Operative Treatment of Humeral Shaft Fractures

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ABSTRACT: Thirty-two cases of operatively treated fractures of the shaft of the humerus were reviewed. The indications for fixation included multiple trauma, unacceptable angulation, delayed and non-union and open fractures. In addition, four cases of radial nerve palsy were explored primarily and the radial nerve was found to be in continuity. Consequently, we conclude that in selected cases humeral shaft fractures may be operated with a low complicated rate. However, we feel that exploration and fixation of the closed humeral shaft fractures with radial nerve palsy may not be warranted.

INTRODUCTION

There is a general consensus of opinion in the literature that fractures of the humerus are the best treated conservatively. Caldwell's[1] treatment of the fractures of the humerus in 1933 by the hanging cast method dramatically lowered the incidence of delayed and non-union. Prior to this, the delayed and non-union of the humeral shaft fractures was common. The non-union rate of non-operatively treated humeral shaft fractures has been quoted between 4 - 8%[1]. When open treatment is used the non-union rate climbs to 12%[2,3]. Moreover, an additional factor for non-operative treatment is that a significant amount of shortening and angulation will cause minimal functional or cosmetic deformity. Most authors feel that 20° to 30° of the angulation or upto 75% lateral displacement of the humeral shaft is acceptable[4,5].

There are; however, selected instances that non-operative cases will not give a satisfactory result. Indications for the operative treatment of the humeral shaft fractures include:

1. Delayed or non-union.
2. Multiply traumatized patients.
3. Open fractures of the humerus (especiall with concomitant radial nerve injury).
4. Unacceptable alignment.
5. Radial nerve injury in closed fractures.

MATERIALS AND METHODS

Thirty-two cases of humeral shaft fractures were treated operatively in Tan Tock Seng Hospital between January 1984 and December 1986. These were reviewed on a retrospective basis. Excluded from this study were patients operated for pathological fractures of the humerus. The minimal follow up time was one year.

Indications for surgery

The indications for surgery are shown in Tabel 1. The majority of these were on multiply traumatized patients. And there were 26 closed fractures (81.3%) and 8 open fractures (18.7%).

Level of fracture

The fractures were divided according to their levels in the shaft as shown in Table 2. The fracture of the middle third of the shaft was the most common site.

Pattern of fracture

Table 3 shows types of fractures. The transverse pattern was the most common accounting for 75% of the fractures.

Cause of injury

Motor vehicular accidents accounted for the majority of the fracture (59.4%). Seven patients (21.9%) sustained their fractures after a fall, 2 during sports and 4 from unrecorded causes.

Associated injuries

There was a large number of multiply injured patients in this series. Table 4 shows the associated injuries. The head injuries were associated with a large number of these patients (47.4%).

Timing of surgery

The majority of these fractures were operated on the day

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of admission (56.3%). This reflects the high number of multiply traumatized patients seen in this series. Another 25% were operated between the second and the seventh day. Six patients were operated later (more than 7 days).

Table 1
Indications for Surgery

Multiple Trauma	19
Failure of Conservative	9
Open Fractures	3
Delayed Union	1

Table 2
Level of Shaft Fracture

Upper Third	4
Middle Third	17
Lower Third	11

Table 3
Patterns of Fractures

Transverse	24
Spiral	3
Comminuted	5

Table 4
Associated Injuries

Head Injuries	8
Upper Limb Fractures	7
Lower Limb Fractures	9
Spinal Fractures	3
Chest Injuries	4
Abdominal Injuries	2
Others	2

Surgical Technique

All fractures were fixed by using AO narrow dynamic compression plates. The length of the plates varied from 5 holes to 10 holes. The most common length of implant was a 6-hole dynamic compression plate.

Besides, twenty-five fractures were approached to use an anterolateral approach (78.1%). The remainder were approached via a posterior approach (21.9%). Extreme care was taken to protect the radial nerve and often the plate was fixed "freehand" as the assistant positioned the plate while the surgeon drilling the holes. In the majority of cases, no tourniquet was used.

RESULTS

There were relatively few post operative complications. There were no deep wound infections and no cases of post-operative radial nerve palsy. However, there was one case of implant failure and one case of plate loosening. The patient with plate loosening was healed in slight angulation and the patient with implant failure was replated with good results.

There was difficulty assessing time to radiographic union as a large number of these fractures were rigidly fixed and did not show abundant fracture callus.

Radial nerve injuries

Five of the 32 cases were associated with radial nerve palsies pre-operatively. Of these five cases, four were explored primarily. In all four cases, the radial nerve was found to be in continuity, the injury being caused either by a haematoma or a direct contusion. Of these four cases, two had full recovery, one had partial recovery and one did not have any significant recovery of function. The one case that was not explored had full recovery of function. In addition, there was no case of the radial nerve being caught in the fracture site.

DISCUSSION

There is agreement that humeral shaft fractures should be treated by non-operative means. The conservative treatment yields a high percentage of excellent results. As usual, the fractures can be expected to unite. The non-union is generally quoted as 5%[2], while residual deformity is usually not functionally or cosmetically troublesome. Circumstances that predispose to non-union include operative management, inadequate immobilization, over-distraction and infection[6]. In general, the non-operatively treated cases should be observed and if there are signs of delayed union in 6 weeks as evidenced by excessive movement at the fracture site or by radiographs, operative fixation with or without bone grafting should be considered.

In this series, 32 cases of operatively treated humeral shaft fractures were reviewed. Almost 60% of these were multiply traumatized patients. In this group of patients, aggressive stabilization of all fractures is advantageous in that it allows nursing procedures to be carried out with minimal difficulty, improves patient comfort and allows early mobilization. Respiratory complications are also minimised by early mobilization. The stabilization of multiple long bone fractures also reduces the incidence of fat embolism syndrome[7,8].

There were 9 patients (28.1%) treated for failure of the conservative treatment. As stated earlier up to 30° of the angulation or a translatory shift of up to 75% the diameter of the humeral shaft is acceptable. Our standard procedure for treating humeral shaft fracture is with a coaptation splint. In this method, gravity is the sole factor in determining fracture alignment. Perhaps a change to a hanging cast method would

have reduced the incidence of the unacceptable alignment.

The problem of radial nerve injuries remained unresolved in this series. Five cases of radial nerve injuries were seen and operated. Nevertheless, there were no severe radial nerve and no interposed radial nerve cases. We feel that closed radial nerve injuries can be treated expectantly. Open radial nerve injuries should ;however, be explored on an urgent basis as there is a likelihood that the radial nerve may be severed.

The approach mostly used in this series was the anterolateral approach. This approach was used because it has allowed easy identification of the radial nerve between the brachialis and the brachioradialis. The nerve can then be taped and protected. Fractures even as distal as 5 cm. proximal to the coronoid fossa may be fixed by this method.

In fractures associated with a radial nerve palsy, we recommend a posterior approach. This allows visualization of the entire length of the nerve.

The implants are normally not removed except in young or active patients. In many of our older patients, the implants are removed by their request. All patients are warned to the possibility of the post-operative radial nerve palsy.

In this series, there was a relatively low complicated rate. The problem of iatrogenic radial nerve palsy was not seen. There was ;however, one case of implant failure and one case of implant loosening. The only wound infections reported were superficial ones. As such we feel that in selected cases, the humeral shaft fractures may be treated operatively with a low complicated rate.

CONCLUSION

This series reviews 32 cases of operatively treated humeral shaft fractures. The conventional wisdom that humeral shaft fractures should be treated conservatively should be followed. However, in selected cases, the operative management may be advantageous to the patient. These include the multiply traumatized patients, those with open fractures associated with radial nerve injuries, patients with delayed union and patients with unacceptable alignment which had failed conservative treatment.

Patients with closed fracture and radial nerve injuries should probably be treated expectantly as early surgical exploration and stabilization did not show any advantage over the conservative treatment.

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