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Functional Outcome of Galeazzi Fractures Treated by ORIF and DRUJ Stabilization either Using Long Arm Cast or Transfixing Wire

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Abstract

Introduction: Galeazzi fracture is a condition where there is distal radial shaft fracture accompanied with disruption of the Distal Radioulnar Joint (DRUJ). Assessment of distal radio ulnar joint stability is mandatory and followed by further joint stabilization methods. The aim of this study was to study the functional outcome Galeazzi fracture management treated with ORIF followed by DRUJ strabilization using transfixing wire with long arm splint compared with long arm cast.

Materials and methods: This study was a cross sectional observational study in patients with Galeazzi fractures from January 2007 to May 2012 underwent ORIF and DRUJ stabilization either using long arm cast or transfixing wire and long arm splint. Functional outcome measurement started at 3 months after surgery. The researcher contacted those eligible patients. After patients gave consent to the study, they were asked to do an interview guided by the researcher using QuickDASH score. The data was analysed using Fisher Exact test.

Results: A total of 32 patients with Galeazzi fracture underwent ORIF followed by DRUJ stabilization. 72% had good functional outcome in subjects underwent ORIF followed by transfixing wire with long arm splint and 79% subjects using long arm cast (p-value>0.05).

Conclusion: This study showed that Galeazzi fracture patients treated with ORIF followed by long arm cast or transfixing wire and long arm splint had not significantly differ and had equally good functional outcome results.

Keywords: Functional outcome; Galeazzi fracture; ORIF

Introduction

Galeazzi fracture is a condition where there is distal radial shaft fracture accompanied with disruption of the Distal Radioulnar Joint (DRUJ). Incidence of this type of fracture is about 3% of all forearm fractures in children and about 7% in adults [1]. Direct or indirect trauma to the wrist can lead to Galeazzi fractures. The mechanism of injury typically is a force applied on the dorsolateral aspect of the forearm, or a fall with forearm pronation onto an outstretched hand. Patients may present with pain around the mid-forearm and wrist. By stressing the distal radioulnar joint, the pain will be exacerbated [2]. The management of Galeazzi fractures in adults is operation in the form of open reduction and compression plating of the radius [3]. In fact, Galeazzi fracture has been referred to a 'fracture of necessity' because of its poor results with non operative treatment [4].

Intraoperatively, the assessment of distal radio ulnar joint stability is mandatory. After the radius fracture has been surgically stabilized, careful ballottment examination can be done to rule out any instability of the DRUJ [5]. When the joint is stable and reduced, generally it does not need an additional immobilization or it can be immobilized using long arm splint or long arm circular cast for 4-6 weeks, if the joint is stable but does not well reduced, the options of immobilization are long arm circular cast for 6 weeks or transfixing Kirschner wire for 4-6 weeks with or without long arm splint for 2-3 weeks. When the joint is unable to be reduced, then it needs an open explorative surgery [3]. Complications that may arise varies from malunion, compartment syndrome to recurrent dislocation. Adequate healing and biomechanical support of the distal radioulnar joint are needed to prevent any complications especially recurrent dislocation of the joint [2].

A simple and easy method to measure functional outcome after extremity injury is by doing a patient self-report questionnaire. One of the example for upper extremity assessment is QuickDASH 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 outcome measure and its shorter version, QuickDASH score. DASH score has 30 item while QuickDASH score only has 11 item. The purpose is to provide a single, reliable instrument to the clinicians that can be used to assess any or all joints in the upper extremity [6].

The aim of this study was to determine the functional outcome of Galeazzi fractures treated with 2 common methods for DRUJ stabilization after ORIF.

Materials and Methods

This was a cross sectional observational pilot study conducted on a consecutive series of patients. It involved patients in Dr. Sardjito General hospital from January 2007 to May 2012 who were older than 18 years that diagnosed as Galeazzi fracture underwent ORIF and DRUJ stabilization either using transfixing wire and long arm splint or long arm circular cast. After surgery, all patients followed standard protocol of rehabilitation from Sardjito hospital. Patients who had multiple trauma, open Galeazzi fracture, and Galeazzi fracture patients that were treated more than 2 weeks after onset were excluded from this study. Functional outcome measurement started at 3 months after

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surgery. The researcher contacted those eligible patients. After patients gave consent to be enrolled in the study, they were asked to do an interview by the researcher using QuickDASH (Table 1).

QuickDASH score was used to measure the functional outcome of the subjects. It is a subjective patients based score which is the short form of DASH score. It contains 11 questions about the ability of subjects to do daily activities [7]. The subjects were instructed to answer every questions, based on their condition in the last week and if they did not have the opportunity to perform some activities mentioned in the questionnaire, they should make their best estimation on which response would be the most appropriate.

Quick DASH score was calculated by adding up all the assigned values for each responses 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 QuickDASH score indicates greater the disability and the other way around lower QuickDASH score indicates good physical function and symptom. In this study, the score result was divided into 4 categories as follows 75-100 means severe disabilities, 50-74 means poor, 25-49 means fair, and 0-24 means good. Fisher Exact test was done as the statistical analysis of this study.

Results

From January 2007 to May 2012, there were 60 adult Galeazzi fracture patients who underwent ORIF but only 32 patients were successfully contacted, met the criterias, and willing to participate in this study.

Most of the subjects were male (56%) with the age group dominantly younger than 30 years old with the mean of 33.1 years old. The injuries in this study are mainly due to road traffic accident with the percentage of 90.6. The fractures mostly lies on the dominant side of the subjects (Table 2).

The results of subjects functional outcome in this study were in good and fair categories. There were no subjects that had poor or severe disabilities for both groups. Good results were achieved in 72% subjects

treated using transfixing wire with long arm splint and 79% subjects using long arm circular cast as shown in Table 3 with p value more than 0.05 which showed that the functional outcome of both groups was not significantly different.

Discussion

Galeazzi fractures are extremely unstable in adults, and it has unsatisfactory result to nonsurgical management [1]. There are several deforming forces contribute to deformation following nonsurgical 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 extensor [8]. Biomechanically, DRUJ disruption is more likely resulted due to distal third radius fractures than fractures of more proximal of the radius. Twelve out of 22 subjects with type 1 Galeazzi fractures where fracture location lies in the distal third of the radius within 7.5 cm 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 fractures [9]. Other factors that can increase the suspicion of DRUJ instability are ulna styloid fracture at the base, an AP radiograph shows widening of the DRUJ, on a true lateral radiograph shows dislocations of the DRUJ, and shortening of the radius greater than 5 mm relative to the distal ulna [10].

DRUJ stabilization can be done by transfixing K-Wire. With the position of forearm in supination, DRUJ is transfixed with K-Wire that are placed transversely proximal to the sigmoid notch. It should protrude from the radial side of the radius after being inserted percutaneously from ulnar to radial to make retrieval easier [8]. In the cases where DRUJ stabilization using K-wire, it is suggested to have additional splinting of the forearm including elbow and wrist. Other wise, during 3 weeks before it is removed, the K Wire will break [11].

The functional outcome of upper extremity can be assess by both, DASH score and QuickDASH score. The DASH can detect and differentiate small and large changes of disability over time after surgery

Please rate your ability to do the following activities in the last week						
No	Activities	1	2	3	4	5
1	Open a tight or new jar	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
2	Do heavy household chores (eg wash walls, wash floors)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
3	Carry a shopping bag or briefcase	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
4.	Wash your back	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
5.	Use a knife to cut food	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
6.	Recreational activities in which you take some force or impact through your arm, shoulder or hand (eg: golf, hammering, tennis, etc)	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
7.	During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	Not at all	Slightly	Moderately	Quite a bit	Extremely
8.	During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder, or hand problem?	Not limited at all	Slightly limited	Moderately limited	Very limited	Unable
Please rate the severity of the following symptoms in the last week						
9.	Arm, shoulder or hand pain	None	Mild	Moderate	Severe	Extreme
10.	Tingling (pins and needles) in your arm, shoulder, or hand	None	Mild	Moderate	Severe	Extreme
11.	During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder, and hand?	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	So much difficulty, cant sleep

Table 1: QuickDASH used in this study based on www.dash.iwh.on.ca [6].

Characteristics		n (%)
Sex	Male	18 (56.2%)
	Female	14 (43.8%)
Age	18-30	16 (50.0%)
	31-40	9 (28.1%)
	>40	7 (21.9%)
Mechanism of Injury	Road Traffic Accident	29 (90.6%)
	Other	3 (9.4%)
Fracture sites	Dominant side	17 (53.1%)
	Non dominant side	15 (46.9%)

Table 2: The characteristics of subjects in this study.

		FUNCTIONAL OUTCOME		Total	P Value
		Good	Fair		
DRUJ STABILIZATION	Transfixing Wire with long arm splint	13	5	18	P 1.000
	Long Arm Circular Cast	11	3	14	
Total		24	8	32	

Table 3: Functional outcome of Galeazzi fracture patients treated by ORIF and DRUJ Stabilization either using transfixing wire with long arm splint or long arm cast.

as well as treatment effectiveness. Minimal important change in DASH score can be consider if there is a 10 point difference in mean [12]. By comparing the performance between 30-item DASH with 11 item quickDASH, Gummesson et al. showed that QuickDASH has similiar precision with DASH in detecting the disability of upper extremity. Although QuickDASH is the shorter version of DASH, the result of QuickDASH can be used instead of DASH in clinical settings [13].

The data analysis being used was fisher exact test due to value in one of the categories was less than 5. We found equally good results in both groups with no significantly differ ($p > 0.05$). This was in accordance to the study by Rettig et al. which reported in a series of 40 patients with Galeazzi fractures underwent ORIF followed by DRUJ stabiliztion. 27 subjects were stabilized using long arm circular cast and 10 subjects were stabilized using transfixing wire [9]. Both groups showed equally good results. Long arm circular cast as the DRUJ stabilizator has higher percentage of good functional outcome (79%) in this study. This result was similiar to a study conducted by Mestdagh et al. They conducted a study about long term result in the treatment of fracture dislocation of Galeazzi in adults. Most of the Galeazzi fracture patients underwent ORIF followed by long arm circular cast showed good to excellent functional outcome results. They could resume their previous occupation 4 to 12 months postoperatively [14].

Although in this study the percentage of good functional outcome from group underwent ORIF followed by transfixing wire and long arm splint were lower compared to long arm circular cast group, but it still considered good result. Seventy two percent of the subjects had good functional outcome. Mikic et al. showed temporary radioulnar transfixation gave better results when compared with no transfixation [15].

Prognosis of Galeazzi-fracture-dislocations treatment by anatomic ORIF is very good to excellent [16]. However, if the management is not adequate, there are several complications that may arise. Malunion, non union, compartment syndrome, neurovascular injuries, and recurrent dislocation are the examples. Recurrent dislocation can be due to radial malreduction. Thus, to ensure adequate healing and biomechanical

function of the distal radioulnar joint, anatomic restoration of the radial fracture need to be prioritized [2].

Besides the fracture, the surrounding soft tissue greatly influences the final functional result, even though all of the initial attention may be focused on the fracture position [17]. Watson-Jones in 1955 pointed that fracture is a soft tissue injury that happens to involve the bone. Different kind of rehabilitation forces can be performed during various stage of healing process to maximize outcome [18]. Rehabilitation protocol done by the subjects after surgery was not discussed deeper in this study, eventhough it may affect the functional outcome of the subjects.

Conclusion

In conclusion, this study showed that Galeazzi fracture patients treated with ORIF followed by long arm circular cast or transfixing wire and long arm splint had not significantly different and had equally good functional outcome results.

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