

Study of functional outcome of DRUJ instability in patients with galeazzi fracture treated with Transfixing K wire for DRUJ instability

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Abstract

Background: Galeazzi fracture is the fracture of middle to DISTAL third of Radial shaft associated with disruption or subluxation of distal radio ulnar joint [DRUJ]. This injury was described 1st by Astley Cooper in 1826 and later named after Riccardo Galeazzi who published his series of cases in 1934 and has been termed as a fracture of necessity and treated with open reduction internak fixation [ORIF] with compression plates with or without pinning of DRUJ.

Objectives: The purpose of our study is to study the functional outcome of DRUJ instability in patients with Galeazzi fractures treated with transfixing K wire for DRUJ instability.

Materials and Methods: 23 patients of Galeazzi fracture treated with transfixation with K wire for DRUJ stabilization after stabilizing radius fracture at MMCRI Mysore from September 2020 to November 2022 with age between 18 to 70 years. Functional outcome for DRUJ instability were performed at 3 months after surgery and results were analysed by using QUICK DASH score.

Results: 23 patients with Galeazzi fracture were followed up in this study, 23 patients were treated with K wire transfixation for DRUJ stabilization after fixing Radius fracture. Patients followed up at 6 weeks for removal of K wire applied for DRUJ stabilization. Functional outcome of DRUJ stability measured at 3 months after surgery with range of movements of wrists joint and QUICK DASH score 95.6% of patients had good functional outcome.

Conclusion: This study showed that Galeazzi fracture patients treated with open reduction of Radius fracture followed by transfixing K wire for DRUJ instability had good functional outcome results.

Keywords: DRUJ (distal radioulnar joint) ORIF (open reduction internal fixation) ECU (extensor carpi ulnaris)

Introduction

Galeazzi fracture is the distal radial shaft fracture associated with disruption of the DRUJ. Incidence of this type of fracture is about 7% in adults ^[1]. The mechanism of injury typically is a force applied on the dorsolateral aspect of the forearm or a fall with forearm in pronation onto an outstretched hand ^[2]. In 1822, Sir Astley Cooper first described the injury. However, the fracture pattern was named after Riccardo Galeazzi after his presentation of 18 cases in 1934 ^[3]. There are several classifications for Galeazzi fractures. Rettig and Reskins classified

the Galeazzi fracture-dislocation according to the radius fractures proximity to the DRUJ: Type I < 7.5 and Type II > 7.5 cms^[4]. Traumatic injuries to the distal radioulnar joint (DRUJ) may give rise to long lasting complaints of pains and restricted functions in the wrist and hand. The distal radioulnar articulation is formed by the distal sides of the radius and the ulna, the sigmoid notch and ulnar seat respectively and the DRUJ provides pronation and supination in an extensive range^[5]. The DRUJ obtains stabilization from the Joint capsule, the TFCC triangular fibrocartilage complex made up of Dorsal & Volar radioulnar ligaments central articular disc, meniscus homolog, ulnar collateral ligament, ECU subsheath, origin of ulnolunate and ulnotriquetral ligaments^[6].

Radiographic signs suggesting disruption of the DRUJ include widening of the DRUJ in posteroanterior view, displacement of the ulnar relative to the radius on the lateral view fracture of the ulnar styloid base and > 5mm of radial shortening of > 5mm occurs only with disruption of the TFCC or interosseous membrane. Shortening of > 10mm results in the disruption of both TFCC and interosseous membrane^[7]. Bruckner et.al further classified the DRUJ dislocation as either simple [reduces spontaneously with reduction of the radius fracture] or complex [requires open reduction to remove any block to obtain satisfactory alignment of the DRUJ]^[8]. The management of the Galeazzi fracture in adults is anatomical reduction with open reduction and internal fixation of the radius, in fact Galeazzi fracture has been referred to a fracture of necessity because of its poor results with non-operation treatment^[9]. Intraoperatively the assessment of DRUJ stability is mandatory. After the radius fracture has been surgically stabilized, careful ballottement examination can be done to rule out any instability of the DRUJ^[10]. When the joint is stable and reduced, it does not need an additional stabilization, if the joint is stable but does not well reduced immobilization done with long arm cast or transfixing K wire for 4-6 weeks when joint is unable to be reduced then it needs open exploration surgery^[9]. Complications that may arise vary from malunion compartment syndrome to recurrent dislocation. Adequate healing and biomechanical support of the DRUJ are needed to prevent any complications especially recurrent dislocation of the joint^[2]. The simple and easy method to measure functional outcome after extremity injury is by doing self-reported questionnaire. One of the examples for upper extremity assessment is QUICK DASH score. DASH stands for Disabilities of the Arm, Shoulder and Hand. The institute for work and health and the American Academy of Orthopaedic Surgeons (AAOS) developed both DASH score and its short version QUICK DASH score. DASH score has 30 items while QUICK DASH score has only 11 items^[11]. The rationale behind the use of one outcome measure for different upper extremity disorders is that the upper extremity is a functional unit^[12]. The aim of this study was to determine the functional outcome of DRUJ disability in patients of Galeazzi fractures treated with 2 common methods for DRUJ stabilization after ORIF transfixing with K wire and long arm cast.

Materials and Methods

This was a cross sectional observational study conducted on a consecutive series of patients presenting with Galeazzi fractures to the orthopaedic department of K.R Hospitals attached to Mysore Medical College Mysore from September 2020 to November 2022 who were older than 18 years and underwent ORIF and DRUJ stabilization using transfixing K wire. Patients who had multiple traumas, open fracture and Galeazzi fractures more than 2 weeks were excluded from this study. Assessment of DRUJ is done by PIANO key test ballottement test, radius pull test, clunk test, ECU test, press test and Radiological examination for DRUJ done initially. After Radius fracture has been surgically stabilized DRUJ stabilization has been done using transfixing K wire. Patients followed up at 3 months after surgery for functional outcome measurement and after informed and written consent patients enrolled in the study were asked to do an interview by using QUICK DASH [Table 1].

It is a subjective patients-based score which contains 11 questions about the ability of subjects to do daily activities^[13]. The subjects were instructed to answer every question based on their condition in the last week. QUICK DASH score was calculated by adding up all assigned values for each response divided by the number of items which is 11 then subtracted

by one and multiplied by 25. The range of the result is between 0 to 100. The higher the QUICK DASH score indicates greater the disability and the other way around lower QUICK DASH score indicates good physical function and symptoms. In this study the score result was divided into 4 categories as follows 75-100 means sever disabilities, 50-74 means poor, 25-49 means fair and 0-24 means good.

Results

There were 23 patients with Galeazzi fractures from September 2020 to November 2022 who underwent ORIF for Radius fracture and met the inclusion and excursion criteria's and willing to participate in this study. Most of the subjects were male (56.5%) with the age group of dominantly 30-50 years. Most of the fractures lies on dominant side of the subjects (Table 1). Functional outcome of all subjects in this study were in good and fair categories. There were no subjects with poor or severe categories. Good results were achieved in 95.6% subjects treated with transfixing K wire as shown in (Table 2).

Table 1: Patient Details

Characteristics		%
Sex	Male	13 [56.5%]
	Female	10 [43.5%]
Age	20-30	3 [13%]
	31-40	15 [65%]
	41-60	5 [21%]
Mechanism of Injury	RTA	20 [87%]
	Others	3 [13%]
Fracture Side	Dominant	15 [65%]
	Non Dominant	8 [35%]

Table 2: Functional Outcome using Dash Score

	Dash Score Functional Outcome	Dash Score Functional Outcome
DRUJ stabilisation with transfixing with k wire	Good	22 [95.6%]
DRUJ stabilisation with transfixing with k wire	Fair	1 [4.4%]



Fig 1: Fixation of Galeazzi Fracture with DCP



Fig 2: Transfixation of DRUJ with K Wire



Fig 3: Clinical Photo of K Wire Fixation for DRUJ



Fig 4: Intra Operative Trans Fixation of K Wire for DRUJ



Fig 5: Post-Operative X-Ray



Fig 6: Follow Up Clinical Photos

Discussion

Galeazzi fracture dislocations incidence is about 7% in adults ^[1]. Galeazzi fracture are extremely unstable in adults and has poor results in non-surgical management ^[1]. There are several deforming forces contribute to deformation following non-surgical management. One of them is gravity, where fracture displacement and subluxation of the DRUJ affected by weight of the hand, as well as forces from the brachioradialis, pronator quadratus, thumb abductors and extensors ^[14]. The proximal radioulnar joint and the DRUJ are pivot points for the radius to rotate on the ulna, providing the function of supination and pronation to the forearm. The stability of DRUJ is dependent on multiple intrinsic and extrinsic stabilizers. Intrinsic factors include dorsal and volar radioulnar ligaments, the TFCC, the capsule and the ulnar collateral ligament. Extrinsic factors include the pronator quadratus muscle, the interosseous membrane, the ECU sheath, and the compression of the flexors and extensor on the DRUJ. Instability of the DRUJ causes worst pain and restricted or painful pronation/supination ^[15]. Missed dislocation of a DRUJ Galeazzi fracture can result in pain and loss of function. Therefore, restoration of DRUJ is essential during ORIF of Galeazzi fracture ^[15, 16, 14]. Fracture of the base of the ulnar styloid has been shown to increase the risk of DRUJ instability in distal radius fractures ^[18, 19]. One study reported 31% of Galeazzi fracture dislocations has an associated fracture of the ulnar styloid ^[20]. Biomechanically DRUJ disruption is more likely resulted due to distal third radius fractures. Twelve out of 22 subjects with type 1 Galeazzi fracture where fractures location has in the distal third of radius within 7.5cms of the midarticular surface of the distal radius were found to have intraoperative DRUJ instability, whereas only 1 out of 18 subjects were found to have intraoperative DRUJ instability in type 2 Galeazzi fracture ^[4]. Other factors that increase the suspicion of DRUJ instability are widening of the DRUJ in AP radiograph. Volar a Dorsal displacement on true lateral radiograph and shortening of the radius > 5mm relative to distal ulna ^[21].

After stabilizing radius fracture with ORIF. DRUJ stabilization done by transfixing K wire with the forearm in supination DRUJ is transfixed with K wire that are placed transversely proximal to the sigmoid notch. It is inserted percutaneously from ulnar to radial to make retrieval easier and protruded from the radial side of the radius ^[14]. In this study DRUJ stabilization done by transfixing K wire for all 23 Galeazzi fracture dislocation patients. Transfixed K wire removed at 6 weeks after surgery and all patients followed standard protocol of rehabilitation to improve the range of movements and functional outcome. The DASH score can detect and differentiate small and large changes of disability over time after surgery as well as treatment effectiveness. By comparing the performance between 30 items DASH with 11 item quick DASH Crummesan *et al.* showed that QUICK DASH has similar precision with DASH in detection of the disability of upper extremity. Although QUICK DASH is the shorter version of DASH the result of QUICK DASH can be used instead of DASH in clinical settings ^[22]. The functional outcome of the patients in this study is done by assessing QUICK DASH score at 3 months after surgery.

Fisher Exact test was done as the statistical analysis of this study. We found good results in 95.6% of patients. The study by Retting *et al.* which reported in a series of 40 patients with Galeazzi fracture underwent ORIF followed by DRUJ stabilization. 27 subjects were stabilized using long arm cast and 10 subjects were stabilized using transfixing K wire ^[4]. Both groups showed equally good results. Long arm cast as the DRUJ stabilizer has higher percentage of good functional outcome (79%) in this study. Mike *et al.* showed temporary radio ulnar transfixation gave better results when compared with no transfixation ^[20]. A study conducted by Mestdagh *et al.* showed good long term results in patients treated with long arm cast with no transfixation. Most of the Galeazzi fracture patient in this study underwent ORIF followed by long arm cast showed good to excellent functional outcome results. Progress of Galeazzi fracture dislocations treatment by anatomical ORIF is very good to excellent ^[24]. However, if the management is not adequate there are several complications that may arise Malunion, Nonunion, are examples of recurrent dislocation. Recurrent dislocation can be due to radial malreduction. Thus, to ensure adequate healing and biomechanical function of the distal radio ulnar joint, anatomic restoration of the radial fracture need to be prioritised ^[2]. Besides the fracture the surrounding soft tissue influences the joint functional result, even though all of the attention may be focused on the fracture position ^[25]. Rehabilitation protocol done after surgery improves the functional outcome of patients ^[26].

Conclusion

This study showed that Galeazzi fracture patients treated with ORIF followed by transfixing K wire had good functional outcome results and anatomical restoration of the radial fracture need to be prioritised.

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