demerit Point System of Gartland and Werley, grip strength by dynamometer were analyzed.

All the intraoperative and postoperative complications that were documented in the surgical write ups were recorded and each return evaluation was analysed for complication. Complex regional pain syndrome (CRPS) was diagnosed clinically based on the Veldman's criteria [16,17]. Frequency and causes of complication were analysed.

The primary (pre-reduction), immediate postoperative as well as final radiographs were checked for alignment and intra-articular step-of. The fractures were classified according to the Frykmann classification. An acceptable reduction was defined as 10 degrees of dorsal tilt, 15 degrees in radial inclination, 2 mm ulnar variance and 2 mm of articular incongruity [12,18]. In the anteroposterior radiographs, radial inclination and radial length and in the lateral radiographs, the palmar tilt was measured [19] Fracture healing was defined as bony bridging of the radial, ulnar, and dorsal cortical aspects of the distal part of the radius [12] . The lateral X-ray verified the plate position and was subsequently classified according to Soong et al. in Grade 0, I and II. [20]

The statistical analysis was performed by SPSS 23.0 (Statistical Package For Social Sciences). This was a prospective study. Descriptive statistics were performed to all study variables. Continuous variables are described as mean and standard deviation. Categorical variables were described as frequency and percentage and were described with graphs, bar charts and pie charts. To compare scaled parameters Paired t-test was used. Chi-square was used for testing categorical data. If p value <0.05 data was considered significant at 5% level of significance and if p value ≤0.01 was considered significant at level of significance.

Results

A total of 46 patients (28 males, 18 females) returned for the follow-up investigation with a mean ± SD age of 34.71 ± 6.80 years (range 18-55 years) and follow-up of 6 months. Detailed demographic data is presented below.

In our study the average radial inclination preoperatively was 7.76±5.8 degrees, the average postoperative radial inclination was 18.2±3.3degrees. The average radial inclination achieved was 10.44 degrees study. Preoperative mean radial length 3.66±1.79 mm was observed preoperatively with an immediate postoperative radial length of 9.08±1.65 mm, we achieved a mean correction of 6.15±2.66 mm during the surgical procedure. The preoperative mean volar tilt was -17.1±7.82 degrees and mean postoperative volar tilt was 6.95±4.54 degrees

the total correction achieved was 19.63±7.56 degrees the higher degree of correction achieved was due to the fact that the dorsal tilt was expressed in negative value and hence the correction achieved was greater than the normal range (0-11degrees). **(Table 1)**

Table 1. Detailed functional outcome measuring range of motion.

Movements	N	Min	Max	Mean ± SD
Week- 8 Pronation	46	51	80	65.61 ± 8.60
Week- 12 Pronation	40	58	100	82.30 ± 10.70
Week- 24 Pronation	40	68	135	111.35 ± 18.40
Week 8 Supination	46	15	32	23.35 ± 4.61
Week 12 Supination	40	24	42	34.98 ± 5.40
Week 24 Supination	40	28	41	36.5 ± 2.9
Week 8 Palmar Flexion	46	15	41	24.76 ± 6.34
Week 12 Palmar Flexion	40	24	49	37.90 ± 5.7
Week 24 Palmar Flexion	40	29	70	54.55 ± 8.80
Week 8 Dorsi Flexion	46	16	39	25.04 ± 5.70
Week 12 Dorsi Flexion	40	26	49	39.83 ± 5.54
Week 24 Dorsi Flexion	40	29	69	55.33 ± 8.37
Week 8 Radial Deviation	46	4	10	7.04 ± 1.67
Week 12 Radial Deviation	40	6	12	10.63 ± 1.46
Week 24 Radial Deviation	40	9	18	14.65 ± 2.30
Week 8 Ulnar Deviation	46	9	18	14.02 ± 2.22
Week 12 Ulnar Deviation	40	12	25	20.40 ± 2.75
Week 24 Ulnar Deviation	40	14	30	25.78 ± 3.93

The mean range of motion achieved in our study was as follows palmar flexion of 54.55 ± 8.80 degrees, dorsiflexion of 55.33 ± 8.37 degrees, radial deviation of 14.65 ± 2.30 degrees, ulnar deviation of 25.78 ± 3.93degrees, supination of 55.55 ± 57.99degrees, pronation of 111.35 ± 18.40degrees. these results were taken at 6 months postoperatively and were compared with the normal side, they required 18.2±16 physiotherapy sessions to attain range of motion described at 6 months. **(Table 1)**

Using the MODIFIED MAYO score, we had 18 (45%) excellent results, 10 (25%) good results, 8 (20%) fair results and 4 (10%) poor results with a mean ± SD Modified Mayo score of 85.6 ± 10.21.

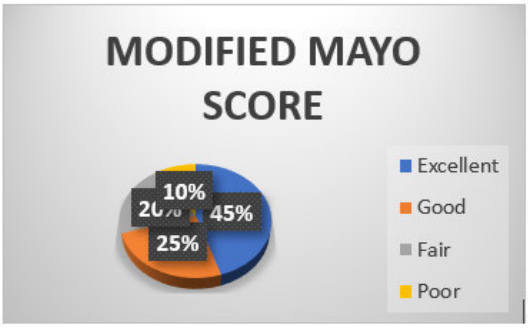

Figure 1 Figure 1. Figure showing Using the MODIFIED MAYO score, we had 18 (45%) excellent results, 10 (25%) good results, 8 (20%) fair results and 4 (10%) poor results with a mean ± SD Modified Mayo score of 85.6 ± 10.21.

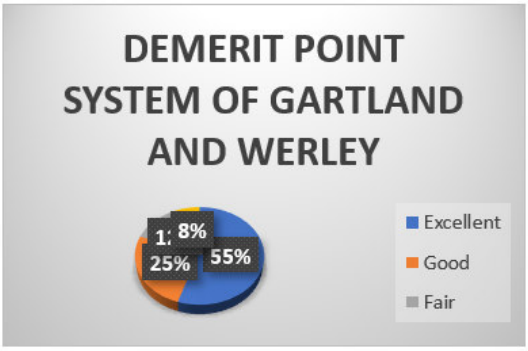

Figure 2. According to Demerit point system of Gartland and Werley we had 22 (55%) excellent results, 10 (25%) good results, 5 (12.5%) fair results, 3 (7.5%) poor results with a mean±SD of Demerit Point System Of Gartland and Werley of 7.23 ± 5.39.

Table 2. Functional outcome using scoring systems.

Score	N	Min	Max	Mean ± SD
Modified Mayo Score	40	59	97	85.6 ± 10.21
Demerit point system of Gartland and Werley	40	1	19	7.23 ± 5.39

A total of 8 complications (17.3%) occurred in 46 patients. Most common complications included CRPS in 4 patients (8.7%). Complications are summarized in **Table 3** below.

Table 3. Percentage of complications.

CRPS	4	8.7
Median Nerve Entrapment under Surgical Scar	1	2.2
Dorsal Tendon Attrition	1	2.2
Superficial Wound Infection	2	4.3
No Complication	38	82.6
Total	46	100.0

Intra articular fractures showed the highest complication rate of 7/34 (20.5%), whereas 1/12 (8.4%) were found in extraarticular fractures. Median Nerve Entrapment under Surgical Scar was found in 1 patient which was confirmed by ultrasonography and was managed with excision of surgical scar followed by median nerve neurolysis and carpal tunnel release it showed a complete regression. All patients with CRPS were treated conservatively with splinting, hand therapy, dimethylsulphoxide (DMSO) ointment, non-steroidal anti-inflammatory drugs and vitamin E. Superficial wound infection was observed in two patients, which was treated conservatively with antibiotics and splinting.

Dorsal tendon attrition was found in one patient of dorsal plating who was managed with hardware removal after radiological union. No significant differences could be found in incidence of complications and plate type (p=0.22), age (p=0.47], gender (p=0.50), or post-operative immobilization [cast/thermoplastic splint (p=0.31)].

Discussion

Distal radius fractures are one of the most common fractures in the upper extremities and the incidence is expected to continue rising due to the growing elderly population[22]. Since the introduction of plate osteosynthesis in the early 2000s plus the initial reports of low complication rates and good functional outcomes, plate osteosynthesis has gained popularity in treating DRF[5.46.47].

Palmar locking plate fixation enables a stabilization of dorsally displaced fractures without the increased risk of tendon irritation compared to dorsal stabilization[5,6,23]. Fixation of DRF provides enough stability to allow an early rehabilitation with active wrist mobilization. Thereby, better functional outcomes can be achieved in the early rehabilitation phase without the increased risk of a loss of reduction or further complications[10,24]. Therefore, functional outcome and reported complications after operatively treated DRF remain current in the literature including a comparison of the various available treatment options[7,25]. Today the optimal treatment options for DRF are under debate, but a recent Network Meta-analysis concluded, that plate fixation offers the best results in terms of early functional outcome and reduction of fracture healing complications. Patients in this study, with a mean age of 34.7 years and a minimum follow-up of six months showed a good functional and in mean an "acceptable" radiological outcome. The Modified Mayo Score averaged 86 points and Demerit Point system of Gartland and Werley 7 points.

Each patient's MODIFIED MAYO score were taken at 8 weeks, 3 months and 6 months interval along with range of motion. Phadnis J et al in 2011 to report the functional outcome of a large number of patients at a significant follow up time after fixation of their distal radius with a volar locking pate reported 74% of the patients with good or excellent DASH and MODIFIED MAYO score. Statistical analysis showed that no specific variable including gender, age, fracture type, post-operative immobilisation or surgeon grade significantly affected outcome. Complication occurred in 27 patients (15%) and in 11 patients was major (6%) study demonstrated good to excellent results in the majority of patients after volar locking plate fixation of the distal radius, with complication rates comparable to other non-operative and operative treatment modalities and recommended this mode of fixation for distal radius fractures requiring operative intervention. Rozental et al. showed mostly good and excellent functional outcomes in 45 patients at 17 months mean follow up. Like our study these both showed good to excellent functional outcome using the MODIFIED MAYO score. Rohit Arora et al. used modified Green and Obrein score and reported 31 excellent, 54 good, 23 fair and 6 poor results. Minegishi H et al in 2011 to evaluate the functional and radiological results of treating unstable distal radius fractures with the volar locking plated

among 15 patients reported 5 patients with excellent outcome, 7 with good outcome, and 3 with fair outcome according to Cooney's clinical scoring chart. K .Egol et al showed a mean Modified MAYO of 78.2±7.7 in external fixator group and 87±4.9 in volar plating group at 12months, but their functional MODIFIED MAYO score at 6 months was 72.6±23.8 in external fixator group ,89.0±21.7 in plating group at 3 months interval their DASH scores was 71.4±21.1 in external fixator group and 89.5±2.1 in plating they did not compare MODIFIED MAYO scores at 8 weeks interval. Adani R et al evaluated MODIFIED MAYO scores sequentially weekly upto 12 weeks and at final examination they reported 94.6±6.3 in the conventional group and 96.2±6.8 in the MIPPO group at 12 weeks. Jirangkul P et al recorded a modified MAYO score 87±7 at 6weeks in ORIF group and 73±28 in CRPP group at 6 weeks they reported a MODIFIED MAYO score 89±13 in ORIF group and 74±23 in CRPP group at 12 weeks with significant P value of 0.01 they recorded another MODIFIED MAYO score at 1 year in which the ORIF group fared with 4±8 score and CRPP fared 9±18 with no significant P value. Ballal A et al reviewed 20 patients, five patients had excellent modified Mayo wrist score, 9 had good scores, 4 had satisfactory and two patients had poor results. Seven patients had a RUSS score less than five points and four patients had RUSS score of five points, four patients had six points, two patients had seven points and three patients had eight points. One patient was noted to have dorsal collapse of the fracture during the final review. But, no evident of cosmetic deformity or any diminution in functional outcome of wrist was noted. In present study MODIFIED MAYO score at 6months follow up is 85.6 ± 10.21.

Sohael M. Khan et al recorded a DEMERIT POINT SYSTEM OF GARTLAND AND WERLEY score of 3.75 in ORIF group and 7.55 in CRPP group at 36 weeks with significant P value of <0.05. in their study 70% patients had excellent results, 20% patients had good results and 10% had fair results. In our study 22 (55%) patients had excellent results, 10 (25%) had good results, 5(12.5%) patients had fair results and 3(7.5%) patients had poor results. Mean Demerit Point system of Gartland and Werley at the end of 6 months follow up was 7.23 ± 5.39.

Complications after plate osteosynthesis for DRF are well reported in the literature. First reports from Orbay et al. suggested a complication rate of 3%[26], respectively 4%[27] but later studies reported complications up to 60% [5,7,21,25]. In a recent systemic review Alter et al.[25] analyzed complications, they reported a complication rate of 15% in 3.911 operatively treated DRF with palmar locking plate. Jie Wei et al in 2013 ( ) did a meta analysis and found that dorsal fixation offers a lower risk of neuropathy and carpal tunnel syndrome than the volar approach, but a higher risk of tendon irritation. Patients with a distal radius fracture can expect similar outcomes after volar or dorsal surgery. Complication rate of 17.4% in this study is comparable to previously published studies and the low complication rate reflects the familiarity with the implant and large numbers of treated DRF by plate osteosynthesis (average 262 DRF per year). The most common complications in this study included CRPS (8.6%) and superficial wound infection (4.3%). No significant impact on the complication rate could be found for age, gender or type of post-operative immobilization. Occurrence of a complication showed no significant or clinical important influence on the final functional outcome. Intra-articular screws are also frequently reported in the literature between 0.5 and 1.3%[5,28] and not only caused by malpositioning, but also due to loss of reduction or secondary fracture dislocation. Even the use of angular stable screws does not preclude secondary displacement[5]. Intra-articular screw penetration can result in a destruction of the radiocarpal joint, causing malunion, osteoarthritis and clinical failure. CRPS is closely associated to fractures of the distal radius with an incidence between 1 and 6%[5], but is also commonly seen in injuries to the upper extremities (most commonly in DRF)[5,25,29,30]. However, it remains a clinical diagnosis and the pathomechanism is still not fully researched. This may, however, be related to an over excretion of cytokinins, mitochondrial dysfunction in the affected

upper extremity, as well a genetic predisposition does exist[31,32]. We agree with Esenwein et al. that CRPS is a complication, that cannot be influenced by the surgeon[5]. Some of the limitations should be addressed before interpreting this study. The study included a total of 46 operatively treated DRF in the study period as due to COVID-19 the number of accidents and number of patients visiting the hospitals decreased significantly. Of these 6(13%) couldn't be followed-up for several reasons. Thus, clinical results and complication rate could be biased. On the one hand, one might assume that patients who do not return have no complications and are asymptomatic, indicating that the complication rate is overestimated and the clinical results are better than reported. Alternatively, patients with complications or problems could simply have gone to another hospital. In addition, there is no unique definition in the literature for an "acceptable" postoperative radiological result and a wide range for cut-of values does exist. It would be desirable, that further studies focus on specific cut-of values to determine which radiological parameters would affect range of motion. At the follow-up radiographs were only taken of the injured wrist and not from the contralateral wrist. Therefore, no comparison with the uninjured wrist was possible. This might explain the discrepancy in the results in ulnar variance, showing a significant correlation to grip strength and range of motion, but no differences between an unacceptable and acceptable ulnar variance. Further studies should consider this issue and investigate the impact of radiological differences between the injured and healthy wrist. Another limitation is that the study was not focused on one particular outcome parameter (e.g., Modified Mayo Score at the last follow-up), resulting in multiple testing. P-value had to be corrected and therefore, the study might be underpowered in some subgroup analyses. At the final follow-up examination, the X-rays of only 2/46, respectively, 3/46 patients showed an unacceptable palmar tilt or radial inclination. Due to the small sample size a comparison between an acceptable and unacceptable radiological result depending on functional outcome was not possible.

The minimum follow-up interval of this study was six months. Therefore, not all complications that typically occur later, for example, tendon rupture, are covered in this study.

Conclusion

Due to aging society, & enormous increase of high-speed motor vehicle accidents, the number of distal radial fractures can be expected to increase in the coming decades. In this study, forty six cases of distal radius fractures who were treated with open reduction and internal fixation with plate osteosynthesis were followed up and functional outcomes were analysed and discussed. From this sample study, we conclude that plate osteosynthesis provides successful results for the treatment of both extra articular and intra articular unstable fractures of distal radius. This method allows restoration of the anatomy, stable internal fixation, a decreased period of im-mobilisation and early return of wrist function. This method, which is effective in anatomic realignment, allows early joint motion, owing to its fixation strength. In the subjects of our study, a successful anatomic alignment was acquired, regardless of the direction of fracture angulation. The patients who were young adults in majority, went back to their daily activities with 90% recovery. Close placement to joint interface and screwing capability in different orders are biomechanical superiorities of a locking plate. The pre-contoured anatomical LCP not only provide restoration of radial length but also helps in stabilizing angulation. They maintain intra-articular congruity thus reducing radio carpal arthritis and decrease in grip strength. They also provide quicker recovery and better functional range of movement and provide better fixation in a osteoporotic bone. In our study excellent to good results suggests that stabilizing the fracture fragments with locking plate is an effective method to maintain the reduction till union and prevent collapse of the fracture fragments, even when the distal radius fracture is grossly comminuted intra-articular / unstable and or the bone is osteoporotic. It is a simple and reproducible procedure that improves recovery from this common injury. The technique emphasis that

ORIF with plating has excellent functional outcome with minimal complications thus proving that it is the prime modality of treatment for distal radius fractures. The procedure is applicable for AO types A, B and C fractures of the distal radius, in young patients with a good bone stock as well as in elderly osteoporotic patients. In conclusion, we looked at Functional results of locking compression plates and found an improved range of movement and radiological outcome at eight, twelve and twenty-four weeks follow up. Thus, this study demonstrates that with the execution of good surgical techniques, including proper plate position, proper insertion of screws and avoidance of past pointing, and proper patient selection, a satisfactory functional and radiological outcome can be obtained for a great majority of patients with most of the distal radius fracture's (incl. Complex intra-articular) by using a locking plate fixation.

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Uncemented Total Hip Replacement with impaction bone grafting in Protrusio Acetabuli in AVN hip

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Study performed at Department of Orthopaedics, R. D. Gardi Medical College & C. R. G. Hospital & Associated Charitable Hospital, Ujjain MP

Abstract

Background and Aim: Protrusio acetabuli is a central acetabular defect resulting from migration of femoral head medial to Kohler's line. Idiopathic central displacement of femoral head within the acetabulum is quite rare. However, it may be seen in arthritic hips secondary to rheumatoid arthritis, ankylosing spondylitis, previous trauma, osteomalacia, etc. Primary Total Hip Replacement (THR) in such cases is difficult because of the deficient medial bone, decreased peripheral bony support to the acetabular component and proximal and medial migration of the joint centre. Several techniques described previously in the surgical management of protrusio acetabuli include cemented acetabular components with cement alone or in association with morselized bone graft to reconstruct the acetabulum. However, cement has high rates of migration and loosening of cemented acetabular components in young patients leads to more revision surgeries within the first decade of implantation. The purpose of the study is to describe the technique and results of using impacted morselized bone graft with a porous coated cementless acetabular component in patients with protrusio acetabuli.

Material and methods: A total of 20 primary THR's (10 unilateral and 5 bilateral) in 15 patients (8 females and 7 males) with protrusio acetabuli were performed between 2018 and 2022, out of which 4 had mild,7 had moderate and 9 had a severe grade of protrusion.

Results: A total of 10 hips were affected by rheumatoid arthritis, 3 by ankylosing spondylitis and 7 had unknown etiology. After the surgery, all bone grafts had united by the sixth month with no perceptible change in acetabular component position in any case. The mean preoperative Harris Hip Score was 48 which improved to 90 at the latest follow-up10 hips (50%) had excellent,8 hips (40%) had good, and 2 hips (10%) had fair results. There was no dislocation.

Conclusion: The use of impacted morselized autograft with a cementless porous acetabular component is a good technique of restoration of hip biomechanics and sound fixation in cases of protrusio acetabuli.

Keywords: Protrusio Acetabuli, Morselised Bone Graft, Uncemented Total Hip Replacement.

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Introduction

Protrusio acetabuli is a central acetabular defect resulting from migration of femoral head medial to Kohler's line (1). This results in medialization of the center of rotation (COR) of the hip. Primary Total Hip Replacement (THR) in such situations can be technically demanding due to associated significant medial and proximal migration of the center of the joint, deficient bone medially (2) and reduced bony support to the acetabular component peripherally.

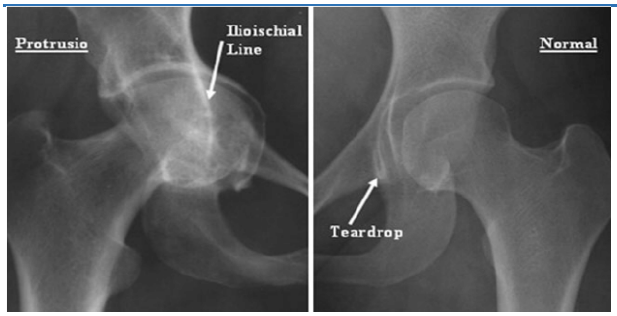

Figure 1- Protrusio Acetabuli

Cemented total hip arthroplasty resulted in promoting bone lysis and implant loosening, however, uncemented total hip arthroplasty with impacted morselized autograft with a porous coated cementless acetabular component provided a biological solution to bone deficiency and long-term fixation in arthritic hips with protrusion.(3,4) Functional outcome of uncemented total hip arthroplasty was evaluated by Harris hip score pre & post operatively in the cases. (5)(6)

Classification:

- Sotelo-Garza and Charnley used the ilioischial line on an AP radiograph of the pelvis as a reference point from which to measure the location of the acetabulum.

Grade	Protrusion (mm)
0	None (0)
I	Mild (1–5)
II	Moderate (6–15)
III	Severe (>15)

Grade	Men	Women
I	3–8 mm	6–11 mm
II	8–13 mm	12–17 mm
III	Over 13 mm with fragmentation	Over 17 mm with fragmentation

Figure 2-Sotelo-Garza and Charnley Classification (5)

The aim of this study is to evaluate the functional and radiological outcome of using impacted morselized autograft with a porous coated cementless cup in cases of protrusio acetabuli of hip joint. (7)(8)

Material and Methods

This is an observational study conducted at R.D. Gardi Medical College and associated CRGH, Ujjain (M.P.), between period August 2018 to July 2022 on a total of 20 cases who are fulfilling the Inclusion criteria. All the patients included in the study were functionally evaluated by Harris hip score, preoperatively along with an X-Ray of pelvis with both hips. Surgery was performed with the patient in the lateral position. All the patients were operated with uncemented total hip replacement by a standard posterior (Southern Moore) approach. Same type of implant was used in all the patients. Dislocation of hip was challenging due to deepened acetabulum and medial displacement of the femoral head. It was facilitated by an extensive capsulotomy, along with simultaneous and sustained gentle traction and rotation. Removal of posterior osteophytes before dislocation also helped. Adductor tenotomy performed in cases with excessive adductor tightness. In cases of difficult dislocation, femoral neck was resected in situ and the femoral head was excised piecemeal.

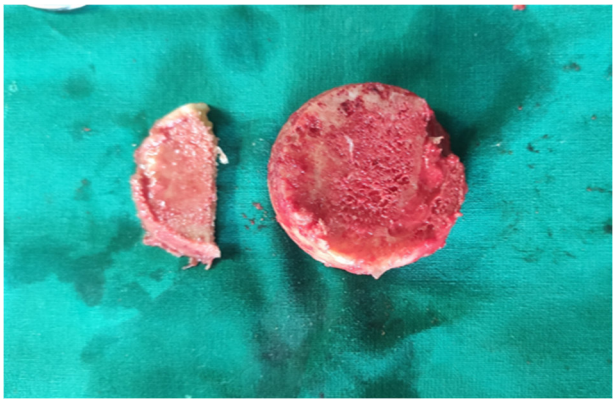

Figure 3-Bone slice

Normally, before neck osteotomy, dislocated femoral head was cut into slices with a power saw. The bone slices were then morselized into 8mm-10mm sized pieces using a bone cutter.

Figure 4- Morsellised autograft

After neck osteotomy, acetabular floor prepared while avoiding penetration of a soft, deficient medial wall until a bleeding bony surface was obtained. Acetabular periphery

reamed using large sized reamers initially. The morselized graft was then introduced into the prepared acetabulum and impacted against the floor using hemispherical impactors. Reverse direction reaming was done to further impact and set the graft in the floor of acetabulum. An acetabular cup trial was inserted to ensure good peripheral fit and more than 50% contact with the host bone. Finally, the chosen acetabular component was impacted into place. Post operative AP X-Ray view of the operated hip obtained. Abduction pillow used during the sleeping time for 7-10 days post-operatively. Active and active assisted range of motion exercises started within the first 24-48 hrs. Partial weight bearing with a walker was advised up to 3 months until bone grafts appeared to be incorporated in x-ray. Full weight bearing started at 3 months. Patients were advised not to squat, not to sit crossed legged and not cross the leg across midline. Patients were called upon at 6 weeks, 3 months, 6 months, and 12 months follow ups. At each visit functional outcome was taken according to Harris Hip score along with an X-ray pelvis with both hips.

Results

Maximum patients (10) were in the age group of 50-60 years, with a female predominance of 8 patients (53%), and 7 male patients (47%). 10 patients had unilateral involvement whereas 5 patients had bilateral involvement. The most common etiology was found to be Rheumatoid Arthritis (10) followed by Idiopathic (7) followed by Ankylosing Spondylitis (3). 4 had mild, 7 had moderate and 9 had severe grades of protrusio. The operation time ranged from 60 to 120 minutes (mean= 79.4 ±14 mins). The blood loss ranged from 200-400 ml (mean=262±36 ml).

Table 1: Comparative mean values of Harris hip score at pre op, 1 month, 3 months, 6 months and 1 year follow up

HARRIS HIP SCORE					
S. No.	PRE OP	6 weeks	03 Months	06 Months	01 Year
1	48.4472	68.0364	76.2004	84.6428	90.0852

The mean preoperative Harris Hip Score was 48 which improved to 90 at the latest follow-up. 10 hips (50%) had excellent,8 hips (40%) had good, and 2 hips (10%) had fair results. There was no dislocation. The mean acetabular inclination angle was 44.2° (range 39°-47°). The distance from the femoral head center to Kohler's line improved from 17.98 preoperatively to 20.36 post operatively).

CASE – 1

Figure 5 - Pre op

Figure 6 - Immediate post op Rt. Side

Figure 7 - Immediate post op Lt. side

Figure 8 - 1 year post op

Figure - 9,10, 11 - One year follow up

Discussion

Study by Mullaji et al suggested that the use of impacted morselized autograft in conjunction with porous coated cementless acetabular component restored hip biomechanics, after an intermediate duration follow up. 30 primary THR's were conducted with a 4.2 year follow up which showed excellent outcome in 90% patients, fair in 7 % patients and poor in 3% patients.(9) Study by Atanu et al showed that using only cement for acetabular reconstruction in protrusio acetabuli has had unacceptably high rates of recurrence, with components migrating into the acetabulum and occurrence of thermal necrosis of the thinned out medial wall due to heat polymerization of the cement. (10) These were some of the factors responsible for poor outcome.

Table 2- Comparison of results of different techniques used to treat acetabular protrusio with primary THR in literature published since 2000

Studies	No. of Hips	Mean age at surgery(years)	Technique	Survival rate of acetabular components
Mullaji et al(9)	30	46	Impacted morselissed bone graft with cementless cup	100% at 4.2 years
Garcia Cimbrelo et al(11)	148	54	Cemented polyethylene component	79% at 16 years
Pereira et al(12)	23	62	Impacted, morsellised bone graft with cementless component	100% at 7.8 years
Rosenberg et al(13)	36	53	Impacted bone graft with cemented component	90% at 12 years
Krushell et al(14)	29	66	Impacted, morsellised bone graft with dual geometry cementless component	100% at 2 years
Current study	9	54	Impacted, morsellised bone graft with cementless cup	100% at 2 years

Conclusion

We treated 20 cases of Protrusio Acetabuli of mild, moderate, and severe grades by Sotello-Garza and Charnley by uncemented total hip arthroplasty using morselized autograft. It helps in restoring biomechanics of hip joint and preventing recurrence of protrusio. We observed fair, good, and excellent functional outcomes in our patients. There was no evidence of progression of protrusio or socket loosening in any of our cases. Osteolytic lesions were also not encountered in our study. All bone grafts united within 4-6 months after surgery and continuous trabecular bone that grew through the host bone and the bone graft was apparent. But a larger sample size and a longer follow up are required to ascertain this fact.

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Prospective study to evaluate the benefits of percutaneous K-wires system in Proximal Humeral Fractures in Elderly Population: Our Experience

Bajoria RS, Bhinde S, Shubhi B

Study performed at Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior MP

Abstract

Introduction: Proximal humeral fractures are extremely common injuries. The incidence of fracture of the proximal humerus is bimodal in geriatric due to osteoporosis and in adolescents due to high-energy trauma. Recent trends are shifting away from open reduction and massive internal fixation (by plates and screws) toward closed reduction and percutaneous fixation as this method is less invasive soft tissue damage and minimal risk of iatrogenic avascular necrosis. The purpose of this study was, to preserve the biological integrity of the humeral head and to secure anatomical reduction with multiple k wires with angular stability also improve stability of fixation osteoporotic humeral bones.

Material and methods: A prospective study was performed on all patients diagnosed with intra-articular proximal humerus fracture presenting to us from Nov 2018 to June 2022. Only patients with closed, displaced two or three part fractures as per Neer's classification were included in the study. Fractures were managed by close reduction and percutaneous pinning with K wires and some cases which were linked by a fixator rod using clamps.

Results: Twenty patients comprising of 12 females and 08 males were followed for an average period of 12 months. Mean age of the patients was 58 years. Fall was the most common mode of injury in 15 patients followed RTA injury in 5 patients. All patients achieved full functional range of motion by the end of 4 months. Out of Twenty patients 06 (30%) patients showing excellent results, 12 (60%) patients having good results, and 02(10%) patients having fair results, no patient having poor result.

Conclusion: percutaneous K wire fixation using the external fixator mini clamps and rods is an effective and economical method allowing biological preservation with good results.

Keywords: Proximal humerus frature, K-wire fixation, external fixator, mini clamps, Neer Classification, Greater Tuberosity.

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Introduction

Fracture of the proximal humerus comprise nearly 4% of all fracture and 26% of fracture of humerus [(1)].They are the commonest fracture in elderly population, which ranks the third and the first and second being, hip and distal radius fracture respectively. Proximal humerus involves head, greater tuberosity, lesser tuberosity and proximal one fourth of the shaft.[(2)] Mostly common in elderly patients due to osteoporosis and less frequently in young adults due to high energy trauma. Usually high energy trauma associated with dislocation.(3)

These types of fractures are very challenging for treatment because of its osteoporotic quality in the elderly people and the deforming forces of the muscles attached. Most of proximal humerus fracture in younger as well as in the elderly patients, are stable & slightly or non-displaced , can be treated non operatively [(2)].These comprise nearly 80% of proximal humerus fracture. The rest of 20% requires surgical fixation either because they needs better shoulder mobility or because their fracture is more severe.[(4)]

Neer's classification distinguishes between the number of displaced fragments with displacement defined as greater than 45° of angulation or > 1 cm of separation. These types

of fracture require stable fixation. There are different types of fixation for proximal humerus fracture like k-wires, screw fixation, T-buttress plate, conventional plate, locking plate and prosthetic replacement. Every fixation has its own complication. The proximal humerus with poor cancellous bone quality especially in older patients, results in high risk of failure of fixation with conventional Plating system.[5]

The multiple k-wire has been introduced to reduce these complications especially in older osteoporotic individual. Even minimally displaced fracture can be treated with transcutaneus pinning to early mobilize the fracture in elderly patient, thereby to avoid shoulder stiffness. Highly communited 3 & 4 parts fracture in elderly pt can be fixed with transcutaneus pinning and thereby enhance the functional out come. This study enlightens the functional outcome & management of the fracture in elderly patient of humerus involving the proximal part, with transcutaneus pinning.

Material and methods

A prospective study was performed at Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior (M.P.) on all patients diagnosed with intra-articular proximal humerus fracture presenting to us from November 2018 to June 2022. Fractures were classified according to Neer's classification for proximal humerus fractures[6]. Only closed, displaced two- or three-part fractures and patients of age more than 45 years were included in the study. A written informed consent was obtained from all the patients for inclusion in the study. Patient demographics, injury mechanism was noted and clinical assessment was done. Radiographic evaluation was done with anteroposterior and axillary radiographs of shoulder. Fractures were managed by close reduction and percutaneous pinning with K wires.

Fracture pattern included for study will be fracture of proximal Humerus. Selection based on some inclusion and exclusion criteria.

Inclusion Criteria was all skeletally mature patients presenting with displaced proximal humerus fracture according to NEER two-, three- and four-part fracture in elderly patients, closed fracture of proximal humerus, Age > 45 Years, patients who have given consent to this study, patients with complete clinical records, preoperative ambulatory patient and medically unfit patients (under short Anesthesia).

Exclusion Criteria was age group (<45yr age), pathological fracture from primary or metastatic tumours, undisplaced fracture, fracture associated with neurovascular deficits, shaft humerus fracture with proximal extension, Neer's one part fracture, refusal to consent and preexisting Shoulder pathology technique[7].

Cases were operated in routine hours and emergency as per admission and availability of Operation Theater. Most of the cases can be operated between 2nd to 10th day of admission.

After preoperative assessment cases were posted for surgery. Under aseptic precaution and prophylactic antibiotic coverage, cases were operated with multiple k wires for proximal humerus fracture, in randomized group. Data collection procedure was included detailed study variable like preoperative and post operative clinical, radiological, surgical and functional status of involved extremity. Data collection tools had patient proforma and questioners table to show patients detail of examination, preoperative workup and surgical methods and post operative follow up. Questioners table was used for functional outcomes.

A through history was obtained including mechanism of injury and patients overall medical status, age and function and economical demands. The functional outcomes and clinical results of the patients evaluated & graded using following criteria.

In the case of a two-part surgical neck fracture, or a three-part fracture in which there is significant displacement of the shaft from under the humeral head, a trial reduction is performed to confirm the feasibility of closed reduction and percutaneous fixation. Reduction is performed by applying longitudinal traction with the arm in minimal abduction and some flexion. In case the humeral shaft is anteriorly angulated or displaced, it can be reduced by posterior

pressure at fracture site lifting elbow upwards. For varus angulation a lever can be placed through a small incision into the fracture site and maneuvered to reduce it. Alternatively, two pins can be passed into head and joy sticking can be done. A 2.5-mm terminally threaded pin is held over the shoulder, and a fluoroscopic AP image is obtained. The pin is positioned over the humeral head, coming from the lateral humeral shaft into the head. A small incision is then made over the lateral arm at the level determined by the fluoroscopic image, and an artery forceps is used to spread the soft tissue down to the humeral shaft. The tip of the artery forceps can confirm the anterior and posterior cortex of the humerus. While the assistant maintains the reduction, the surgeon drills the pin, initially horizontally to engage lateral humerus cortex and then up into the humeral head, confirming pin position with either spot radiographs or fluoroscopic control until the pin tip is just beneath the articular surface. Head is rotated internally and externally to confirm appropriate pin placement. A second pin is drilled parallel to the first pin in a similar manner. Two pins are passed from the greater tuberosity to engage into the medial cortex of humeral shaft. Additional pins can be inserted to enhance stability. Pins are connected to a fixator rod using mini clamps.

Following this shoulder immobilizer was applied for two weeks. Patients were explained pin tract care. They were instructed to daily clean the fixator and shoulder gently with chlorhexidine scrub solution followed by povidone iodine ointment at pin sites. Gentle passive shoulder mobilization was started after 2 weeks. Active mobilization of shoulder was allowed after 4 weeks. The fixator was removed when there were signs of trabecular bridging or periosteal new bone formation on radiographs and clinical improvement in the form of subsidence of pain usually by 8 weeks. Patients were evaluated for functional outcome at 4 months, 6 months and 1 year using the Constant shoulder score[8].

Follow-up is done and patient discharged on 3rd or 7th day of post op depending on wound status, regular follow up at every weekly up to 2 months and after 2 months monthly follow up to 4 months.

Results

Twenty patients comprising of 12 females and 08 males were followed for an average period of 12 months (range, 10-14 months). Mean age of patients was 58 years (range, 45- 72 years). Fall was most common mode of injury in 15 patients followed RTA injury in 5 patients. Average time between injuries to surgery was 5 days. The fracture union time ranged from 14-18 weeks with mean of 16 weeks. Out of Twenty patients 06 (30%) patients showing excellent results, 12 (60%) patients have good results, and 02(10%) patients having fair results, no patient having poor result.

Post-operative complications were noticed in total 03 patients, 02 patients had pin tract infections and one patient had mal- union. patients with pin tract infection were treated with antibiotics (oral as well as intravenous) and daily dressing, and by rigorous monitoring and were discharged after symptoms of infections had disappeared completely. patients with mal-union had acceptable level of movements, so he was not given any further surgical intervention.

Table 1: Sex Distribution

Sex	No. of patients	Percentage
Male	08	40%
Female	12	60%
Total	20	100%

Table 2: Side Affected

Side	No. of Patients	Percentage
Right	14	70
Left	06	30
Total	20	100

Table 3: Mode of Injury

Mode of Injury	No. of Patients	Percentage
RTA	05	25%
Fall	15	75%
Total	20	100%

Table 04: Showing Duration of Fracture Union

Duration (Weeks)	Number of patients	Percentage (%)
12-14	02	10%
14-16	10	50%
16-18	08	40%

Table 5: Post-Operative Complications

Non-union	Malunion	Pin tract Infection
NIL	1	2

All patients achieved full functional range of motion by the end of 4 months. No nerve injury was reported.

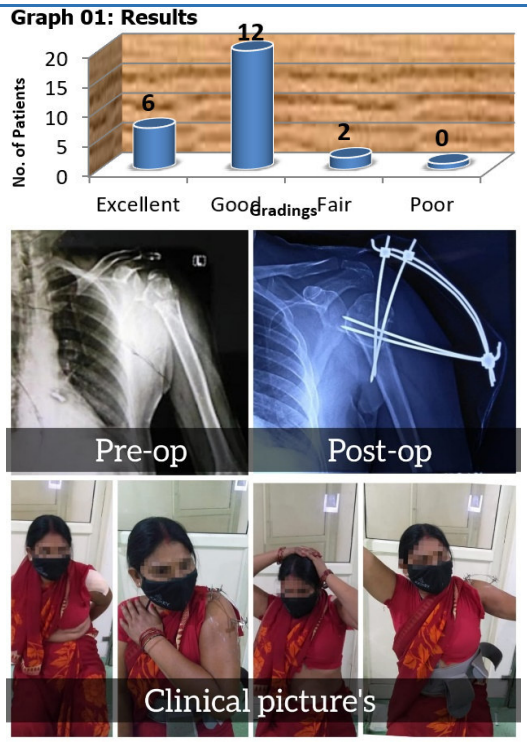

Figure 1- Case 1

Figure 2 - Case 2

Figure 3-Case 3

Discussion

This k-wires technique has always been providing good results with extremely low post-operative complications and has been successfully used in our study on all patients groups, osteoporotic patients with low blood loss and short post-operative stay in hospital[9].

Majority of the patients with proximal humerus fractures are above 60 years old and most of these fracture in these populations is due to osteoporosis. Conservative treatment in a sling followed by functional rehabilitation under the supervision leads to satisfactory results in minimally displaced fractures whereas, displaced two and three part fractures need to be reduced and stabilized.[10]

While conservative treatment may lead to malunion and stiffness, open reduction may lead devascualrization of fragments and since most patients are elderly, chances of infection and comorbid conditions preventing extensive surgery are higher. Closed reduction and percutaneous pinning techniques, when treating the elderly patients with cardio-vascular or pulmonary diseases, in whom anesthesia is very risky or clearly contra-indicated.

In our study, all fractures were reduced conservatively, without requiring any invasion, thus making it extremely less invasive with extremely low chances of post- operative infection. Some surgeons prefer open reduction and then fixation with K-wire of such fractures, but this does not serve the original purpose. Best results of K-wire fixation of such fractures can be only achieved by conservative reduction by traction, manipulation, abduction and then fixation with K-wire. This helps in extremely low post-operative complications and provides stable fixation of such fractures.

The K-wire fixation of such fracture is extremely cost effective and in the reach of the poorest candidate. Though the rehabilitation and physiotherapy exercises are being delayed in K-wire fixation, but the ultimate results are so promising that it decimates such delay in start of exercises.[9]

Best part in our study was that we had used K-wires in all the 20 patients, irrespective of their

ages, sex, osteoporosis, extreme displacements of fracture site, etc and achieved extremely encouraging results, intra-operatively as well as post- operatively. Thus, we can draw a clear-cut conclusion of supremacy of closed reduction and K-wire fixation such fractures. and also, some big comparative studies be carried out to clearly make conclusions in favour of K-wire fixation of these fractures.

Conclusion

Percutaneous K-wire fixation is a useful technique in select patients with proximal humerus fractures. It has extremely low post-operative complications, and at an extremely low cost, being affordable by poorest candidates. This preserves the biological integrity of the humeral head and to secure anatomical reduction with multiple k wires with angular stability. Also improves stability of fixation in osteoporotic humeral bones. K wires linked with clamps and fixator rod is an economical way to prevent K wire related complications often seen in post-operative period. So, we can conclude that K-wire fixation of humerus fractures provide extremely good post- operative results.

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Functional outcome of patients of intertrochanteric femur fracture treated with trochanteric fixation nail in elderly patients

Shukla R, Rajput R, Soni A K

This study performed in Department of Orthopaedics, Sri Aurobindo Medical College, and P.G. Institute, Indore

Abstract

Background-Intertrochanteric fractures are disabling injuries in geriatric population and they are the most frequently operated fracture type which has the highest postoperative fatality rate of all surgically treated fractures. The objective of the study was to evaluate the functional outcomes of intertrochanteric fractures treated with trochanteric fixation nail (TFN) in elderly patients.

Method-This is a prospective and retrospective study with 30 patients of Intertrochanteric femur fractures carried out in the Department of Orthopaedics, Sri Aurobindo Medical College, and P.G. Institute, Indore from Jan 2015 to Aug 2020. Data collected according to Evan's classification. Patients were followed up at intervals of 6 weeks,12 weeks,6 months and 12 months and final results were evaluated using Harris hip score at the end of 1 year.

Results -The study included 30 patients, 18 males, 12 females with mean age of 70.27 years (range: 65-85 years). The fracture union rate was 96% and average union time was 12.9 weeks. Our results were excellent (39.3), good (50%), fair (7.1%) and poor (3.6%). The most common complication encountered was Varus collapse and shortening seen in 4 (13.33%) patients, superficial wound infection in 2 patients (6.67%); Varus collapse and shortening and Z effect and screw revision was seen in 2 (6.67%) while Deep infection and secondary _Z` effect, Implant failure, Non-union, Knee stiffness in 1 patient each.

Conclusion-The treatment of intertrochanteric fractures with TFN had a more favourable outcome and it is the ideal implant of choice for intertrochanteric fractures at present.

Keywords: intertrochanteric fracture, trochanteric fixation nail (TFN), Z effect

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Introduction

Intertrochanteric fractures are one of the most frequent fractures of the proximal femur and occur predominantly in geriatric patients and are among the most devastating injuries in the elderly. Incidence of the fractures of the proximal femur is increasing since the general life expectancy of the population has increased significantly during the last few decades. (1)

Intertrochanteric fractures involve from the extra-capsular basilar neck region to the region along the lesser trochanter proximal to the development of the medullary canal. Most of the proximal femoral fractures occur in elderly individuals as a result of only moderate or minimal trauma. In younger patients, these fractures usually occur as a result of high energy trauma. Intertrochanteric fractures mostly occur due to a simple self-fall. The chances of self-fall increase with age, which is further increased by decreased muscle power, decreased reflexes, poor vision, and labile blood pressure. (1,2, 3)

Cummings et al. attributed four factors in determining whether a fall in an elderly is

significant to cause fracture, the fall must be oriented in such a way that the person lands on or near the hip, the protective reflexes must be inadequate to reduce the energy of fall below the critical threshold, muscles and fat acting as local shock absorbers around the hip must be insufficient and the bone density at the hip must be inadequate to withstand the fall. (3)

Prophylactic interventions to decrease the risk of falls and aggressive screening and treatment of osteoporotic patients with risk of fragility fractures are very important. (4)

Unstable intertrochanteric fracture includes 3-fragment fracture with posteromedial comminution, fracture >2 intermediate fragments (lateral wall blows out), reverse oblique fracture, transverse oblique fracture and Intertrochanteric fracture with subtrochanteric extension. (5,6)

The surgical stabilization of unstable intertrochanteric fractures remains a persistent challenge. Before the introduction of appropriate fixation devices, treatment of intertrochanteric fracture was non-operative (9), consisting of prolonged bed rest in traction until fracture union (10 – 12 weeks). This is followed by a lengthy program of walking training. In elderly people, this was associated with high complication rates and to prevent these complications, the treatment of intertrochanteric fracture by reduction and internal fixation has become the standard management. (10)

TFN preserve the fracture hematoma and associated with less blood loss and short operating time. The intramedullary position of the TFN prevents the excessive collapse of the proximal fragment & medialization of the distal fragment. Being an intramedullary load-sharing device, TFN aids in early postoperative mobilization, weight-bearing, and ultimately the early fracture union.

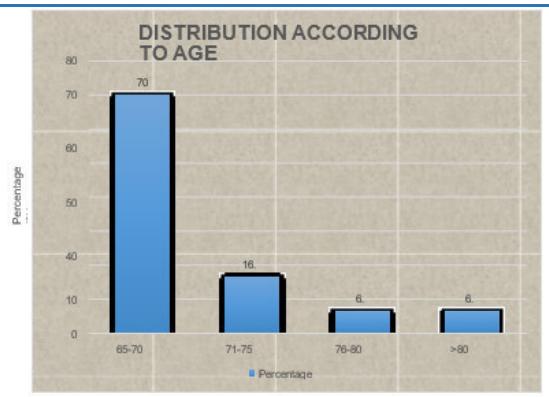
Materials and methods

This is a prospective and retrospective study with 30 patients of Intertrochanteric femur fractures carried out in the Department of Orthopaedics, Sri Aurobindo Medical College, and P.G. Institute, Indore from Jan. 2015 to Aug. 2020. Duration of the study was 2 years (one and half years for data collection and 6 months for analysis and writing) from September 2019 to August 2021. Method of collection of data and selection of cases was patients of Intertrochanteric fractures presented to the Emergency Department or OPD were treated surgically are included in the study after prior informed written consent. The patients were operated with standard methods of fixation. Patients coming for follow up were studied regularly. Inclusion criteria was all Intertrochanteric femur fractures and patient more than 65 years of age. Exclusion criteria was patient having any other injury, open fractures and patients with previous history of fracture in the same limb treated either conservatively or surgically. 30 patients were included in the study, out of which 6 were retrospective cases and 24 were prospective cases managed surgically. Patients admitted with Intertrochanteric fracture were examined and investigated with an X-ray pelvis with both hips AP and Lateral view (whenever possible).

Results

There were 21 (70%) patients in the age group 65-70 years, 5 (16.7%) patients were in the age group 71-75 years, 2 (6.7%) patients were in the age group 76-80 years and 2 (6.7%) patients were in the age group more than 80 years. Majority of the patients were in the age group 65-70 years, followed by 71-75 years. The mean age of the patients was 70.27 ± 5.82 years with a range from 65 to 85 years. There were 12 (40.0%) females and 18 (60.0%) males in the present study. There was a male predominance in the study. The male: female ratio was 1.5: 1.

22 (73.3%) patients sustained this injury due to fall and 8 (26.7%) patients sustained injury due to road traffic accidents. Fall was the most common mode of trauma. In 17 (56.7%) patient's left side was involved and in 13 (43.3%) patients' right side was involved. In majority of the patients left side involvement was seen in our study. All the fractures were classified as per the Evan's Classification. In which Type 1 was considered stable fractures. Type 2 was unstable fractures. 28 (93.3%) patients had fractures of Evan's Classification type 1 and 2 (6.7%) patients had type 2 intertrochanteric fracture.



Graph 1: Bar diagram showing distribution of patients according to age

One (3.3%) patient was suffering from chronic kidney disease, 4 (13.3%) patients were suffering from diabetes mellitus type-2, 4 (13.3%) patients were suffering from hypertension, 1 (3.3%) had anaemia and 1 (3.3%) patient had pulmonary tuberculosis, of the 30 patients, 19 (63.3%) patients were not having any comorbidity. 22 (73.4%) patients underwent surgical intervention within 3 days, 7 (23.3%) patients in 4-7 days, and only 1 (3.3%) patient was operated after 7 days of the injury. The mean duration between injury and day of surgery is 3.47 ± 1.85 days. It was subjected to the day of admission after trauma and availability of OT and surgical fitness of the patient.

The average operating time was 67mins (45min-110min) after incision. The fracture was reduced anatomically by closed means. Blood loss was counted intraoperatively by the number of mops used during the surgery. One mop equal to 50 ml blood loss and 1gauge piece equal to 10 ml approximately. The average blood loss was 1.4 mops, so 71ml (50-150ml). 5 patients required intraoperative blood transfusion as their pre-operative haemoglobin was less. 3 required blood transfusion postoperatively. The fracture was reduced anatomically by closed means. If that was not achieved then it was achieved by limited open reduction during surgery. 29 (96.7%) patients were managed with closed reduction and 1 (3.3%) patient, it was achieved through open reduction.

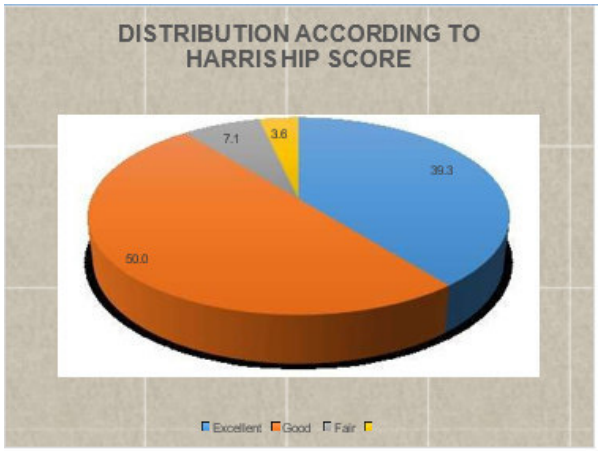
20 (66.7%) patients had a hospital stay less than or equal to 5 days, 6 (20.0%) patients had hospital stay between 6-7 days and 4 (13.3%) patients had stay of more than 7 days.

Graph 2: Bar diagram showing distribution according to complications

The mean hospital stay was 6.03 ± 3.13 days, with a range from 2 days to 13 days. The majority of the patients were discharged within 5 days of hospitalization. Union time was calculated radiologically on serial follow up x-rays of the patient. The follow-up x-rays were taken at 6 weeks, 3 months, 6 months and 1 year. 4 (13.3%) patients achieved fracture union in <10 weeks, 22 (73.4%) patients in 10-15 weeks, and rest 4 (13.3%) patients achieved in more than 15 weeks. The most common complication encountered was Varus collapse and shortening seen in 4 (13.33%) patients, superficial wound infection in 2 patients (6.67%); Varus collapse and shortening and Z effect and screw revision was seen in 2 (6.67%) while deep infection and secondary ‗Z' effect, Implant failure, Non-union, Knee stiffness in 1 patient each. The vast majority of the patients were not having any sort of complications.

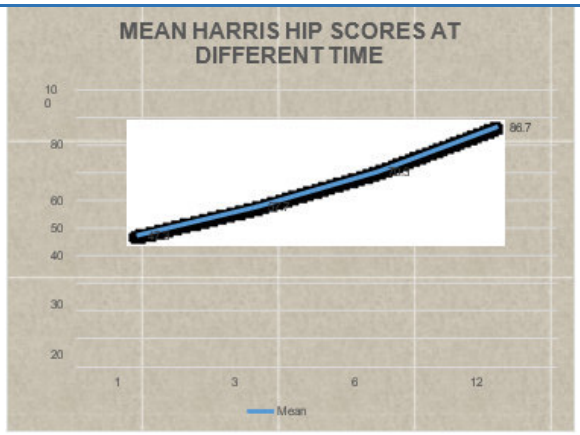
Of the 30 patients included in the study, 2 (6.7%) patients died and 28 (93.3%) patients survived. Of the two patients who expired, 1 died due to chronic illness and other died due to Covid-19 infection. Both the deaths were not related to the trauma. The further analysis was carried out on the patients who survived (N=28). 2 patients had expired during the study period, so were excluded from the analysis. Of the 28 patients who followed-up till 12 months, 11 (39.3%) patients had excellent outcome at 12 months, 14 (50.0%) patients had good outcome, 2 (7.1%) patients had fair outcome and 1 (3.6%) patient had poor outcome. Majority of the patients i.e. 25 (89.3%) patients had good to excellent

outcome according to Harris Hip Score. The mean Harris Hip Score at 1 month was 47.32 ± 8.06 and at 3 months it was 57.75 ± 7.74. The difference was found to be statistically significant (p=0.001), showing a significantly improved Harris Hip Score at 3 months in comparison to 1-month score. The mean Harris Hip Score at 3 months was 57.75 ± 7.74 and at 6 months it was 70.39 ± 7.95. The difference was found to be statistically significant (p=0.001), showing a significantly improved Harris Hip Score at 6 months in comparison to 3 months score. The mean Harris Hip Score at 6 months was 70.39 ± 7.95 and at 12 months it was 86.75 ± 4.45. The difference was found to be statistically significant (p=0.001), showing a significantly improved Harris Hip Score at 12 months in comparison to 6 months score.



Graph 3: Pie diagram showing distribution of patients according to Harris Hip Score at 12 months

There was a persistent statistically significant improvement in the mean Harris Hip Score at 3 months, 6 months and 12 months (p<0.05). Unpaired 't' test applied. P-value < 0.05 was taken as statistically significant. The mean Harris Hip Score in females was 86.67 ± 4.68 and in males was 81.78 ± 18.59. The difference was found to be statistically not significant (p=0.383), showing that the mean Harris Hip Score at 12 months is comparable between males and females. We can conclude that the Harris Hip Score is independent of the sex of the patients.



Graph4: Line diagram showing mean Harris Hip Scores at different time intervals

Unpaired 't' test applied. P-value < 0.05 was taken as statistically significant

Conclusion

Intramedullary nailing with the TFN has distinct advantages over other management options like shorter operating time and lesser blood loss for intertrochanteric fractures.

Early mobilization and weight-bearing are allowed in patients treated with TFN thereby decreasing the incidence of bedsores, uraemia and hypostatic pneumonia. For favourable outcomes, good preoperative planning with intraoperative reduction and sound surgical technique is vital and cannot be emphasized more. TFN is a momentous advancement in the treatment of intertrochanteric fractures which have the unique advantage of closed reduction, preservation of fracture hematoma, less tissue damage during surgery, early rehabilitation, and early return to work.

Osteosynthesis using a TFN, used in trochanteric fractures, resulted in low rates of clinical complications, excellent stabilization, few mechanical complications, and adequate functional results. Thus, the treatment of intertrochanteric fractures with TFN had a more favourable outcome and it is the ideal implant of choice for intertrochanteric fractures at present.

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Functional and radiological outcome of locking compression plate for distal end radius fracture

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Abstract

Background: Fracture distal end of radius are one of the most common skeletal injuries encountered in orthopaedic departments. Various modalities for treatment like close reduction and cast application, external fixators, ORIF with plate etc. Close reduction and cast application or K-wire fixation, external fixation is associated with immobilisation, wrist stiffness, loss of reduction postoperatively. So, we performed volar plating for distal end radius fractures and assessed the results.

Study design: Prospective case series of 48 patients who underwent volar plating for distal end radius fracture at CRGH associated with R D Gardi Medical College, Ujjain.

Methods: We performed ORIF with plating (Volar approach) in 48 patients (32 male and 16 female) of distal end radius fractures, depending on inclusion and exclusion criteria. Fractures were classified according to Frykman classification. All patients were operated under tourniquet and anaesthesia. Results were analysed using Green and o'brien scores for functional and Lidstrom classification for radiological outcome.

Results: Out of 48 patients, as per Frykman classification 1 had type III, 30 had type IV, 7 had type V,8 had type VI and 2 had type VII fractures. RTA as a (52.1%) mode of trauma was higher as compared to Fall (47.9%). Average time to clinico-radiological union was 8 weeks with the longest follow up time 6 months. Average time to wrist mobilisation was 8 days. According to Green and o'brien scores, 22 patients had excellent,20 good and 6 fair results. As per Lidstrom classification 26 patients had excellent,18 good and 4 fair results.

Conclusion: Volar plating for fracture distal end radius reduced the chances of wrist joint stiffness, loss of reduction and good results increased the patient compliance.

Keywords: distal end radius fracture, Volar plating, locking compression plate.

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Introduction

Fractures of the distal end of the radius accounts around 15% of all fractures diagnosed and treated in the emergency rooms. In the words of Dr. Abraham Colles "this fracture takes place about an inch and a half above the carpal extremity of the radius and there is a 17% lifetime probability for distal radius fractures". Most of these injuries are 'closed', with no evidence of breach of the surrounding skin.

Fractures of distal end of radius are one of the most common skeletal injuries. Though the management of these fractures remained a controversial issue.[1] These were often treated with closed reduction and longer immobilisation but the difficulty here is the possibility that displacement may persist even in the least

complex fractures. Other problem with this method is immobilisation of wrist and forearm for at least 6 weeks and the further time required to regain the functions of forearm wrist and hand by physiotherapy. During this entire time duration, patient's ability to carry out day to day activities is hampered. The need of the hour is the treatment modality that restores and maintains anatomy and allows early functional mobility which allows patient to carry out his activities of day-to-day life with minimal discomfort.

A bimodal age distribution is seen, with differing trends in males and females. In females, the probability of these fractures rises with age, especially from the age of 40 years and onwards; in people below the age of 40 years, the incidence is more in males. In young people, these fractures usually result secondary to high velocity injury such as a motor vehicle accident or fall on an outstretched hand. While in the elderly, the fracture commonly occurs from low-energy or moderate trauma, like a fall from standing height. This is due to the fragile bone in older adults because of osteoporosis.

Management for distal radius fractures has evolved significantly over the years. Closed Manipulative Reduction (CMR) and below elbow cast application has been the main treatment. However, the outcomes are often less than satisfactory with loss of reduction, limitation of function and disabilities. Several studies have shown that after a distal radius fracture, patients function more effectively when the anatomy is restored. Despite this fracture being very common, we lack evidence to support a single reparative technique as against the use of others. It is difficult to compare "fractures of the distal radius" because of the many different specific patterns of lesions. In addition, different plates are used for fixation, different outcome tools are used, and the fractures also vary in their complexity.

Numerous other methods of treating injuries of this nature like closed percutaneous pinning, external fixation, buttress plating have enjoyed recognition from time to time, testifying the fact that there is no ideal modality of treatment. The anti-glide effect of Buttress plates helps to reduce and stabilise intra-articular fractures.[2] However, the need for protection of fracture, till it consolidates and the chances of loss of reduction on mobilisation are still areas of concern with Buttress plating.

Treatment of comminuted, displaced intra-articular or potentially unstable fractures of the distal radius with open reduction and internal fixation with locking compressions plates (LCP) and screws has increasingly been found to be the better alternative.[3]

The functional outcome of treatment of fracture of the distal aspect of the radius is influenced by the anatomical reduction of the articular surface and the extraarticular alignment of the distal part of the radius.[4] By directly restoring the anatomy, plating allows secure internal fixation with resultant early return of wrist function. Furthermore, the increase in the incidence of sympathetic dystrophy with immobilisation over long duration is circumvented by this novel method of fixation.

This new fixation technique of using LCP for treating distal end radius fracture shows promise in terms of stable intraoperative fixation and restoration of acceptable anatomy, resulting in early mobilisation and good recovery of function. [5,6,7] This holds true even for osteopenic bones.[7,8] Stable internal fixation with minimal complications can be achieved using distal radius LCP. [7,9] We report a series of 48 distal radius fractures treated by this method of internal fixation with satisfactory results in all.

Material and method

Inclusion Criteria was patient with distal end radius close fracture, aged between 18 to 60 years. Also, patient with complete clinical records and medically and surgically fit for surgery.

Exclusion Criteria was patient with associated ipsilateral fracture, compound fracture, pathological fracture, age group <18 and > 60.

Protocol was followed once patient was admitted and planned for surgery. First, fracture was stabilized with slab immobilization and limb elevation given then surgery delayed till soft tissue becomes favourable for surgery. Patients were admitted and physical fitness for surgery was obtained. Fractures were classified

using Frykman classification and randomization was done based on day of admission and mode of treatment was decided. patient operated with volar distal radius plating application. Post operatively intravenous antibiotic regimen given, along with IV fluids and pain control medications. Joints were mobilized after 48 hrs. Patients were encouraged for active finger and elbow movements.

At Follow-up Patients were regularly followed 6,12 and 24 weeks, and every 4 weeks thereafter until radiographic healing and full functions are achieved. During follow-up we evaluated any possible loss of reduction. Also, assessment and analysis of any complication. Functional outcome was assessed according to the Green and O'Brien scoring system.

Observation and Result

The study comprised a total of 48 patients of fractures of the distal radius according to inclusion and exclusion criteria for the final evaluation of results. The study was performed between January 2019 to june 2020.

The mean age of the patients taken up for the study was 33.35 years. There were 16 female patients (33.3%) and 32 male patients (66.7%). Mode of trauma due to RTA 25(52.1%) is more as compare to Fall 23 (47.9%). Left side 28 (58.30%) is involved more as compared to right 20 (41.70%).

Out of 48 patients, we had Frykman type-III-01(2.1%) type-IV-30(62.5%), type-V-07(14.6%), type-VI-08(16.7%), type-VII-02(4.2%) fracture. As per Green and O'Brien scores, 22 patients have excellent, 20 have good and 6 have fair results. And as per Lidstrom classification 26 patients have excellent, 18 have good and 4 have fair results.

Table-1 Functional outcome

FUNCTIONAL SCORE	FREQUENCY	PERCENT
EXCELLENT	22	45.8
GOOD	20	41.7
FAIR	6	12.5
Total	48	100.0

Table 2: Radial angle

RADIAL ANGLE	FREQUENCY	PERCENT
EXCELLENT	22	45.8
GOOD	19	39.6
FAIR	7	14.6
Total	48	100.0

Table 3: Volar tilt presentation.

RADIAL LENGTH(MM)	FREQUENCY	PERCENT
EXCELLENT	31	64.6
GOOD	12	25.0
FAIR	5	10.4
Total	48	100.0

Table 4: Radial length shortening.

VOLAR TILT	FREQUENCY	PERCENT
EXCELLENT	5	10.4
GOOD	41	85.4
FAIR	2	4.2
Total	48	100.0

Table 5: Lidstrom Classification Outcome

OUT COME	FREQUENCY	PERCENT
EXCELLENT	26	54.2
GOOD	18	37.5
FAIR	4	8.3
Total	48	100.0

Table 6: Final Result

RESULT	FREQUENCY	PERCENT
EXCELLENT	20	41.7
FAIR	6	12.5
GOOD	22	45.8
Total	48	100.0

Case-1

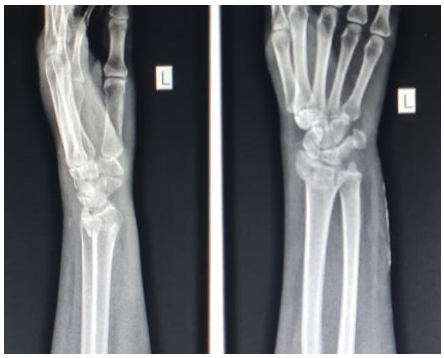

Figure 1- Pre op x-Ray

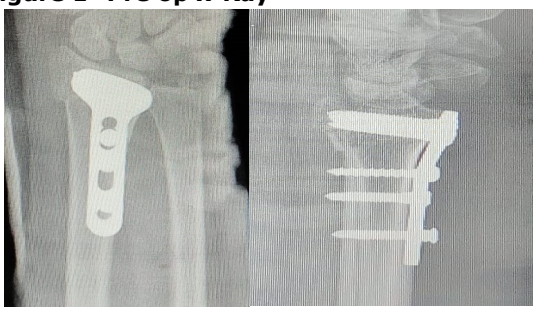

Figure 2- Post op x-ray

Figure 3 & 4- Follow up functional results

Case-2

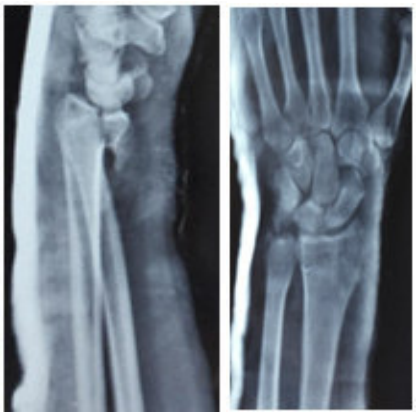

Figure 5- Preop Xray

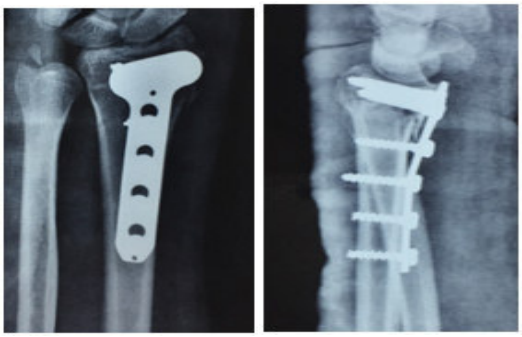

Figure 6- Post op x-ray

Figure-7 & 8 Follow up of patient with functional outcome

Discussion

Over the last decade, several studies have been directed towards clarifying which surgical treatment method would be best for fracture of the distal extremity of the radius. In this context, Osada et al recently documented the increasing popularity of open reduction and internal fixation, especially since the introduction of locked volar plates in 2001.[13] They demonstrated that locked volar plates are well tolerated, allow early mobilization, and provide good support for muscle forces after the surgical reduction, even in intra-articular fractures. The majority of the studies have used subjective tools for measuring quality of life, such as the Gartland and Werley calculation and the DASH calculation while others have given greater emphasis to the radiographic parameters obtained after surgical reduction of fractures of the distal extremity of the radius.[12-15]

In present study patients evaluated functionally by Green and O'Brien score and radiologicaly by Lidstrom classification. The average age of the patients in our study was 33.35 years. The eldest patient in the study was 65 years of the age and the youngest patient was 22 years old (mature skeleton) as compare with other studies like Kevin C, Chung et al had average age of the patients was 48.9 years with minimum age 18 years and maximum years 83 years.[16] In Rohit et al average age of the patients was 57 years with minimum age 17 years and maximum years 79.[17] In Kilic et al average age of the patients was 45 years with minimum age 18 years and maximum years 77.[18] In Anakwe et al average age of the patients was 48 years with minimum age 22 years and maximum years 67.[19]

In present study, most of the patients were males 32 (66.7%) as compared with females 16 (33.3%). In Margaret Fok WM et al study there were 56 (57.7%) male and 41 (42.3%) female while Tank Gyaneshwar study had female 52 (65%) and male was 28 (35%) in number.[20,21]

In the present study, the mode of injury was road traffic accident in 25 patients (52.1%), fall in 15 patients (47.9%). In the study of Ayhan Kilic et al also found road traffic accident in 13 patients (48.1%) and fall in 14 patients (51.9%) while Chung KC et al found 42 patients (48.3%) had road traffic accident and 45 patients (51.7%) had trauma due to fall.[16,18] Arora Rohit et al in his study got 40 patients with road traffic accident and 60 patients due to fall. [17]

In present study, out of 48 patients, 3 patients (6.3%) had an associated injury, similarly in Jakob M et al study out of 73 patients, 21 (28.8%) had associated injury and In Aggarwal AK et al study out of 16 patients, 10 (62.5%) had associated injuries.[22,23] The percentage of associated injuries was low in our study because of exclusion criteria, while in other studies considered all the varieties of injuries.

In present study, 3.5mm size plate was used. Similarly, in Aggarwal AK et al study also 3.5 mm size plate was used. Jakob M, et al in his study, 2 mm plate used. While Santiago A et al used 2.4 mm plate size.[22-24] The use of plate and screws allows more accurate treatment after reconstruction of joint under direct vision and reestablishment of radial length, both intermediate and lateral columns can be buttressed and cancellous bone graft may be added where it is needed. The 2 screws usually give good purchase in distal fragments. A 3.5 mm T plate can be used for the intermediate column but not for the lateral column and also this plate is too big for small fragments, and it is difficult to obtain a good purchase in comminuted distal fragments.[25] There is extensive work to show that locked volar plates are well tolerated, allow early movement and maintain position even for intraarticular fractures.[26,27]

Proposed advantages of locked volar plating include improved pull-out strength even in osteoporotic bone.[28] Internal fixation using a dorsal plate, which is greatly advocated, achieves anatomical reduction with good stability. However, a variety of complication has been documented, including irritation of subcutaneous tissue, tenosynovitis of extensor tendons, rupture of extensor tendon and even chronic pain.[29] In view of this fixed angle locked volar plate for the distal end of radius have gain much space among orthopaedic surgeons, since these plates are not only provide stable fixation but also avoids the above-mentioned complication.[30,31] Volar surgical approach that avoids need for an extensive dorsal dissection. The plate is positioned in well-padded area beneath pronator quadratus to avoid flexor tendon irritation and it is thought that patient tolerate volar wrist scar better than dorsal one.[32,33] As they are less obvious and the blood supply to the radius is less likely to be disturbed.

Dorsal plate fixation is biomechanically effective in buttressing a dorsally displaced fracture of distal radius. Osada et al compared the biomechanical properties of dorsal and volar fracture fixation plate designs in a cadaver model.[34] They reported that if, the volarily placed titanium symmetry plate was used to fix a colles – type fracture, the distal fragment of radius to develop a dorsal angulations of about 9 degrees, if early active mobilization of fingers was initiated during the postoperative period, on the other hand, Leung et al demonstrated no statistical difference between axial loading transmission though the intact radius and a distal radius fracture fix with a volar locking plate.[35] In fact, the volar locking plate showed advantages over dorsal plating in the fixation of dorsally unstable distal radius fracture. In addition, volar plate fixation is a valuable method because of decreased risk of inducing dorsal soft tissue complications. The dorsal approach often needs dissection of the extensor retinaculum and sometimes, dissection of lister tubercle. Therefore, the extensor tendon generally exposed to mechanical attrition by the plates and screw.

In the volar approach, the volar anatomy of the wrist presents advantage over the dorsal aspect because there is more space between the volar cortex and the flexor tendons, and the pronator quadratus can also sometime act as a hedge to prevent soft tissue complications. The palmer cortex is relatively flat, and the plate better contoured for application from this aspect rather than on the dorsal cortex of the distal radius.[36] The volar cortex of the distal radius was very often not as communited when compared with dorsal cortex. Anatomical reduction of palmar cortex may avoid the shortening of the radius, which is important for its restoration. The volar plate system used in our study was a locking plate system and this must be one of the reasons for retaining good anatomical reduction.

The optimal placement of distal screw is important, they must be inserted at the radius styloid, beneath the lunate facet, and near the sigmoid notch. Therefore, the plate is positioned near the volar radius margin. But fixation implants placed over or distally to the watershed line can exert pressure on the flexor tendon and cause injury. The watershed line is defined as a transverse ridge that is the most volar aspect of the volar margin of the radius distally. Distal to this line, the radius slopes in a dorsodistal direction and become prominent, palmarly. The course of flexor pollicis longus tendon is close to the palmar rim of the distal radius. The plate placed very close to the wrist joint can support the palmar aspect of the

articular surface. However, it sometimes causes flexor tendon impairment in the very distal area, it is not possible for the reattached pronator quadratus muscle to protect the flexor tendon. As a result, the tendon can abrade against the plate and sharp edges of the screw heads. It also must be emphasized that protruding screw heads can cause tendon irritation. To avoid rupture of flexor pollicis longus tendons, care must be taken especially in a very distal fracture, type C3 fractures and osteoporotic bone. Adequate image intensifier control to verify the extraarticular and subchondral position of screw and plate is also quite important. Jakob M used double plating when open reduction of dorsal displaced fracture of the radius is indicated to restore congruency and extra-articular anatomy.[19,22] It Is very important to select the proper plate width to provide satisfactory subchondral support across the entire articular surface as well as to capture volar ulnar fragments with at least one threaded peg. Volar prominence of the plate is often associated with an insufficient fracture reduction and residual dorsal tilt of the dorsal fragment as well as with plate application distal to the watershed line.[20]. The use of newer plate may have changed outcomes in some way, however the basic principle of fracture reduction, stable fixation and respect for the soft tissues remain paramount regardless of implant. In study of Agrawala S, all the fractures were excess through volar approach and fixed with titanium LCP (2.4mm and 3.5mm distal radius LCP).[11]

If, any instability was encountered after volar plate fixation and additional lateral column plate was added to improve stability of construct through same incision as volar plate alone will be inadequate in fixation of fracture with complex pattern. Furthermore, the increase in incidence of sympathetic dystrophy with immobilization over long duration is circumvented by this novel method of fixation. In present study, most of the fractures were united in the time duration of 6 to 8 weeks. The difference in union rate was due to variable factors, like there was trend towards increasing union time with higher energy fracture type like in type C fracture but this did not prove significant. While in Anakwe RE, et al average time of bony union was 12 weeks.[30] Overall mean time to fracture union was 8.4 weeks (6-28 weeks) in the study of Phadnis J et al.[37] Excessive distraction of the hardware to obtain satisfactory reduction can result in delayed union, nonunion, complex regional pain syndrome or digital stiffness. [38,39]

Avoidance of malunion is important, since a poor anatomical result adversely affects recovery of function as was reflected in the difficulties in patients with malunion had with activities of daily living. The study of keating et al, concluded that malunion with dorsal tilt could be because of inadequately contouring the plate resulting in excessive dorsal angulation of the distal fragments. They suggested that restoration of the normal volar tilt is the single most important determinant of functional outcome. Despite the high rate of malunion they noticed and acceptable level of function after rehabilitation.

Conclusion

Results of present study have been encouraging. The operation is technically demanding, we believe that restoration of joint and the articular anatomy led to desired results of range of movement, grip strength, pain intensity and functional status. Consequently, it seems rational to use LCP for distal radius fracture with volar approach as an effective treatment method in terms of early functional mobilisation compared to other available methods.

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A rare solitary intraosseous calcaneal lipoma: case report

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Abstract

Intraosseous lipoma, a rare primary benign tumor of the skeleton, is most found in the calcaneus. It may contain homogenous fat, but it may also contain necrosis, calcification, or ossification. It usually does not show contrast enhancement, but there is an interface enhancement between the outer fat plain and the inner fluid part. Differential diagnoses for calcaneal lipoma include aneurysmal bone cyst, fibrous dysplasia, enchondroma, and intraosseous ganglia and UBC. Herein, we present an unusual 47-year-old female case of calcaneal intraosseous lipoma. Nonoperative treatment may be a viable option for many patients with small or asymptomatic lesions. Interventions include intralesional steroid injection, open curettage and bone grafting, decompression and percutaneous injection of bone marrow or graft substitutes. Attention is directed to the use of injectable steroid as an alternative means to open surgical intervention. Certain potential problems exist, despite the various surgical approaches utilized, including infection, postoperative fracture, recurrence, immobilization, and prolonged hospitalization.

Keywords: Intraosseous lipoma, calcaneus, intralesional steroid injection

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Lipoma of bone is a benign neoplasm of adipocytes that typically arises within the medullary cavity of bone. Although there is a large amount of fatty tissue in bone marrow, intraosseous lipoma occurs very rarely, with a 0.1-2.1% prevalence [1-3]. However, this probably is not the actual incidence number because the lesions are frequently asymptomatic. Calcaneus bone is reported to be the most frequent site of intraosseous lipoma [4]. Herein, we present a case of a rare calcaneal intraosseous lipoma.

CASE PRESENTATION

A 47-year-old female patient presented with pain of approx. 6 months duration in the left heel (Figure1). The patient complained of pain on palpation of the medial aspect of the heel and hind foot. The pain increased on weight bearing and shoe contact and subsided with rest. There is no history of focal trauma, and the patient denied any pre-existing inflammatory conditions such as RA, or other metabolic disorders. The patient had been previously treated with NSAIDS with partial relief, but the pain continued.

Her medical history was unremarkable, and the physical examination was only significant for tenderness and edema localized to the medial aspect of the right heel. The range of motion of the ankle was normal;. Laboratory findings, including a complete blood count with differential cell count, erythrocyte sedimentation rate, C-reactive protein, and a biochemical profile that included serum alkaline phosphatase, calcium and phosphate levels were all in the normal range.

Initially a Xray of left foot advised, showing a well-defined, osteolytic lesion in the anterior portion of the body of the calcaneus, with a centralized radiodensity.

A Non-contrast MRI shows small calcaneal lipoma (measuring ~ 1.7*1.2*1.0 cm) (Figure2). According to Milgram's classification,

the lesion was graded as a stage 3 calcaneal lipoma because of necrosis, centrally cystic transformed areas and sclerosis in the wall.

Under aseptic precaution intralesional steroid injection (methyl prednisolone) applied and patient follow up done for 6 months. The result shows good functional outcome. Patient got relieved from pain.

Figure 1. Left foot lateral x-ray radiograph showing a well-defined, osteolytic lesion in the anterior portion of the body of the calcaneus, with a centralized radiodensity.

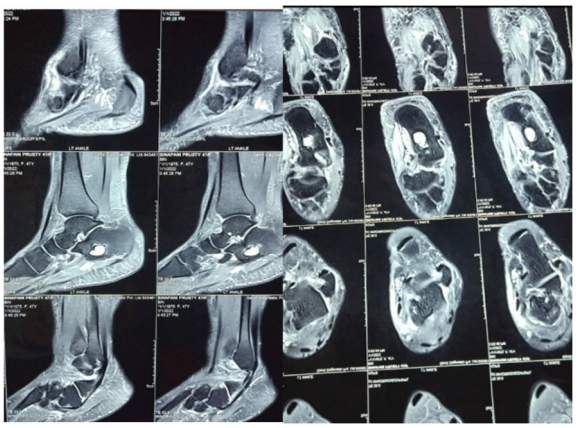

Figure 2. MRI study of the Left ankle; small calcaneal lipoma (measuring ~ 1.7*1.2*1.0 cm).

DISCUSSION

Intraosseous lipomas, which occur in both males and females, are generally present in the fourth and fifth decades of life, with a prevalence of 0.1-2.1%. However, the real prevalence is thought to be higher than this estimate because most cases are asymptomatic [2, 3]. Therefore, most cases have been detected incidentally. Pain is the major complication in symptomatic patients, and they present with pathological fractures.

Although intraosseous lipoma can occur anywhere in the skeletal system, 71% of these lipomas are in the lower extremities, and usually appears in the calcaneus (32%), in which the most frequently found tumor is also the intraosseous lipoma. The upper extremities, skull, mandible, and spine are involved with decreasing frequencies. Intraosseous lipomas located in long bones usually affect the metaphysis [5-8]. Basically, simple bone cysts called intraosseous ganglia are present in intraosseous lipomas. On X-rays, intraosseous lipomas appear as benign, osteolytic lesions with well-defined limits, and it is difficult to identify them only based on X-ray findings. Computerized tomography (CT), especially MRI, is useful in differential diagnosis. Radiographic diagnosis of a lipoma may not be straightforward and so there may be differential diagnosis that may include simple bone cyst, nonossifying fibroma, aneurysmal bone cyst, fibrous dysplasia, bone infarct, giant cell tumor, chondroid tumor or fungal infections. The appearance of these lesions on radiographs, CT scans and MRIs can vary as result of their degree of involution and necrosis. It is important to make a correct diagnosis based on multi-method imaging studies, especially MRI.

In the classifications performed by Milgram et al. [4], intraosseous lipomas are divided into three stages based on fat necrosis: Stage 1A - sharply limited lesion with homogenous fat content; Stage 2 - Dominantly fatty lesions with central necrosis, calcification, or ossification, and Stage 3 - A heterogeneous, fat- containing lesion involving multiple necrotic areas, cystic transformations, sclerosis, or ossification in the wall. Our case was staged as 3 according to this classification.

Because calcaneal lipomas do not affect bone stability, conservative treatment can be applied. The fracture can be treated with curettage and bone graft in cases of doubt. There is usually no recurrence after surgery [5]. Non-operative treatment may be a viable option for many patients with small or asymptomatic lesions. Interventions include intralesional steroid injection, open curettage and bone grafting, decompression and percutaneous injection of bone marrow or graft substitutes.

Certain potential problems exist, despite the various surgical approaches utilized, including infection, postoperative fracture, recurrence, immobilization, and prolonged hospitalization.

CONCLUSION

Proper diagnosis and appropriate therapeutic management are necessary not only prevent the recurrence but also to exclude other cystic lesions of calcaneum. Intraosseous lipomas can be diagnosed easily with their fatty component, especially via MRI. Steroid injection remains a reliable method for treating calcaneal lipoma owing to its low invasiveness. Steroid injection therapy for calcaneal lipoma yielded a good functional result. Patient got relieved from pain and procedure is economical with less complications. As it is an outdoor procedure, so hospital stay is avoided. Therefore, this procedure could be a choice for treatment of calcaneal lipoma/SBCs patient. To furthermore strengthen this conclusion, Further study needs to be conducted with more sample size.

Informed consent

Written informed consent was obtained from the patient for the publication of this case report.

Conflict of interest

The authors declared that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Calcar Buttress Screw Fixation: A Wonderful Modality to preserve the Head of Femur

Vidyarthi A, Sirsikar A, Johari V

Study performed at Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur MP

Abstract

Case Details: A 25-Year-old male presented to our department, with complaints of pain, swelling and inability to move his right lower limb, on examination swelling, tenderness was present over right hip and restricted movement at right hip joint. Radiological examination revealed fracture Neck of Femur Right, Pauwels grade 3 with more than 50° and Garden Classification Type 4.
Operative Details: Closed reduction internal fixation with 3, 7.5mm self-tapping cannulated cancellous screw was done in biplanar double supported screw fixation.

Keywords: Calcar Buttress Screw Fixation, fracture Neck of Femur, BDSF

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Introduction

Fractures of neck of femur that are associated with risk of avascular necrosis of hip joint is a challenge for surgeons using standard operative techniques.

Case Details

A 25-Year-old male presented to our department, with complaints of pain, swelling and inability to move his right lower limb, on examination swelling, tenderness was present over right hip and restricted movement at right hip joint. Radiological examination revealed fracture Neck of Femur Right, Pauwels grade 3 with more than 50° and Garden Classification Type 4.

Operative Details

Closed reduction internal fixation with 3, 7.5mm self-tapping cannulated cancellous screw was done in biplanar double supported screw fixation.

Result

The functional outcome and pain were assessed with Harris Hip score. We observed fair result in Harris Hip score, score was 73.2 in 3 months with 60 degrees of flexion, 15 degrees of extension, 35 degrees of abduction, 20 degrees of adduction. No complication was noted till 3 months of follow up.

Discussion

Neck of femur fracture is prone to avascular necrosis thus anatomical fixation is essential to achieve a stable and mobile hip. Secondary procedure for hip arthroplasty is uncommon after BDSF, and there is a small risk of neck perfusion related complication, but no such complications were noted in our case.

Conclusion

Fracture neck of femur managed with self-tapping cannulated cancellous screw in biplanar double supported screw fixation to restore neck femur anatomy and to achieve a good function outcome. The achieved results with the BDSF method in terms of fracture consolidation are far more successful than the results with conventional fixation methods. The BDSF-method ensures reliable fixation, early rehabilitation and excellent long-term outcomes.

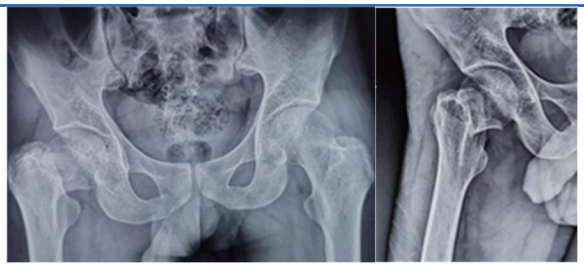

Figure 1 & 2 Pre-Operative X Rays

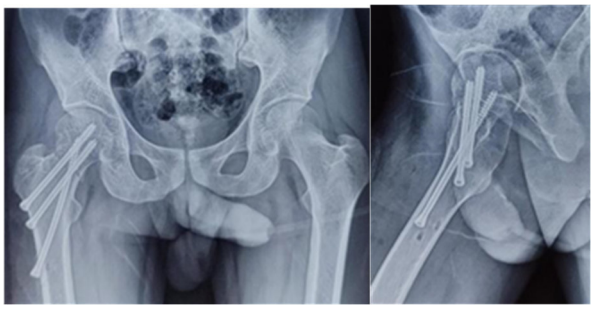

Figure 3 & 4-Post-Operative X Rays

Figure 5,6,7,8,9, 10- Three Months Follow-up

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A case report on nerve sheath tumour of median nerve at distal end radius damaging distal radius ulna joint

Girdhar S, Raheja P, Bajoria R S

Study performed at Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior MP

Abstract

PNSTs (Peripheral Nerve sheath tumors) are common tumors of hand present as solitary swelling along the course of nerve. However, Multiple swellings may be present along the course of nerve in patients of neurofibromatosis. The most common benign PNSTs are neurofibroma and schwannoma, which account for approximately 10% to 12% of all benign soft tissue neoplasms and may occur in upper and lower extremities. PNSTs generally presents with painless swelling.

In this paper, we present a 67-year-old female with swelling on her right wrist from last 6 months which was increasing gradually over the time for which she took treatment at various hospitals and was investigated. Patient was investigated radiographically and excisional biopsy was done and diagnosis was confirmed. On final follow up for last 6 months patient did not have any recurrence of swelling with complete movements at wrist joint.

Keywords: nerve sheath tumour, median nerve, distal radius ulna joint

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Introduction

Soft tissue tumours of bone are infrequent in Orthopaedics practice. Therefore peripheral nerve sheath tumours are uncommon and mostly mistaken for Ganglion of the wrist and have diagnostic and treatment challenges.[1] PNSTs (Peripheral Nerve sheath tumors) are tumors of hand present as solitary swelling along the course of nerve with incidence of 5% of all tumors of upper extremity.[2]

More common in females and have known to show association with Neurofibromatosis type 1.[3] They usually grow slowly and appear as painless swellings for several years before diagnosed.[4] Bony involvement is extremely rare, especially in the upper extremities[5].

Although the diagnosis is established with imaging in most of the cases, the gold standard for diagnosis still remains histopathological examination[6]

Case Report

A 67-year-old female presented to our OPD with swelling on her right wrist from last 6 months which was increasing gradually, over the time for which took treatment at various hospitals. Regarding her family history, there were no reports of related systematic or neoplasm diseases. On clinical examination, swelling was firm, non-tender and no signs of inflammation were present and percussion over the mass produced a Tinel-like sensation along the median nerve. Neither motor weakness nor muscular atrophy was observed.

Other laboratory findings were normal. For the final excision, a longitudinal incision which was centred over the sweeling was made, without releasing the transverse ligament of the carpal tunnel. The lesion was revealed in an eccentric position along the median nerve.

A marginal swelling excision with preservation of the median nerve was done after careful

surgical manipulations. After the complete excision of the mass, clear damage to the distal ulna and radius was seen. The defect of the bone and soft tissue was postoperatively protected with a forearm splint for six weeks and final diagnosis of PNST was made on the basis of Histological report. On final follow up for last 6 months patient did not have any recurrence of swelling with complete movements at wrist joint

Figure 1 & 2 - Swelling present over the wrist MRI and FNAC was done at some private institution reporting it as Ganglion cyst. On radiographic imaging, X-Ray showed the characteristic pattern of a large soft tissue mass damaging distal radio ulnar joint was noted.

Figure 3 & 4-_Xray suggestive of mass in between radius ulna destroying radius, Ulna and DRUJ anatomy

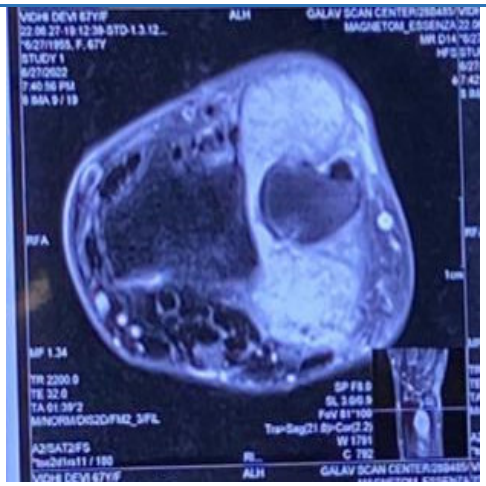

Figure 5

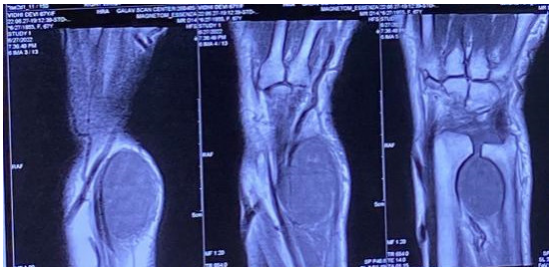

Figure 6 & 7 Well-defined PD FS hyperintense/T1 hypointense lesion noted in the distal forearm with widening of distal radioulnar joint. The lesion is seen the dorsal and volar aspect of distal forearm traversing in between distal radius and ulna. Th lesion is displacing the triangular fibrocartilaginous complex caudally.

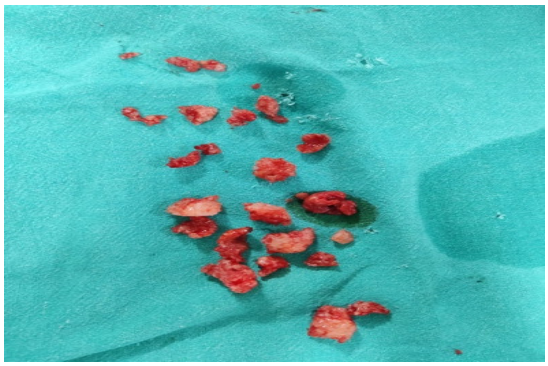

Figure 8- Intra operative Swelling Excision

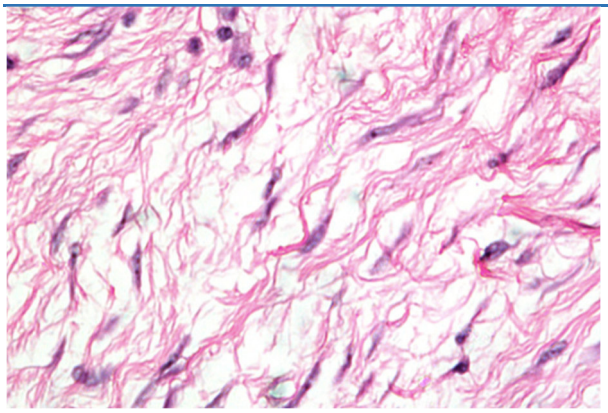

Figure 9-Histopathological slide showing tumour cells with elongated nuclei in collagen rich matrix

Discussion and Conclusion

Pathology behind Peripheral Nerve Sheath tumours of hand is not clear, most of these tumors are misdiagnosed as ganglion cyst.[1] Histopathological examination is the most important for diagnosis. Kubiena et al.[7] showed that these lesions arise from the cells of the nerve sheath and engulf some nerve fascicles. However, bone destruction due to a benign NF is not so common. This presentation of bone damage is commonly seen in schwannomas, neuromas, and malignant tumors.[8] The diagnosis of Peripheral nerve sheath tumor always remains a challenge and multiple differential diagnosis even after using MRI remains challenging and following tumors can be considered: begin solitary neoplasms such as lipomas, fibromas, xanthomas, ganglion tumors, mucous cysts, glomus tumors, giant cell tumors of the tendon sheath, vascular tumors, as well as post-traumatic neuromas, in addition to low-grade malignant neoplasms.[9] A challenging step in the treatment is the complete tumor excision and the simultaneous preservation of nerve function. On the other hand, wide local dissection is difficult in patients who presents with large masses which infiltrate the surrounding soft tissue and bone.[6]

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