

**EARLY OUTCOME OF MID-SHAFT RADIUS ULNA FRACTURE
OSTEOSYNTHESIS THROUGH SINGLE POSTERIOR INCISION
APPROACH**

ABSTRACT:

OBJECTIVE: To determine the early outcome of mid-shaft radius ulna fracture osteosynthesis through single posterior incision approach.

STUDY DESIGN: This is a retrospective study.

SETTING: Study carried out at Orthopaedic Surgery department, Liaquat University of Medical and Health Sciences Jamshoro, form September 2019 to December 2020.

MATERIAL & METHOD: In total 14 patients were operated out of which 9(64.29%) were male and 5 were females through posterior single incision approach (Thompson approach). Demographic data regarding the pattern of fracture and the complications after the surgery at 2,6 and 12 weeks was collected respectively.

RESULTS: The total number of cases operated from September 2019 to October 2020 were 14 ,out of 14 patients 9(64.29%) were male and 5(35.71%) were females. The average age of patients was 26.5 years ranging from 16-40 years .The average time of surgery was 61 minutes ranging from 50-70 minutes . The patients were discharged on 3rd post op day and were followed up in OPD after 2, 6 and 12 weeks respectively .Two patients developed superficial wound infection which was treated with antibiotics after culture and sensitivity There was no neurovascular deficit in all patients . All the fractures were united within 3 months time, and there was no radio ulnar synostosis observed within mean time.

CONCLUSION: To conclude we can say that the single posterior incision approach for treatment of mid-shaft radius ulna fractures osteosynthesis is effective and safe provided the surgical expertise and good anatomical knowledge for identification of the vital structures are there.

KEY WORDS: Tibia fracture, Gustilo-I diaphyseal fracture, Road traffic accident

INTRODUCTION:

The hand being most important functional unit of the upper limb needs the forearm as a whole to be completely anatomically fit to perform the multiple daily activities. The increased incidences of forearm fractures because of road traffic accidents, domestic/public violence and heavy machine industries have been reported. About 1% of total fractures present to be the mid-shaft radius ulna both)fractures^{1,2}. Closed reduction as a management of upper limb fractures has become history due to the bad outcomes and malunion of the bones, open reductions and internal fixation (ORIF) by dynamic compression plating is now considered compulsory and gold standard in adult mid shaft radius and ulna fractures^{3,4}. We usually use traditional anterior (Henry) OR the posterior(Thompson) and lateral approaches to fix the shaft fractures. Being subcutaneous ulna is approached via direct incision over the respective bone and for radius we usually opt for posterior Thompson approach^{5,6}. However here in this study we tried to use single posterior incision for fixation of both the radius and ulna fracture^{7,8}. Although the posterior single incision approach is difficult and require a lot of expertise and diligent surgical hand to explore the mid shaft radius ulna fracture to perform it safely. Some documented complications like injury to posterior interosseus nerve (PIN) in the posterior approach is a point of concern⁹. Even though the course of PIN is straight through the supinator muscle and its reflection over the supinator saves it from injury but in some cases the non anatomical position of the nerve makes it prone to injury which comprise of 25 % of cases^{10,11}. Radial artery¹², is also on stake in upper part of the approach but not more then as it is in anterior approach plus the skin closure is sometimes difficult in two separate incisions approach because of a small bridge in between the two incisions which can be remedied by single incision posterior approach^{13,14}. However all these complications can be avoided by gaining surgical expertise and meticulous technique of surgery.

MATERIAL & METHOD:

Data was collected from orthopedic department of Liaquat University of Medical & Health Sciences Jamshoro, after getting a proper approval from ethical committee and an informed consent from the patients from September 2019 to December 2020. A total of 14 patients out of which 9(64.29%) were male and 5(35.71%) females were operated for mid

shaft radius ulna fracture through posterior single incision approach . The average age of patients was 26.5 years ranging from 16 to 40 years. All the patients had both the radius and ulna fracture at the mid-shaft with 10 closed and 4 grade 3 open fractures. All the patients inclusive of study were operated with in 36 hrs after having the fracture. Both the bones were approached through single posterior incision approach. The average time of surgery was 61 minutes ranging from 50 to 70 minutes . The patients were discharged on 3rd post op day .The patients were followed up in OPD after 2, 6 and 12 weeks respectively .Two patients developed superficial wound infection which was treated with antibiotics after culture and sensitivity. There was no neurovascular deficit in all patients.

SURGICAL TECHNIQUE

The patient laid in supine position ,upper limb elevated and pneumatic tourniquet applied at upper one third of arm the elbow fully flexed at side arm of the table the incision made at the lateral condyle of the humerus and ulnar head of the ulna distally. The center of incision at the fracture site with variable length. Skin subcutaneous tissue cut, deep fascia exposed separately for radius and ulna. Ulna exposed between the extensor carpi ulnaris and flexor digitorum profundus muscles. The radius exposed between the extensor carpi radialis brevis and extensor digitorum muscle .The abductor polices longus and extensor policus brevis mucle retracted distally at radius for good exposure. Both fractures reduced and small dynamic compression plate applied first to stable bone and then to the other bone. After fixation tourniquet deflated, hemostasis secured fascia closed separately with vicryl 3/0 suture and skin closed with skin stapler /prolene suture. Aseptic dressing done ,forearm advised to keep elevated at heart level.

RESULTS

The total number of cases operated from September 2019 to October 2020 were 14,out of 14 patients 9 (64.29%) were male and 5(35.71%) were females. The average age of patients was 26.5 years ranging from 16 to 40 years .The average time of surgery was 61 minutes ranging from 50 to 70 minutes . The patients were discharged on 3rd post op day .the patients were followed up in OPD after 2, 6 and 12 weeks respectively. Two patients developed superficial wound infection which was treated with antibiotics after culture and

sensitivity. There was no neurovascular deficit in all patients .All the fractures were united within 3 months time, and there was no radio ulnar synostosis observed within mean time.

DISCUSSION:

The forearm Fractures are considered comparatively more common fractures than any other fractures and ORIF with dynamic compression plates (DCP) is the treatment choice . Commonly we use a standard approach for ulna and for radius we chose between the anterior (Henry) or posterior (Thompson) approach ^{5,6,16} , then again the usual choice for radial shaft is anterior approach and rest of the bone exploration depends on surgeons own preference with all their pros and cons.¹⁷ The avoidance of PIN injury and good exposure to complete radial shaft through anterior approach while lesser risk to radial artery ,less irritation of bicep tendon at posterior approach is advocated by anterior and posterior platers respectively.^{18,19} However identification saving of all the structures of concern we just mentioned can increase the time of surgery and can risk the limb viability with prolonged application of tourniquet.

Approaching the simultaneous both bone fractures through two separate incisions leave a skin bridge in between making it more difficult to close. So we decided to approach the mid shaft fractures of radius and ulna which are comparatively less covered through a single posterior incision rather than the conventional approaches already present and crafting more options for the orthopedition to operate upon. The fractures are assessed between the extensor carpi radialis longus ECRL and BR after some superficial dissection . Incision can be extended both proximal and distal and plating can be done safely after complete identification and preservation of vital structures .⁵ PIN palsies and 1 radial nerve palsy are reported by Mehdi Nasab et al. and Saikia et al. out of 70 and 18patients who went through ORIF and DCP respectively.^{14,19,20,21}

It is also observed that this single incision posterior approach also provide good wound closure and reduces the incidence of wound infection.¹³ However the rate of union of bones and the long term outcomes correspond to the already existing approaches and techniques. In our patient 100% union of bones in mean time of 12 weeks without any radial nerve palsy or vascular injury was observed. Only 2 patients developed superficial wound infection which was treated by antibiotics after culture and sensitivity.

Leung and Chow reported union rate of 100% and mean time of union, 17 weeks

with LCDCP by anterior approach and union rate of 100% with mean time of union as 22 weeks with DCP was reported by Stevens and Ten Duis. Anderson et al. and Hertel et al. also reported rate of union as 97.8% and 98.5% after DCP respectively.^{6,15,22,23} Furthermore we did not attempt the removal of plate via this single incision posterior approach in order to avoid greater risk of PIN injury due to excessive scaring of the operated area as appraised by Mekhail et al.^{18,24}

This study also has some limitations like very small size of sample and from only one center. we must admit that this study of ours inspite of providing another/modification of existing approach for mid-shaft radius and ulna fracture is also in a very early stage to validate something and invite others to carryout similar studies ,so that a powerful data can be gathered and presented for maximum validation.

CONCLUSION:

To conclude we can say that the single posterior incision approach for treatment of mid-shaft radius ulna fractures osteosynthesis is effective and safe provided the surgical expertise and good anatomical knowledge for identification of the vital structures are there. Single incision posterior approach can be another choice along with already existing anterior (Henry) and posterior Thompson approaches for mid-shaft radius ulna fractures. However educating the patient, a good preoperative plan, consistency of AO principles , proper sterilization and post operative care is a must.

REFERENCES:

1. Donaldson, LJ, Cook, A, Thomson, RG. Incidence of fractures in a geographically defined population. *J Epidemiol Community Health* 1990; 44(3): 241–245.
2. Johansen, A, Evans, RJ, Stone, MD. Fracture incidence in England and Wales: a study based on the population of Cardiff. *Injury* 1997; 28(9–10): 655–660.
3. Hughston, JD . Fractures of the distal radial shaft, mistakes in management. *J Bone Joint Surg Am* 1957; 39–A(2): 249–264.
4. Knight, RA, Purvis, GD. Fractures of both bones of the forearm in adults. *J Bone Joint Surg Am* 1949; 31A(4): 755–764.

5. Leung, F, Chow, SP. A prospective, randomized trial comparing the limited contact dynamic compression plate with the point contact fixator for forearm fractures. *J Bone Joint Surg Am* 2003; 85–A(12): 2343–2348.
6. Leung, F, Chow, SP. Locking compression plate in the treatment of forearm fractures: a prospective study. *J Orthop Surg (Hong Kong)* 2006; 14(3): 291–294.
7. Thompson, JE . Anatomical methods of approach in operations on the long bones of the extremities. *Ann Surg* 1918; 68(3): 309–329.
8. Henry, AK . Exposure of the long bones and other surgical methods. Bristol: Wright, 1927.
9. Henry, AK . Extensile exposure, 2nd ed. Baltimore: Williams & Wilkins, 1970, p. 100.
10. Davies, F, Laird, M. The supinator muscle and the deep radial (posterior interosseous) nerve. *Anat Rec* 1948; 101(2): 243-7.
11. Spinner, M . Injuries to the major branches of peripheral nerves of the forearm. 2nd ed. Philadelphia, PA: WB Saunders, 1978.
12. Ruedi, TP . A prospective study evaluating incision placement and wound healing for tibial plafond fractures: invited commentary. *J Orthop Trauma* 2008; 22(5): 299–306.
13. Heim, D Forearm shaft fractures. In: Ruedi, TP, Murphy, WM (eds) *AO principles of fracture management*. New York: Thieme Stuttgart, 2000, p. 342-6.
14. Hoppenfield, S, DeBoer, P. Surgical exposures in orthopaedics: the anatomic approach. 3rd ed. Philadelphia: JB Lippincott, 2003:150–2.
15. Anderson, LD, Sick, D, Tooms, RE. Compression plate fixation in acute diaphyseal fractures of the radius and the ulna. *J Bone Joint Surg Am* 1975; 57(3): 287–297.
16. Burwell, HN, Charnley, AD. Treatment of forearm fractures in adults with particular reference to plate fixation. *J Bone Joint Surg Br* 1964; 46: 404–425.
17. Chapman, MW : Fractures and dislocations of the elbow and forearm, in chapman MW. *chapman’s orthopaedic surgery*. 3rd ed. Philadelphia: Lippincott Williams and Wilkins, 2001: 511.
18. Cross, JD, White, JA, Johnson, AE. Comparison of dorsal and volar approaches to the proximal radius. *Orthopedics* 2011.
19. Mehdi Nasab, SA, Sarrafan, N, Fakoor, M. Comparison of volar and dorsal approaches for surgical treatment in fracture of proximal half of the radius. *Pakistan J Med Sci* 2013; 29(2): 532–535.

20. Mehdi Nasab, SA, Sarrafan, N, Arti, H. Outcome of forearm shaft fractures in adults treated by open reduction and internal fixation with dynamic compression plate (DCP). *Pak J Med Sci.* 2012; 28(1): 45–48.
21. Saikia, KC, Bhuyan, SK, Bhattacharya, TD. Internal fixation of fractures of both bones forearm: comparison of locked compression and limited contact dynamic compression plate. *Indian J Orthop* 2011; 45(5): 417–421.
22. Stevens, CT, Ten Duis, HJ. Plate osteosynthesis of simple forearm fractures: LCP versus DC plates. *Acta Orthop Belg* 2008; 74(2): 180–183.
23. Hertel, R, Pizan, M, Lambert, S. Plate osteosynthesis of diaphyseal fractures of radius and ulna. *Injury* 1996; 27(8): 545–548.
24. Mekhail, AO, Ebraheim, NA, Jackson, WT. Vulnerability of the posterior interosseous nerve during proximal radius exposures. *Clin Orthop Relat Res.* 1995; (315): 199–208.