Direct Lateral Approach to Shaft of Radius

Muhammad Hanif, Muhammad Saeed Akhtar, Raza Elahi Rana, Shahzad Azhar

ABSTRACT

Shaft of radius may be exposed surgically by dorsal (Thompson)or volar (Henry) approaches. Both of these approaches are adopted depending upon the operative requirement or expertise of the surgeon. However, both of these approaches have their advantages and disadvantages. The author felt the need of any other approach, which did not have disadvantages of both approaches and at the same time have advantages of both approaches. The goal of this study was to determine the validity of a novel, direct lateral or radial approach to the shaft of radius throughout its full length. We hypothesized that by this approach, complications of both the standard Henry and Thompson approaches may be avoided. A descriptive case series was conducted in the department of orthopedic surgery, King Edward Medical College for this purpose. From October 2012 to April 2014. Twenty-seven patients were operated for internal fixation of fracture of radius with dynamic compression plate. Fracture was exposed through lateral approach and internally fixed by standard AO principles. Patients were followed up on 4th, 8th and 12th postoperative week and functional outcome was assessed. No patient included in the study had posterior interosseous nerve palsy, hematoma formation or restriction of supination or pronation by the end of the final follow up period. Absence of any complication related to the standard volar and dorsal approaches indicated the validity of this approach. Comparison with the other approaches is needed to determine its advantage over others.

MESH words: Lateral Approach, Shaft Radius

INTRODUCTION

The human radius is a curved bone with convexity dorso-laterally, cylindrical in the proximal third, triangular in the middle third, and flat distally. It is surgically exposed due to a number of reasons, fracture of the shaft being the most common reason.[1]Traditionally, there are two approaches adopted to excess the fracture site. Volar approach described by Henry and therefore also called as Henry approach, offers exposure of the entire anterior surface of the shaft.[2]For the exposure of proximal third of the radius traditionally dorsal approach is used to its own theoretical advantages. It was described by Thompson in 1918.[3] There exists deficiency of evidence regarding advantage of one approach over the other for specific circumstances.[4]

Understanding the advantages and disadvantages of both these approaches is very important. Perceiving the need for strictly abiding by the AO principles[5], the author felt the need for plating on the lateral surface of radius. This led to a new approach i.e. lateral or the radial approach to radius. To our knowledge, this approach is not mentioned in the literature and therefore the goal of this study was to explore its safety and functional outcome.

MATERIAL AND METHOD

A descriptive case series was carried out in the department of Orthopedic Surgery Unit II, King Edward Medical University, Mayo Hospital, Lahore. From October 2012 to April 2014. Twenty-seven patients were operated for internal fixation of fracture of radius with dynamic compression plate. All skeletally mature patients who needed internal fixation for the management of fracture of radius were included in the study. Patients with previously operated fractures and pathological fractures were excluded from the study. Additionally, patients having radial nerve injury were also excluded from the study. All patients were operated within 3 days of admission in the hospital and were operated by a single operating team.

Department of Orthopaedics, King Edward Medical University / Mayo Hospital, Lahore
Correspondence: Dr. Muhammad Hanif
Email: hanifspine@gmail.com

Direct Lateral Approach, Surgical Technique

The forearm was placed in the mid-prone position. Longitudinal incision was made laterally in the middle of the mobile wad of Henry. Inter-muscular plane was developed between Brachioradialis and Extensor Carpi RadialisLongus and shaft of the radius exposed in its proximal, middle or distal third according to the site of the fracture. All fractures were internally fixed with dynamic compression plates applied on the tensile surface i.e. the lateral surface of the radius with minimal stripping of periostium from anterior and the posterior surface. Wound closure was done and patients were discharged on the next postoperative day.

Fig. 1: Inter-muscular plane between Brachioradialis and Extensor Carpi Radial is Long us and direct exposure of the lateral surface of radial shaft.

All patients were followed on 2nd , 4th, 8th and 12th weeks. Radiological sign of union and clinical assessments were done. Presence of trabeculations across the fracture was termed as the sign of union. Presence or absence of complications like posterior inetrosseous nerve injury, superficial branch of radial nerve injury, hematoma formation, sign of horns and decrease range of motion (supination and pronation) were documented and results were analyzed.

RESULTS

Total of 27 patients meeting the inclusion criteria were included in the study. Age of the patients ranged from 18 to 64 with mean age of 38. There were 17 (63%) male and 10 (37%) female patients. 15 patients (55.5%) had fracture in the middle 1/3 of shaft, 8 patients (29.6%) had fracture in the proximal 1/3 and 4 patients (14.8%)had fracture at the distal 1/3 of radius.

Radiological union was satisfactory in the 12th week follow up period in all patients. None of the patients had postoperative posterior interosseous nerve palsy. No case of hematoma formation or postoperative sensory loss at radial nerve distribution area was reported. Range of motion (supination and pronation) was functional in all patients. Fig. 2 and 3.

Fig. 2: Post-operative supination

Fig. 3: Post-opeartive pronation

DISCUSSION

Radius is a curved bone with convex lateral border and concave medial border. It is cylindrical in the proximal third, triangular in the middle and flat distally. Fig. 4

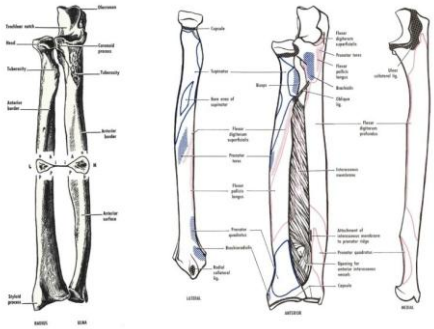

Fig. 4:
www.dartmouth.edu/~humananatomy/figures/chapter_6/6_21

A few of very important structures are present around the shaft of the radius namely, posterior interosseous nerve, radial artery and superficial branch of radial nerve. Adequate knowledge of different approaches is mandatory to avoid damage to these structures. Similarly, familiarity with AO principles and methodology is also very essential.

Fracture of radial shaft can be managed either by Henry or the Thompson approach. Surgeons well versed in either of the approaches have been claiming advantages of one approach on the other.

The volar approach is an internervous plane between Brachioradialis and Flexor Carpi Radialis and Pronator Teres[6,7]. It is associated with a few but dangerous complications that affect the outcome of the surgery. The posterior inetrosseous nerve, which runs along, the proximal end of the radius is at risk in this approach. Neuroparaxia of this nerve can take place with excessive retraction of supinator muscle through which this nerve travels. Impingement of biceps tendon as well as tuberosity may occur as result of anterior plating by this approach. Multiple branches of radial artery are given to Brachioradialis in the proximal one-third level of radius. In this approach, since the dissection is between the artery and the muscle, risk of avulsion of these branches emerges and this may lead to post operative hematoma formation. There also exists a risk of injury to superficial branch of radial nerve in this approach. In this case not only numbness can develop in the sensory distribution area of the nerve but also a painful neuroma may develop. Plating on the anterior surface may cause impingement on bicipital tuberosity and the biceps tendon[8]. Anterior surface of radius is the compression side of the bone and plating on this surface means going against the AO principles as well[5]. Therefore, problems with fixation of plate and subsequently problems with functional outcome may have to be faced.

The dorsal approach offers better visualization of the posterior interosseous nerve while exposure of the proximal radius but again the tensile surface of the radius is not exposed. There exists a risk for the paralysis of extensor digitorum communis in this approach making it less desirable. Spinner[9] reported seven cases of isolated paralysis of Extensor digitorum communis that resulted into inability to extend middle and ring finger at metacarpophalyngeal joint (sign of horns).

As mentioned earlier, radius is a curved bone with apex laterally and therefore the lateral surface is the exact tensile surface. The implant, which seats on the surface should be restoring the anatomical curves of the bone so as to obtain maximum positive outcome. The plate has to be bent in a C shape in order to make it seated on volar or the dorsal surface, which is quite difficult particularly when the size of the plate is small.

With ever-expanding understanding of implant and bones interaction in orthopedics new ideas and approaches to the same problem keep on emerging[10]. This study was also conducted to manage the fracture of radial shaft in a non-traditional and a novel way. In all the patients in the study group, the dissection was uneventful and straightforward with minimal encounter of superficial radial nerve and the radial artery. The convex surface of the bone was directly exposed and with minimal periosteal stripping plate was accommodated over the bone. The bending or contouring of the plate was also easy and normal anatomical curvature of the bone was obtained. Fig.

Fig. 5: Lateral plating of proximal third of radial shaft

Fig. 6: Lateral plating of middle third of radial shaft

Authors admit the limitations in the study and further comparative study is in progress to evaluate superiority of one approach over the other.

CONCLUSION

Direct lateral approach to radial shaft produces goods radiological and functional outcome with minimal complication rate.

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