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Research Article

Clinico-radiological validation of the DASH questionnaire in patients operated for fracture of shaft of humerus

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ABSTRACT

Background: Fractures of the humeral shaft are commonly encountered in the emergency department and are treated conservatively or surgically. Quantification of the results forms an important part of the treatment protocol and scoring systems are one of the best ways for quantification without bias. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire is a questionnaire which is filled by the patient and is used to assess the results in the upper limb.
Methods: Between October 2004 and December 2008, 68 patients with fracture of the shaft of the humerus were managed surgically in our institutions. Four were lost to follow up and the remaining 64 were assessed clinico-radiologically and by the DASH questionnaire. The results given by the two methods of assessment were then compared.
Results: There were 30 excellent, 18 good, 11 fair and 5 poor results when assessed clinically and radiologically. There were 32 excellent, 18 good, 9 fair and 5 poor results when the same patients were assessed by the DASH questionnaire.
Conclusion: The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire is an efficient instrument to quantify the results in fractures of the humerus.

Keywords: DASH questionnaire, Fracture humerus, Scoring system, Upper limb

INTRODUCTION

Fractures of the humeral shaft accounts for 3-5% of all fractures and 20% of all humeral fractures.[1,2] If this is not treated properly it results in significant morbidity. Humeral shaft fractures usually occur due to direct trauma, although indirect trauma may also be the cause.[3] This fracture is becoming more common because of the rise in road traffic accidents and increased efficiency of rescue teams in enabling the polytrauma patient to survive till he reaches the hospital. Humeral fractures have a bimodal pattern in terms of age and sex of patients. The 1st peak is seen predominantly in young males in the age group 21-30 years mainly due to high energy trauma. The 2nd peak in seen in females of age 60-80 years caused primarily due to simple falls.[1] Conservative treatment is the gold standard of treatment of humeral shaft fractures.[4] Surgical treatment is indicated in special situations like failure of conservative treatment, neuro-vascular injury, ipsilateral upper limb fractures, polytrauma etc. Plate osteosynthesis and intramedullary nailing are commonly used surgical methods for fixation.[5,6]

The goal of any treatment is to return to pre-injury level but this is not possible in all patients. A proper

assessment of the results of treatment is necessary for documentation and to improve our skills. Scoring instruments, clinical-radiological assessment and questionnaires are used for this purpose. For the upper limb many scoring systems are used. The commonly used among these are disabilities of the Arm, Shoulder and Hand (DASH) questionnaire,[7-10] Capabilities of Upper extremity Instrument (CUE),[11] medical outcomes study Short Form-36 (SF-36)[9] and American Shoulder and Elbow Surgeons Shoulder Scale (ASES-s).[12]

The DASH questionnaire has been used in various studies to assess function of the upper limb.[9,10,13] The only supposed flaw of this instrument is that, it involves only the patient as it is a questionnaire that the patient has to fill. The surgeon is kept out of the loop during assessment. The purpose of this study is to correlate the results as given by the DASH questionnaire with clinical and radiological assessment and to verify the validity of the questionnaire.

METHODS

This present study has been conducted after the institutional ethical clearance and the informed consent from all the patients. All adult patients of either sex coming to our hospitals with a fracture of the shaft of the humerus were included in the study. Patients with open fractures, pathological fractures, and patients with pre-existing shoulder and elbow problems and patients who were treated conservatively were excluded from study.

Sixty eight adult patients with fracture of the shaft of the humerus were treated with internal fixation using Limited Contact Dynamic Compression Plate (LCDCP), Dynamic Compression Plate (DCP) or Antegrade interlock nailing. After the surgery, the arm was immobilized with a U slab till the pain decreased and then movements of the shoulder and elbow were started. The patients were followed up every second week till radiological union was seen.

At every follow up clinical examination was done to assess status of the surgical wound, pain or tenderness at the fracture site, range of motion of shoulder and elbow, stability of the fracture and clinical union. Clinical union was defined as absolute lack of mobility and pain at the fracture site. Roentgenograms were taken in AP and lateral views to look for signs of radiological union. Radiologically, union is said to have occurred when plain X-ray shows bone trabaculae or cortical bone crossing fracture site on at least three surfaces on orthogonal radiograms. The time taken for clinical and radiological union to occur was noted. Delayed union was said to be present if after sixteen weeks, no clinical signs of union are seen. Non-union in our study was defined as absence of fracture union after thirty two weeks after injury.

The functional outcome was measured by the Disabilities of Arm, Shoulder and Hand (DASH) Questionnaire when clinic-radiological union occurred or at 9 months whichever was earlier. At the same time clinical and radiological parameters like pain on activity, range of motion at shoulder and elbow, power at shoulder and elbow, subjective opinion of the patient about his level of satisfaction with the treatment and presence or absence of radiological union were also recorded

Pain was graded as no pain, mild, moderate and severe. Loss of range of motion was graded as <10% loss, 11-20% loss, 21-30% loss and >31% loss. Power was graded as no weakness, mild, moderate and severe weakness. The satisfaction level of the patient with the treatment was graded as very happy, satisfied, moderately unsatisfied and unsatisfied.

The DASH questionnaire has thirty questions the answers of which are graded from one to five points. The functional score is calculated by the formula:

$$\text{DASH disability/Symptom score} = \frac{(\text{Sum of n responses} - 1) \times 25}{\text{N}}$$

Where 'N' is the number of responses. The best possible score is '0' and the worst possible score is '100'. The functional outcome decreases as the score increases. The result was then graded as excellent (0 to 20 points), good (21 to 40 points), fair (41 to 60 points), and poor (Greater than 60 points). The results as graded by the DASH questionnaire was then compared with the results graded clinico-radiologically.

Statistical analysis: The data were expressed as percentage and statistically analysed using students 't' test. P value less than 0.05 was considered significant.

RESULTS

Numbers of patients recruited were sixty eight. Types of intervention for different patients were given in Table 1.

Table 1: Type of intervention to the patients (N=68).

Type of intervention	Number of patients
Limited contact dynamic compression plate (LCDCP)	15
Dynamic compression plate (DCP)	34
Antegrade Interlock nailing	19

The mean age of patients was of 39 ± 20 years. There were 46 male patients and 18 female patients. Road traffic accident was the commonest mechanism of injury accounting for 48 patients. Assault, simple fall at home (especially in elderly women) and industrial accidents accounted for the rest. In 37 patients the left humerus was fractures and the right humerus was fractured in 27 patients. All but one patient was right handed individual. 31 patients had associated injuries like head injury, fractures of the lower limbs, contralateral upper limb

injuries, blunt trauma abdomen and brachial artery injury. The indication of surgery in our study population was most commonly failed close treatment. The other less common indications were polytrauma requiring early mobilization, morbid obesity and brachial artery injury. Post-operative radial nerve palsy was seen in 3 patients, all of whom recovered uneventfully. Delayed union was seen in 2 patients and non-union was seen in one patient in the DCP group which required revision surgery and bone grafting. The comparison of the scores of DASH and clinic-radiological was shown in Figure 1 to 5.

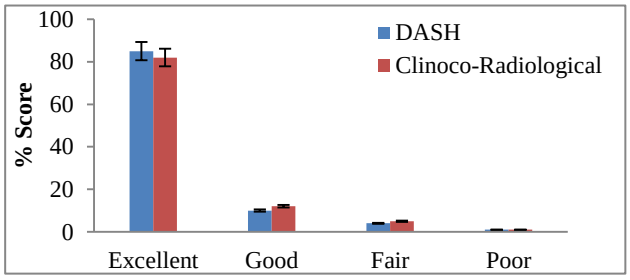

Figure 1: Comparison of disabilities of the arm, shoulder and hand (DASH) questionnaire score and clinic-radiological score on pain on activity. P value is nonsignificant (P >0.05).

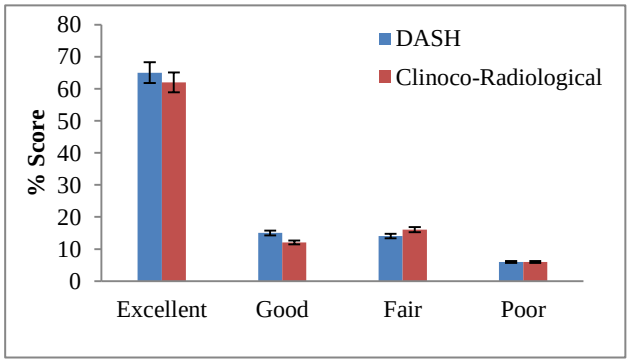

Figure 2: Comparison of disabilities of the arm, shoulder and hand (DASH) questionnaire score and clinic-radiological score on range of motion. P value is nonsignificant (P >0.05).

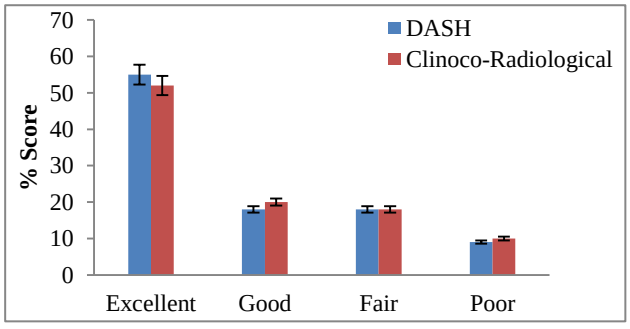

Figure 3: Comparison of disabilities of the arm, shoulder and hand (DASH) questionnaire score and clinic-radiological score on power at shoulder and elbow. P value is nonsignificant (P >0.05).

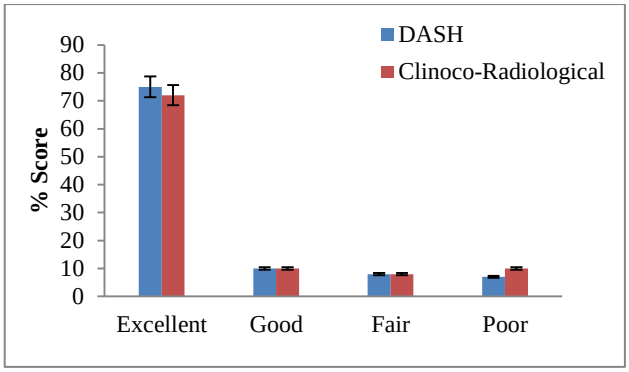

Figure 4: Comparison of disabilities of the arm, shoulder and hand (DASH) questionnaire score and clinic-radiological score on level of satisfaction on treatment. P value is nonsignificant (P >0.05).

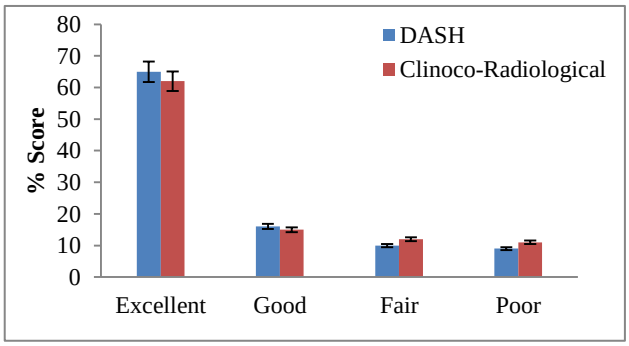

Figure 5: Comparison of disabilities of the arm, shoulder and hand (DASH) questionnaire score and clinic-radiological score on presence or absence of radiological union. P value is nonsignificant (P >0.05).

DISCUSSION

In today's era of evidence based medicine, monitoring the effectiveness of treatment forms the foundation of standard of care. Hence assessment of recovery forms an important part of the treatment protocol. This usually achieved in the clinical setup by a combination of clinical examination and radiological examination. The flaw in this approach is that the assessment may vary from surgeon to surgeon and the validity of results published will be questionable.

Various scoring systems like the DASH questionnaire aim to standardize the reporting of results. Various studies have demonstrated that the DASH questionnaire is a very good instrument to quantify the results.[9,10,13] We used the English version of the questionnaire and translated it to patients who did not know English. Our result shows that this questionnaire gave a very similar assessment of the results when compared with a detailed clinical and radiological assessment which is time and resource consuming.

All the poor results identified by the clinic-radiological assessment were picked up by the DASH questionnaire.

Fair results are slightly higher in the clinico-radiological group. Both the patients who grouped in fair group clinic-radiologically and in the good group by DASH questionnaire had limitation of elbow movement. The large range of motion of the shoulder compensates for some disabilities distally and makes the patient confident to do their activities and thus answer positively in the questionnaire. The excellent and good results correlated very well between the two systems of assessment.

CONCLUSION

The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire is a very efficient instrument to quantify the results in fractures of the humerus and if used widely will result in correct quantification of the effectiveness of treatment, which forms the foundation of evidence based medicine.

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Ethical approval: The study was approved by the institutional ethics committee

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