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## EVALUATION OF PROXIMAL HUMERUS FRACTURES AND ITS NON-SURGICAL MANAGEMENT

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### SUMMARY

Fractures of the proximal humerus are common and present a challenge to the attending surgeon. A thorough evaluation should consist of precise history, taking and physical examination, accompanied by relevant imaging studies. Confronted with literature in support of differing treatment recommendations, a surgeon must then decide upon the optimal treatment plan for each individual patient. This report presents own experiences of authors in discussion to the current literature on the topic.

**Keywords:** proximal humerus fracture, evaluation, management

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### Introduction and aim

Fractures of the proximal humerus are common, accounting for 5% of all adult fractures (Court-Brown and Caesar 2006). This number is expected to increase, with a rising trend reported by Palvanen *et al.* (2006), observing a three-fold rise in incidence from 1970 to 2002.

These fractures often present in a myriad of permutations, accompanied by classification systems that have variable inter-observer reliability (Sjödén *et al.* 1997). To further complicate matters, there has not been a strong consensus with regards to recommended treatment options for these fractures. The inability to generalize these

## OCENA ZŁAMAŃ BLIŻSZEGO KOŃCA KOŚCI RAMIENNEJ I ICH LECZENIE ZACHOWAWCZE

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### STRESZCZENIE

Złamania bliższego końca kości ramiennej są powszechne i stanowią wyzwanie dla chirurga. Dokładna ocena schorzenia powinna składać się z dokładnego wywiadu, badania klinicznego, z udziałem odpowiednich badań obrazowych. W konfrontacji z literaturą wskazującą na odmienne zalecenia leczenia, chirurg musi podjąć decyzję dotyczącą optymalnego planu leczenia, indywidualnego dla każdego pacjenta. Niniejsza praca przedstawia własne doświadczenia autorów w dyskusji z aktualną literaturą na ten temat.

**Słowa kluczowe:** złamanie bliższego końca kości ramiennej, ocena, leczenie

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fractures and their treatment supports the concept of individualized management. In order to tailor our recommendation, a comprehensive evaluation of the patient must first be obtained.

This report presents own experiences of authors in discussion to the current literature on the topic.

### Patients and methods

#### *Evaluation*

A thorough evaluation is essential, without which one may fail to provide the optimal treatment plan to the patient. This would involve obtaining a complete history, with

particular attention to the mechanism of injury; associated co-morbidities; pre-morbid functional status; social and occupational history amongst others. A low functional patient with multiple co-morbidities and high perioperative risks may predispose one to a non-invasive mode of treatment. Frequently, patients do not fall into either extreme, and the clinician must then assess the risk/benefit ratio of the individual.

A comprehensive physical examination must include the evaluation of the neurovascular status, as well as the documentation of any other associated injuries and the presence of open wounds. Features suggestive of a proximal humerus fracture include swelling or bruising around the shoulder, and the arm is commonly supported in internal rotation by the contralateral upper limb. The axillary nerve is in close proximity, and injury of which may present with decreased sensation over the “regimental badge” area.

To further aid in understanding the pathology, conventional imaging studies such as orthogonal X-ray views of the affected shoulder are essential. This would allow one to determine the general fracture configuration as well as to assess for joint congruency. In patients suffering from fracture-dislocations, or three- and four-part fractures, it is our firm belief that conventional X-rays are inadequate. Where available, a computed tomography study would provide additional information for the clinician. Apart from improving the understanding of the fracture prior to clinical recommendation, studies have shown that certain features may lead to a predictable sequence of events and eventual morbidity for the patient (Edelson *et al.* 2008).

Upon obtaining the relevant information and images, one can then begin to map out a treatment plan that should aim to be robust and comprehensive.

### Management

A surgeon commonly finds himself confronted by literature, in particular with respect to the

elderly patient, when deciding upon the ideal treatment option (Zyto *et al.* 1997; Olerud *et al.* 2011; Olerud *et al.* 2011b; Rangan *et al.* 2015). In essence, one is faced with the following questions:

1. What is the aim of our treatment?
2. How do we achieve that aim for the patient?
3. What would be considered a “bad” result for the patient?

Without doubt, an ideal outcome would be a patient satisfied with a pain free shoulder and restored premorbid function. In fracture patterns with displaced components, restoration of bony anatomy is believed to improve the functional outcomes. Olerud *et al.* (2011b) in 2011 published the outcomes of three-part proximal humerus fractures 2 years after they were randomized into either fixation with locked plate or non-operative treatment. Patients who underwent surgical fixation were found to have improved functional outcomes and a higher quality of life at that stage. However, 13% of the operated patients had to undergo revision surgery and a further 17% required minor reoperation. Furthermore, surgical intervention involved higher financial costs as compared to non-operative treatment, even without factoring in any needs for re-operation.

The benefits of surgical fixation is further eroded by the results of Zyto *et al.* (1997). They compared the results of 40 elderly patients with three- or four-part fractures and observed no functional differences between the surgical cohort and the conservative cohort despite radiological evidence of “improved” humeral head position. As with Olerud *et al.* (2011b), complications observed were isolated to patients undergoing surgical intervention.

Faced with contrasting results, we may find ourselves in an uncomfortable position of recommending masterly inactivity. However, the alternative of surgical intervention and its associated risks should make one feel equally uncomfortable. The complication rate of fixation or arthroplasty is clearly the

overriding consideration at the present time. However, with the development of novel devices, one is optimistic that the clinical situation can improve.

In the last year, the gauntlet has been thrown down for not just the elderly, but younger patients presenting with proximal humerus fractures. A contentious study – the PROFHER trial (Rangan *et al.* 2015) compared the outcomes of surgical versus non-surgical treatment of 231 adults with displaced fractures of the proximal humerus. They concluded an absence of significant difference in patient-reported clinical outcomes between the cohorts. This finding, though similar to Zyto *et al.* (1997), resulted in fair amounts of attention, which included a headline in the BMJ that read ...“*Surgery is no better than a simple sling for displaced fracture of upper arm, study finds*”... (Wise 2015). A response from Hertel and Domos identified several valid points, of which a pertinent point raised was the exclusion of an uncertain number of patients from the trial for “clear indication for surgery”. As such, the results of the trial can aid in cautioning a surgeon with regards to patients with “unclear indications”. However, it may not be relevant for patients deemed to be clear candidates for surgical intervention and hence denied the option of surgery.

### Discussion and conclusions

Ultimately, in the management of the patients' fracture, one crucial consideration is the avoidance of a “bad” result. This can essentially be summarized as preventing the occurrence of an outcome that one cannot effectively salvage. It can be argued that should malunion or avascular necrosis occur, a hemiarthroplasty could be performed at a later stage. The outcome of the eventual arthroplasty is affected by several variables, of which we know from the study by Boileau *et al.* (2001), that the positions of the tuberosities play an important role. The need for an osteotomy resulted in poorer outcomes than compared to when an osteotomy is

not required. In situations where malunion of the tuberosities may occur, conservative management in a surgically healthy patient may be inappropriate. Surgical reduction and fixation would be recommended if there are no contraindications to surgery as we aim to avoid a need for osteotomy should an arthroplasty be eventually required. To address this issue, we recommend that the relationship between the fractured head and shaft must first be corrected at the index surgery. This restoration of inclination, rotation, and offset will aid in the reduction of the tuberosities and the eventual rotator cuff tension.

Should a patient be a candidate for non-surgical treatment, we are faced with the challenge of determining the ideal duration of immobilization. We are aware of studies that report benefits of early mobilization (Lefevre-Colau *et al.* 2007). However, we recognize that for the majority of our patients, misguided enthusiasm may achieve the opposite effect. Apart from the duration of immobilization, the position of the immobilized arm is also being studied. An ongoing study comparing the outcomes of immobilizing the arm in external rotation as compared to the traditional internal rotation is being performed. This may aid in the minimization of macro-motion at the fracture site. We do recognize the difficulty in the objective measurement of discrete movements at the fracture sites with the different conservative methods of treatment. Without doubt, current imaging methods and measurement tools do not offer a solution to the problem. A promising novel software is being designed for its effectiveness in addressing the above problem and may eventually guide us in the management of such complex fractures and its associated complications.



## REFERENCES

- Court-Brown C.M., Caesar B.** *Epidemiology of adult fractures: A review.* Injury 2006; 37, 8: 691–697.
- Boileau P., Trojani C., Walch G., Krishnan S.G., Romeo A., Sinnerton R.** *Shoulder arthroplasty for the treatment of the sequelae of fractures of the proximal humerus.* Journal of Shoulder and Elbow Surgery 2001; 10, 4: 299–308.
- Edelson G., Safuri H., Salami J., Vigder F., Militianu D.** *Natural history of complex fractures of the proximal humerus using a three-dimensional classification system.* Journal of Shoulder and Elbow Surgery 2008; 17, 3: 399–409.
- Lefevre-Colau M.M., Babinet A., Fayad F., Fermanian J., Anract P., Roren A., Kansao J., Revel M., Poiraudreau S.** *Immediate mobilization compared with conventional immobilization for the impacted nonoperatively treated proximal humeral fracture. A randomized controlled trial.* The Journal of Bone and Joint Surgery. American Volume 2007; 89, 12: 2582–2590.
- Olerud P., Ahrengart L., Ponzer S., Saving J., Tidermark J.** *Hemiarthroplasty versus nonoperative treatment of displaced 4-part proximal humeral fractures in elderly patients: a randomized controlled trial.* Journal of Shoulder and Elbow Surgery 2011a; 20: 1025–1033.
- Olerud P., Ahrengart L., Ponzer S., Saving J., Tidermark J.** *Internal fixation versus nonoperative treatment of displaced 3-part proximal humeral fractures in elderly patients: a randomized controlled trial.* Journal of Shoulder and Elbow Surgery 2011b; 20, 5: 747–755.
- Palvanen M., Kannus P., Niemi S., Pakkari J.** *Update in the epidemiology of proximal humeral fractures.* Clinical Orthopaedics and Related Research 2006; 442: 87–92.
- Rangan A., Handoll H., Brealey S., Jefferson L., Keding A., Martin B.C., Goodchild L., Ling-Hsiang Chuang L.-H., Hewitt C., Torgerson D.** *Surgical vs Nonsurgical Treatment of Adults With Displaced Fractures of the Proximal Humerus.* The PROFHER Randomized Clinical Trial. JAMA. 2015; 313, 10:1037–1047.
- Sjödén G.O., Movin T., Güntner P., Aspelin P., Ahrengart L., Ersmark H., Sperber A.** *Poor reproducibility of classification of proximal humeral fractures. Additional CT of minor value.* Acta Orthopaedica Scandinavica 1997; 68, 3: 239–242.
- Wise J.** *Surgery is no better than a simple sling for displaced fracture of upper arm, study finds.* BMJ 2015; 350: h1304.
- Zyto K., Ahrengart L., Sperber A., Tornkvist H.** *Treatment of displaced proximal humeral fractures in elderly patients.* Journal of Bone and Joint Surgery. British Volume 1997; 79, 3: 412–417.

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