CLINICAL OUTCOME AFTER OPERATIVE TREATMENT IN FLOATING SHOULDER- A PROSPECTIVE STUDY

Nabarun Saha[1], Partha Sarathi Sarkar[2], Sagar Mukhopadhyay[3], Sujit Narayan Nandi[4], Kiran Kumar Mukhopadhyay[5]

[1]RMO -Cum Clinical Tutor, Department of Orthopaedics, NRS Medical College, Hospital, Kolkata.
[2]Associate Professor, Department of Orthopaedics, NRS Medical College, Hospital, Kolkata.
[3]Resident, Department of Orthopaedics, NRS Medical College, Hospital, Kolkata.
[4]Professor, Department of Orthopaedics, NRS Medical College, Hospital, Kolkata.
[5]Professor, Department of Orthopaedics, NRS Medical College, Hospital, Kolkata.

ABSTRACT

BACKGROUND

The 'floating shoulder' is a rare injury consisting of ipsilateral fractures of the clavicle and glenoid neck. Although it may appear to be bony injury, studies suggest that ligamentous disruption associated with ipsilateral clavicle fracture and scapular neck fracture contributes to such entity. More commonly floating shoulder is defined as double disruption of the superior shoulder suspensory complex. Open reduction and internal fixation of both the fractures is the treatment of choice. We have made this study to assess clinical outcome after operative treatment of floating shoulder by DASH score.

MATERIALS AND METHODS

This is a study of 10 cases of floating shoulder injury operated in the same sitting by anterior approach for fracture clavicle and Judet's posterior approach for scapula fracture from Jan 2014 to Oct 2016. All cases were assessed with DASH score at the end of six months.

RESULTS

Results of our study shows that majority of patients had excellent to good results with improvement in DASH score from 92.8 to 16.8 at final follow up. No major complications. All patients had radiological signs of union at the end of 1 year.

CONCLUSION

Surgical intervention should be considered for all floating shoulder injuries. open reduction and internal fixation not only increases stability but also to improves functional outcome of the patient. DASH score is an effective method to assess clinico-functional outcome in post-operative cases of floating shoulder.

KEYWORDS

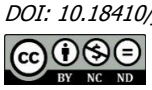
Operative Outcome, Floating Shoulder.

HOW TO CITE THIS ARTICLE: Saha N, Sarkar PS, Mukhopadhyay S, et al. Clinical outcome after operatne treatment in floating shoulder- a prospective study. J. Evid. Based Med. Healthc. 2017; 4(51), 3123-3130. DOI: 10.18410/jebmh/2017/620

BACKGROUND

Scapula fractures are high velocity injuries; they constitute 1% of all fractures and 5% of fractures around shoulder.[1,2] Clavicle fractures are common, usually being caused by a fall or a blow to the tip of the shoulder. Conservative treatment usually produces good results in fractures of clavicle or scapula. But this is not so when both the bones on ipsilateral side are injured. The 'floating shoulder' is a rare injury consisting of ipsilateral fractures of clavicle and glenoid neck. As these fractures result from high velocity trauma and most of these cases are associated with concomitant injuries like rib fracture, pneumothorax, haemothorax, brachial plexus injuries, head injury etc. under diagnosis and under treatment remains an important issue. Since this kind of injuries are relatively rare, therefore there are no randomized trials on the treatment of such an injury. Most of the literature consists of case reports, case series or retrospective observational cohort studies. We have made a prospective study on clinico-functional outcome after operative treatment of floating shoulder.

Financial or Other, Competing Interest: None.
Submission 04-06-2017, Peer Review 12-06-2017,
Acceptance 22-06-2017, Published 24-06-2017.
Corresponding Author:
Dr. Kiran Kumar Mukhopadhyay,
No. T4/F11/A4; /Ruchitra Residency, Kolkata-700078.
E-mail: orthokiran@gmail.com
DOI: 10.18410/jebmh/2017/620



Anatomical Considerations

Floating shoulder was first described in 1975 by Ganz and Noesberger.[3] Subsequently, Goss expanded on their definition by describing it as a 'double disruption' of the superior shoulder suspensory complex.[4] Proper understanding of anatomy and biomechanics of superior shoulder suspensory complex is essential for effective management of floating shoulder. The superior shoulder suspensory complex is, essentially, a bone and soft-tissue ring secured to the trunk by superior and inferior bony struts (Figure 1) from which the upper extremity is suspended. The ring is composed of bony elements (1. Glenoid process, 2. Distal clavicle, 3. Acromion process, 4. Coracoid process)

and soft tissue elements (1. Coracoclavicular ligament, 2. Acromioclavicular ligament, 3. Coracoacromial ligament). Middle third of clavicle constitutes the superior strut, while inferior strut is the junction of scapular body and glenoid neck. The complex can be subdivided into three units: a) clavicle-acromioclavicular joint-acromial strut, b) clavicle-coracoclavicular ligament-coracoid and c) three process-scapular body. Secondary support is provided by the coracoacromial ligament.[5] Isolated, single traumatic disruptions are common (e.g., grade II acromioclavicular joint dislocation) but they do not significantly change the stability of the ring. When the complex is disrupted at two places (i.e. double disruption), the integrity of the superior shoulder suspensory complex is breached and a potentially anatomically unstable situation is created.[6] In such situation the weight of the arm and the muscles acting on the humerus pull the glenoid fragment distally and anteromedially which results into drooping of shoulder followed by nonunion, malunion, brachial plexopathy, limited range of motion, weakness in abduction and subacromial impingement.[7] Williams et al in a cadaveric study observed that in ipsilateral glenoid neck and clavicular fractures, instability of the glenoid segment occurred only if the coracoacromial and acromioclavicular ligaments were divided.[8] They concluded that the floating shoulder only becomes unstable when there is an associated disruption of these ligaments.

MATERIALS AND METHODS

This is a prospective study from Jan 2014 to October 2016. Study group include patients who had ipsilateral injury to scapula and clavicle or acromioclavicular joint with concomitant injury to Superior Shoulder Suspensory Complex (SSSC). AP x-ray of shoulder, Scapular Y view & CT scan of shoulder with 3D reconstruction were obtained in all the cases. There were total 10 cases included in this series with clinical and radiological floating shoulder. All the patients we studied are male. Patients with pediatric and geriatric age group, with scapulothoracic dissociation and compound injuries were excluded.

After initial resuscitation in the emergency department according to ATLS protocol further management was based on the amount of fracture displacement and general condition of patient. We have classified clavicle fracture according to Craig classification.[9] (Table 1) and scapula fracture according to Zdravkovic and Damholt classification.[10] (Table 2). DASH score.[11] (Figure 2) was evaluated in all patients. Management was based according to above said classification. All the patients were treated with open reduction internal fixation of clavicle first followed by fixation of scapula through Judet approach in the same sitting. We approached to clavicle through anterior or superior approach in supine position. After dissection we looked for integrity of Coracoclavicular ligament and acromioclavicular ligament. Then fixation of clavicle done with 3.5 precontoured locking plate or 3.5 reconstruction plate (for middle 1/3rd fracture), 3.5/2.7 lateral locking plate (for lateral 1/3rd fracture) and hook plate for clavicular fracture with AC joint dislocation. Following meticulous closure of the clavicle incision, patient was turned semiprone on intact side with arm draped freely according to surgical approach described by Robert Judet.[12] for scapular fixation. A boomerang skin incision was given along the scapular spine followed by medial border of scapula. Posterior border of deltoid retracted laterally and the infraspinatus and teres minor gap is identified and infraspinatus is retracted proximally keeping attention to suprascapular nerve and circumflex scapular artery. The spinal portion of the deltoid and the medial portion of the infraspinatus are covered by a common fascia. The common fascia is split by a T-shaped incision. In some cases it is possible to make only medial and lateral windows without mobilizing the whole infraspinatus. On the lateral side it is sufficient to detach the infraspinatus from the lateral border of the scapula only; on the medial side it is typically released in the spino-medial angle. In fractures of the scapular body and neck it is essential to restore the integrity of the biomechanical body, so the first step is to stabilize fractures of the lateral border. Sometimes we used bone hook or schanz screw as joystick or lost k wire techniques.[13] for fracture reduction. Implants used are 3.5/2.7 normal or precontured reconstruction plate for body fixation. 2+2 & 3+3 fixation used as needed. We used T plate of 3.5/2.7 mm system for inferior angle and glenoid fractures. 3.5 mm cortical screws were used for CC process fracture and inferior glenoid fracture. After proper reduction and fixation, c-arm images were taken and wound was closed after putting a drain. Dressing and drain removal were done after 48 hours. Patient was advised arm pouch sling. Stitch off was done at 14th day. Range of motion pendular exercise within arm pouch sling was started from 3rd week onwards followed by abduction exercise from 6th week. Follow up radiographs were obtained immediate post-op, at 6 weeks, 3 months and 6 months. DASH score was evaluated at 3rd week, 6th week, 3 months, 6 months.

RESULTS

We have operated 10 patients and followed up 9 patients. All the patients we studied are male. Mean age was 48 (20-65 yrs). None of them had associated head or chest injury. To site the cause of injury- six (6) had history of fall from height and four (4) sustained road traffic injury. Fracture classification as per preoperative X-ray. Clavicle fracture: Craig Group I-6 and Group II-4. Scapula fracture: Zdravkovic and Damholt type III- 10 cases

One of them had preoperative axillary neuropathy due to primary impact. Mean preoperative DASH scoring was 92.8. Average time interval between trauma and surgery was 10 days. Average duration of surgery was 135 minutes. Average blood loss during surgery was 420.9 ml. Among postoperative complication one patient came with superficial wound infection which was healed with change in antibiotics and regular dressing. There were no cases of loss of fracture reduction or distal neurovascular deficit. Average hospital stay was 10 days. We evaluated the patient every month and DASH scoring was done at 6 months follow up. Average score came out to be 16.8.

All patients showed radiological signs of union by the end of 1 year. Two (2) cases of floating shoulder with preoperative and postoperative radiograph and postoperative functional outcome have been demonstrated from Figure 3 to Figure 10.

Group I	**Fracture of the Middle Third**
Group II	Fracture of the distal third
Type I	Minimal displacement (interligamentous)
Type II	Displaced secondary to a fracture medial to the coracoclavicular ligaments
II A	Conoid and trapezoid attached
II B	Conoid tom, trapezoid attached
Type III	Fractures of the articular surface.
Group III	fracture of the proximal third
Type I	minimal displacement
Type II	displaced (ligaments ruptured)
Type III	intraarticular
Type IV	epiphyseal separation (children and young adults)
Type V	comminuted

Table 1. Craig Classification for fracture Clavicle

Type I	Fracture of the body (49-89%)
Type II	Fracture of the apophysis including the coracoid and acromion
Type III	Fracture of the supero-lateral angle including the neck/glenoid

Table 2. Zdravkovic and Damholt Classification for Scapula Fracture

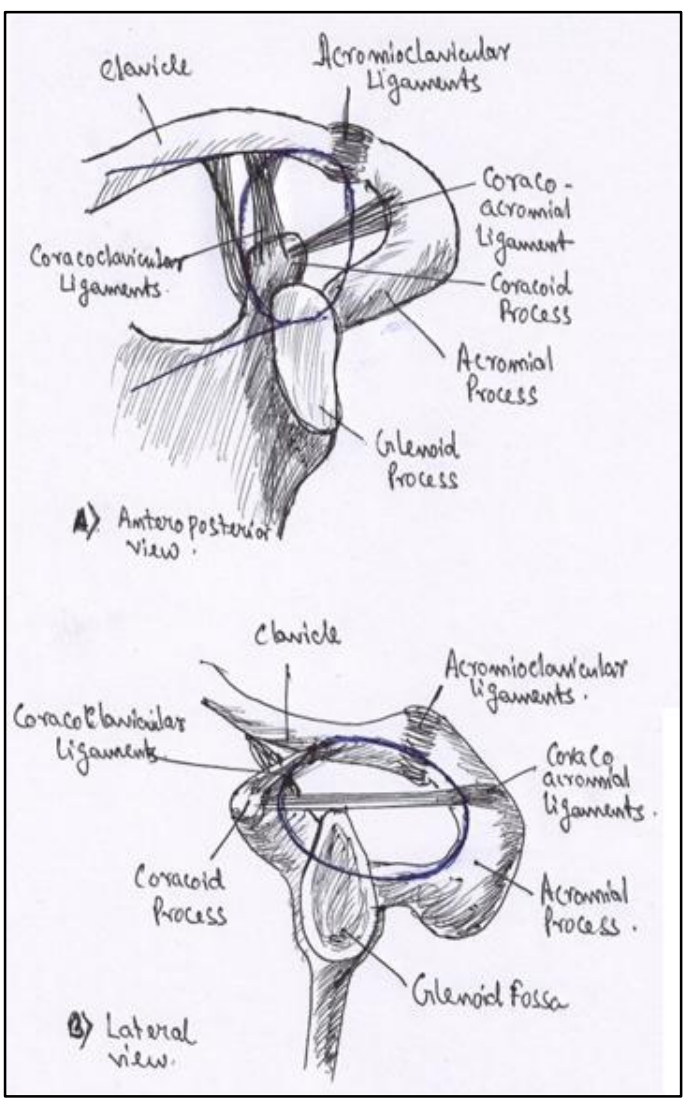


Figure 1. Superior Shoulder Suspensory Complex (Antero-Posterior and Lateral View)

Patient Name DOB DOS DOE DASH SCORE _____

Preop 2 week F/U 6 week F/U 12 week F/U

6 month F/U 12 month F/U 24 month F/U

Annex 1– Rate how well you were able to do the following activities last week by circling the appropriate response below:

	No difficulty	A little difficulty	Moderate difficulty	A lot of difficulty	I wasn't able to do it
1. Open a new glass jar, or one with a very tight lid	1	2	3	4	5
2. Write.	1	2	3	4	5
3. Turn a key	1	2	3	4	5
4. Prepare a meal	1	2	3	4	5
5. Open a heavy door	1	2	3	4	5
6. Put something on a shelf above head height	1	2	3	4	5
7. Do heavy domestic tasks (such as washing the floor)	1	2	3	4	5
8. Do gardening work	1	2	3	4	5
9. Make your bed	1	2	3	4	5
10. Carry a bag or a small case	1	2	3	4	5
11. Carry a heavy object (more than 5 kg).	1	2	3	4	5
12. Change a light bulb above head height	1	2	3	4	5
13. Wash or dry your hair	1	2	3	4	5
14. Wash your back	1	2	3	4	5
15. Put on a closed blouse	1	2	3	4	5
16. Use a knife to cut food	1	2	3	4	5
17. Recreational activities that require little effort (such as playing cards or knitting)	1	2	3	4	5
18. Recreational activities that require strength or impact in the arms, shoulders or hands (such as playing volleyball or hammering)	1	2	3	4	5
19. Recreational activities in which you move your arm freely (such as fishing or playing shuttlecock)	1	2	3	4	5
20. Transport from one place to another (going from one place to another)	1	2	3	4	5
21. Sexual activities	1	2	3	4	5
	It didn't affect them	**It affected them slightly**	**It affected them moderately**	**It affected them a lot**	**It affected them enormously**
22. Last week, to what extent did your arm, shoulder or hand problem affect your normal activities with your family, friends, neighbors or colleagues?	1	2	3	4	5
	It didn't limit them	**It limited them slightly**	**It limited them moderately**	**It limited them a lot**	**I wasn't able to do them**
23. Last week, were your work or normal daily activities limited because of your arm, shoulder or hand problem?	1	2	3	4	5
Rate how severe the following symptoms were last week	**None**	**A little**	**Moderate**	**A lot**	**Extreme**
24. Pain in your arm, shoulder or hand	1	2	3	4	5
25. Pain in your arm, shoulder or hand when you did specific activities	1	2	3	4	5
26. Discomfort in the skin of your arm, shoulder or hand (prickling)	1	2	3	4	5
27. Weakness in your arm, shoulder or hand	1	2	3	4	5
28. Difficulty in moving your arm, shoulder or hand	1	2	3	4	5
	No difficulty	**A little difficulty**	**Moderate difficulty**	**A lot of difficulty**	**So difficult that I wasn't able to sleep**
29. Last week, did you have any difficulty in sleeping because of pain in your arm, shoulder or hand?	1	2	3	4	5
	Totally disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Totally agree**
30. I feel less capable, less confident and less useful because of my arm, shoulder or hand problem	1	2	3	4	5

Figure 2. DASH Questionnaire

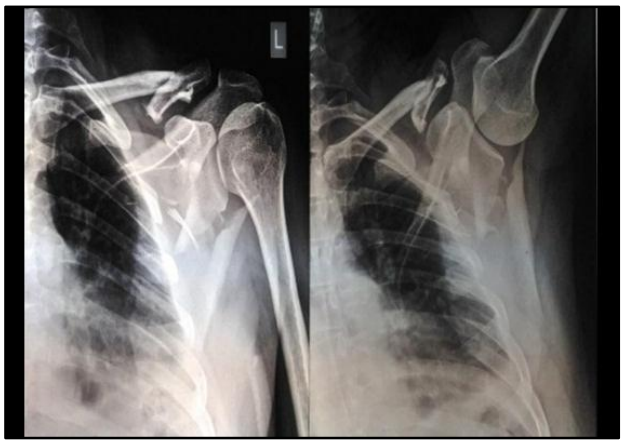


Figure 3. Case 1- Pre operative Radiograph-AP and Oblique

Figure 4. Case 1- Pre operative CT Scan with 3D Reconstruction

Figure 5. Case 1- Post Operative Radiograph - 6 Months follow up

Figure 6. Case 1- 6 Months Follow up- Functional Outcome

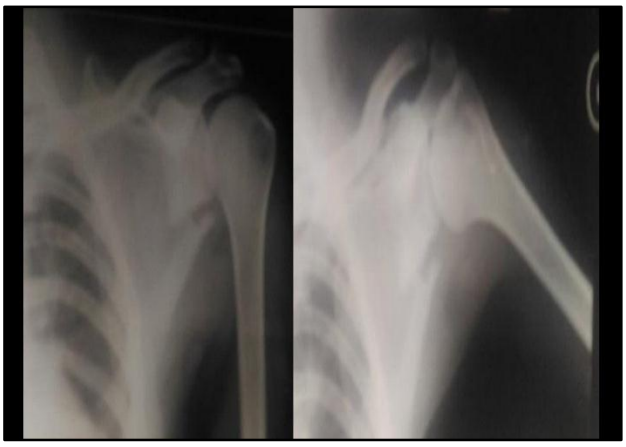


Figure 7. Case 2 -Pre operative Radiograph-AP and Oblique

Figure 8. Case 2- Pre operative CT Scan with 3D Reconstruction

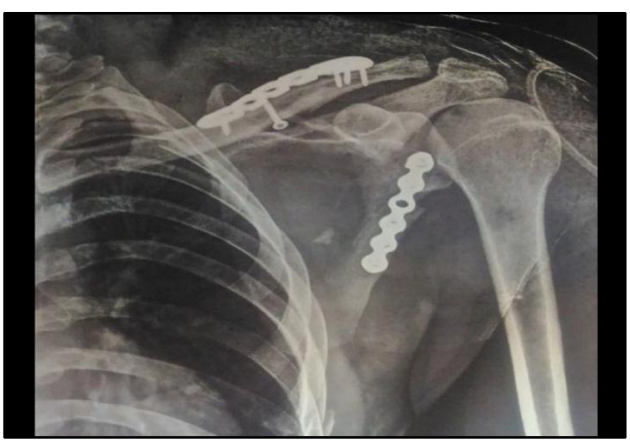


Figure 9. Case 2- Post operative X-ray- 6 Months Follow up

Figure 10. Case 2 6 Months Follow up

DISCUSSION

Scapula fractures occur relatively infrequently. According to various studies, they account for 0.4% to 0.9% of all fractures and for about 3% to 5% of all fractures of the shoulder girdle.[14,15,] Floating shoulder is another complex entity related to scapula fracture defined by Goss.[4] We have defined the superior shoulder suspensory complex anatomy, biomechanics of injury andits outcome previously. It is a very rare entity too and less literature support is there. Regarding definitions there are different views from different authors. Floating shoulder was defined by Herscovici et al as "ipsilateral midclavicular and scapular neck fractures".[16] Williams et al. pointed out that Goss did not include the CA ligament in the structures.[8] DeFranco and Patterson considers this ligament as an important stabilizer in the superior shoulder suspensory complex.[17]

We tried to study the clinico-radiological outcome after operative fixation of floating shoulder in our institution. Most of the cases of floating shoulder are associated with other fractures and co-morbidities like blunt trauma chest, abdomen, head injuries, brachial plexus injury pelvic trauma. We sorted out the patients and studied 10 of the floating shoulder cases without other injuries. Unfortunately all of them were male and one patient was lost to follow-up. At the first encounter in emergency we resuscitated the patients, immobilized the shoulder. Antero-posterior view of shoulder, Scapular y view, CT scan of shoulder with 3D reconstruction were advised.[5] There are only a few papers on classification of floating shoulder like that published by Jan Friederichs et al.[18] However they are complex and are not easily reproducible. We have used Craig classification for clavicle fracture and Zdravkovic and Damholt for scapula fracture. Craig subdivided middle third and lateral third clavicle fractures. Moreover middle third clavicle fractures were reclassified on the basis of ligamentous integrity of coracoclavicular ligament complex (conoid and trapezoid ligaments).[19] Intraarticular fractures are subtyped in lateral third clavicle fractures. Zdravkovic and Damholt classified scapula fractures on anatomical basis. It is easy to execute and reproducible.

Regarding treatment, it has also an illusury history. In isolation, each fracture when minimally displaced can be managed non-operatively. In floating shoulder too publications like Romero et al[20] Pace et al[21] Bozkurt et al[22] Van Noort et al[23]support a conservative treatment with good outcome. However recent studies suggest each disruption can make the other unstable, for example, the glenoid neck fracture may increase the displacement of the clavicular fracture and vice versa. The resultant instability will be greater if there is additional disruption of the clavicle-acromioclavicular joint-acromial strut or coracoacromial ligament.[24] Hardegger, Simpson and Weber felt that these injuries represented a "functional imbalance" owing to the "altered glenohumeral-acromial relationships" and thus altered joint reaction forces.[25] Hardegger et al. recommended surgery in these cases.[25] They emphasised on reduction and stabilization of clavicle fracture by screw/plate fixation if the displacement is unacceptable. This reduces the risk of non-union, alleviates tension on the brachial plexus, restores normal anatomical relationships and ensures restoration of normal shoulder function.[6,26] They came out with a concept that fracture of glenoid neck will indirectly reduce and stabilize as a result of clavicle fixation. However, if significant displacement of glenoid neck persists, it should be reduced and fixed. Associated injuries of the Coracoacromial ligament will usually heal satisfactorily if glenoid neck and clavicle are properly stabilised. Hashiguchi and Ito.[27] published a series of five patients with ipsilateral fractures of the clavicle and glenoid neck, for whom only fixation of the clavicle was performed. He used the concept of indirectly reducing the glenoid fracture by fixing the clavicle alone, however failed to demonstrate the reduction of glenoid fracture in any of his cases. Leung et al in 1993 reviewed the outcome of surgical treatment of ipsilateral fracture of the clavicle and scapular neck in 15 patients.[28] All the patients were treated by open reduction and internal fixation of both fractures. The average time of fracture healing was 7-8 weeks. According to the scoring system of Rowe.[29] eight patients had an excellent functional result, six had a good result and one had a fair result. The authors recommended fixation of both fractures, to provide stability to the shoulder complex and allow early postoperative mobilization. According to the authors, postoperative rehabilitation is greatly facilitated following fixation of both fractures, and the results in their series appeared superior to those that had been reported for isolated fixation of either the scapular or clavicular facture. We carried out fixation of both clavicle and scapula. Recent studies like Labler et al[30] Egol et al[31], and Leung and Lam.[32] support our consensus.

There is debate over order of fixation. Initial fixation of clavicle may allow indirect reduction of the glenoid segment and obviate the need for a posterior procedure. If significant displacement persists, however, the fracture of the glenoid must also be addressed.[33] Conversely, fixation of the displaced glenoid segment may be deemed more important and can be carried out first, followed by open reduction and internal fixation of the fracture of the clavicle if necessary.[5] We carried out open reduction and internal fixation of clavicle first followed by scapula.

There are no prospective studies which compare shoulder disability score pre and post operatively in case of floating shoulder. There are several scoring for shoulder disabilities measurement like Simple Shoulder Test (SST), Oxford Shoulder Score (OSS), Single Assessment Numeric Evaluation (SANE), Short Form-12 (SF12), and Disabilities of the Arm Shoulder and Hand score (DASH). We have used Disabilities of the Arm Shoulder and Hand score (DASH) pre and post operatively. The Disabilities of the Arm, Shoulder and Hand (DASH) Outcome Measure is a 30-item, self-report questionnaire designed to measure physical function and symptoms in patients with any or several musculoskeletal disorders of the upper limb. The questionnaire was designed to help describe the disability experienced by people with upper-limb disorders and also to monitor changes in symptoms and function over time. Testing has shown that the DASH performs well in both these roles. It gives

clinicians and researchers the advantage of having a single, reliable instrument that can be used to assess any or all joints in the upper extremity. The DASH Outcome Measure is scored in two components: the disability/symptom section (30 items, scored 1-5) and the optional high performance Sport/Music or Work section (4 items, scored 1-5). Free information and calculation services for the DASH Outcome Measures are available from Orthopaedic Scores.[11] We used this software format to be filled up by the patent preoperatively and then during postoperative follow ups. Preoperative DASH score was 92.8 and post operatively it improved to 16.8. This result is comparative to 14.5 DASH score in a retrospective monocentric study by ReÌ gis Pailhes et al[34]

CONCLUSION

So to conclude surgical intervention should be considered for all floating shoulder injuries. Operative fixation of only clavicle does not satisfactorily reduce the displaced fracture of the glenoid neck. Hence, open reduction and internal fixation of the second site must be performed not only for stability but also to improve functional outcome of the patient. Order of fixation may vary according to surgeons. DASH score is an effective method to assess clinio-functional outcome in post-operative cases of floating shoulder.

REFERENCES

[1] Imatani RJ. Fractures of the scapula: a review of 53 fractures. J Trauma 1975;15(6):473-478.

[2] McGahan JP, Rab GT, Dublin A. Fractures of the scapula. J Trauma 1980;20(10):880-883.

[3] Ganz R, Noesberger B. Treatment of scapular fractures. Hefte Unfallheilkd 1975;126:59-62.

[4] Goss TP. Double disruptions of the superior shoulder suspensory complex. J Orthop Trauma 1993;7(2):99-106.

[5] Owens BD, Goss TP. The floating shoulder. J Bone Joint Surg Br 2006;88(11):1419-1424.

[6] Gupta A, Nagla A, Chaudhery P. Management of floating shoulder injury with dual surgical approach. IJOS 2017;3(1):572-576.

[7] Goss TP. Scapular fractures and dislocation: diagnosis and treatment. J Am Acad Orthop Surg 1995;3(1):22-33.

[8] Williams GR, Naranja J, Klimkiewicz J, et al. The floating shoulder: a biomechanical basis for classification and management. J Bone Joint Surg Am 2001;83A(8):1182-1187.

[9] Craig EV. Fractures of the clavicle. In: Rockwood CA, Green DP, eds. Fractures in adults. 6th edn. Philadelphia: Lippincott Williams & Wilkins 2006:1216-1217.

[10] Zdravkovic D, Damholt VV. Comminuted and severely displaced fractures of the scapula. Acta Orthop Scand 1974;45(1):60-65.

[11] Hudak PL, Amadio PC, Bombardier C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. The upper extremity collaborative group (UECG). Am J Ind Med 1996;29(6):602-608.

[12] Judet R. Traitement chirsurgical dos fractures de l' onoplate, indication operatuires. Acta Orthop Belg 1964:673–678.

[13] Bartonícek J, Fric V. Scapular body fractures: results of the operative treatment. Int Orthop 2011;35(5):747-753.

[14] Cole PA, Gauger EM, Herrera DA, et al. Radiographic follow-up of 84 operatively treated scapula neck and body fractures. Injury 2012;43(3):327-333.

[15] Plagemann H. Zur Diagnostik und Statistik der frakturen vor und nach der verwertung der röntgendiagnostik. Brun's Beitr Klin Chir 1911;73:688-738.

[16] Herscovici D, Fiennes AG, Allgöwer M, et al. The floating shoulder: ipsilateral clavicle and scapular neck fractures. J Bone Joint Surg Br 1992;74(3):362-364.

[17] DeFranco MJ, Patterson BM. The floating shoulder. J Am Acad Orthop Surg 2006;14(8):499-509.

[18] Friederichs J, Morgenstern M, Bühren V. Scapula fractures in complex shoulder injuries and floating shoulders: a classification based on displacement and instability. J Trauma Manag Outcomes 2014;8:16.

[19] O'Neill BJ, Hirpara KM, O'Briain D, et al. Clavicle fractures: a comparison of five classification systems and their relationship to treatment outcomes. Int Orthop 2011;35(6):909-914.

[20] Romero J, Schai P, Imhoff AB. Scapular neck fracture--the influence of permanent malalignment of the glenoid neck on clinical outcome. Arch Orthop Trauma Surg 2001;121(6):313-316.

[21] Pace AM, Stuart R, Brownlow H. Outcome of glenoid neck fractures. J Shoulder Elbow Surg 2005;14(6):585-590.

[22] Bozkurt M, Can F, Kirdemir V, et al. Conservative treatment of scapular neck fracture: the effect of stability and glenopolar angle on clinical outcome. Injury 2005;36(10):1176-1181.

[23] van Noort A, van Kampen A. Fractures of the scapula surgical neck: outcome after conservative treatment in 13 cases. Arch Orthop Trauma Surg 2005;125(10):696-700.

[24] Owens BD, Goss TP. Surgical approaches for glenoid fractures. Tech Shoulder Elbow Surg 2004;5:103-115.

[25] Hardegger FH, Simpson LA, Weber BG. The operative treatment of scapular fractures. J Bone Joint Surg Br 1984;66(5):725-731.

[26] Herscovici D, Fiennes AG, Allgower M, et al. The floating shoulder: ipsilateral clavicle and scapular neck fractures. J Bone Joint Surg Br 1992;74(3):362-364.

[27] Hashiguchi H, Ito H. Clinical outcome of the treatment of floating shoulder by osteosynthesis for clavicle fracture alone. J Shoulder Elbow Surg 2003;12(6):589-591.

[28] Leung KS, Lam TP. Open reduction and internal fixation of ipsilateral fractures of the scapular neck and clavicle. J Bone Joint Surg Am 1993;75(7):1015-1018.

[29] Rowe CR. Evaluation of the shoulder. In: Rowe CC, ed. The shoulder. New York: Churchill Livingstone 1988:631-637.
[30] Labler L, Platz A, Weishaupt D, et al. Clinical and functional results after floating shoulder injuries. J Trauma 2004;57(3):595-602.
[31] Egol KA, Connor PM, Karunakar MA, et al. The floating shoulder: clinical and functional results. J Bone Joint Surg Am 2001;83(8):1188-1194.
[32] Leung KS, Lam TP. Open reduction and internal fixation of ipsilateral fractures of the scapula neck and clavicle. J Bone Joint Surg Am 1993;75(1):1015-1018.
[33] Goss TP. Fractures of the glenoid neck. J Shoulder Elbow Surg 1994;3(1):42-52.
[34] Pailhes RS, Bonnevialle N, Laffosse J, et al. Floating shoulders: clinical and radiographic analysis at a mean follow-up of 11 years. Int J Shoulder Surg 2013;7(2):59-64.