CASE REPORT

Use of a Dall-Miles plate and cables for the fixation of a periprosthetic humeral fracture

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Increase in the use of shoulder arthroplasty has resulted in the emergence of periprosthetic fractures of the humerus. The management of such fractures is technically demanding. We describe a case in which a displaced periprosthetic fracture at the tip of a stable humeral implant was successfully managed with the Dall-Miles plate and cables system.

INTRODUCTION

Periprosthetic humeral fractures are uncommon and are associated with significant patient morbidity. The incidence of such fractures as reported in the literature is approximately 1% to 2% ; fracture may occur during surgery or as a late complication (2). Risk factors include rheumatoid arthritis, osteopenia or osteoporosis and inadequate operative exposure (1, 2, 8). The presence of a prosthesis, in association with the humeral shaft fracture confers a higher non union rate than that of a humeral shaft fracture alone, regardless of the method of treatment.

Herein we present the management of a fracture below the tip of the stem of a cemented humeral prosthesis, in a patient in which conservative means failed to promote healing of the fracture.

CASE REPORT

An 84-year-old woman underwent a cemented Neer II shoulder hemiarthroplasty after a four-part fracture of the proximal extremity of her right humerus. Her initial recovery from this procedure was uneventful. Three years after the hemiarthroplasty, she injured her right humerus again, after a fall while walking. Radiographs revealed a displaced transverse fracture (B2) just below the tip of the prosthesis (fig 1).

Initially a decision for conservative management of the fracture was taken and a U-slab was applied. A check radiograph after one week showed satisfactory alignment of the fracture. Four weeks after the fracture a check radiograph did not reveal any callus formation. Clinically there was not any evidence of healing. At that time a decision for operative treatment was taken.

A posterior incision with triceps split was used. The radial nerve and the vessels were identified, dissected free and protected with a tape. A wide exposure of the fracture was performed. A Dall-Miles plate with two cables proximally and two cables distally were applied for the fixation of the fracture (fig 2). All cables were placed around the humerus by insertion through the fracture site which was then reduced. Autologous bone grafts from the iliac crest were used, as well.

Although this procedure allowed for a secure fixation of the fracture, a humeral brace and a

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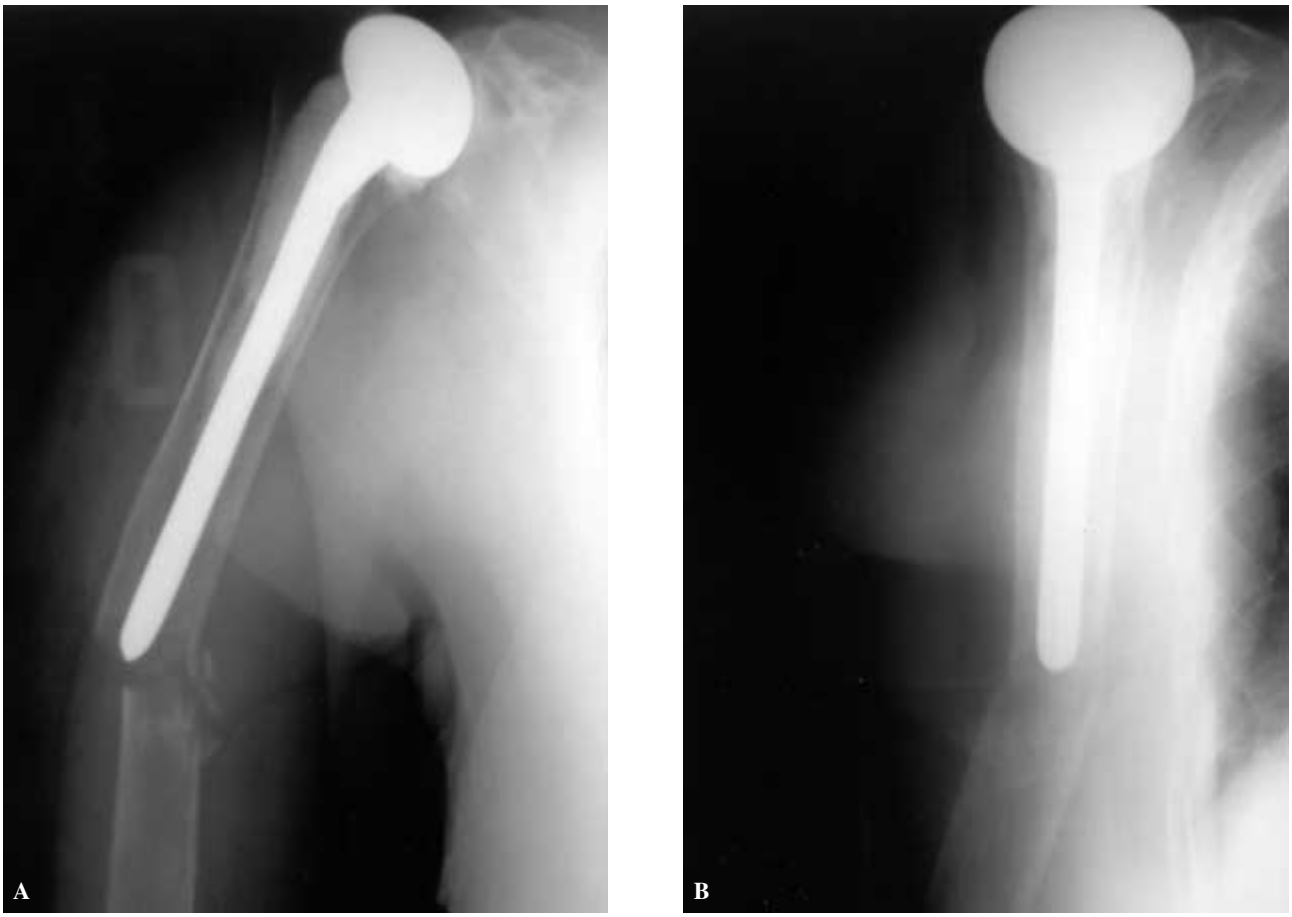

Fig. 1. — Radiographs of a periprosthetic fracture at the tip of the humeral prosthesis. **A :** anteroposterior view, **B :** lateral view

broad arm sling were applied postoperatively for three weeks. A radiograph eight weeks after the operation revealed abundant callus formation. At that time there was evidence of clinical and radiological union, and aggressive physiotherapy was recommended, considering exercises to improve the range of movements and the strength of the shoulder. Six months after the operation the range of movements of the shoulder joint was the same as prior to the fracture with abduction 90°, external rotation 30° and internal rotation up to the L5 spinous process.

DISCUSSION

Periprosthetic fracture is a serious complication of any arthroplasty and can result in non-union, malunion and subsequent prosthetic loosening. These fractures can be treated using operative or non operative techniques, depending on patient parameters (condition, age) and fracture parameters (location in relation to the implant) (4, 7). The non operative treatment includes traction and the use of casts and braces. There is controversy as to the most appropriate surgical technique. If the fracture relates to a loose implant, revision of the prosthesis is the best option in a fit patient (3, 4, 7). However, in the presence of a stable prosthesis, open reduction and internal fixation of the fracture is an easier, less morbid and cost effective option (6).

Boyd *et al* reported seven cases of periprosthetic humeral shaft fractures and attempted non-operative treatment initially in all cases (2). However, the

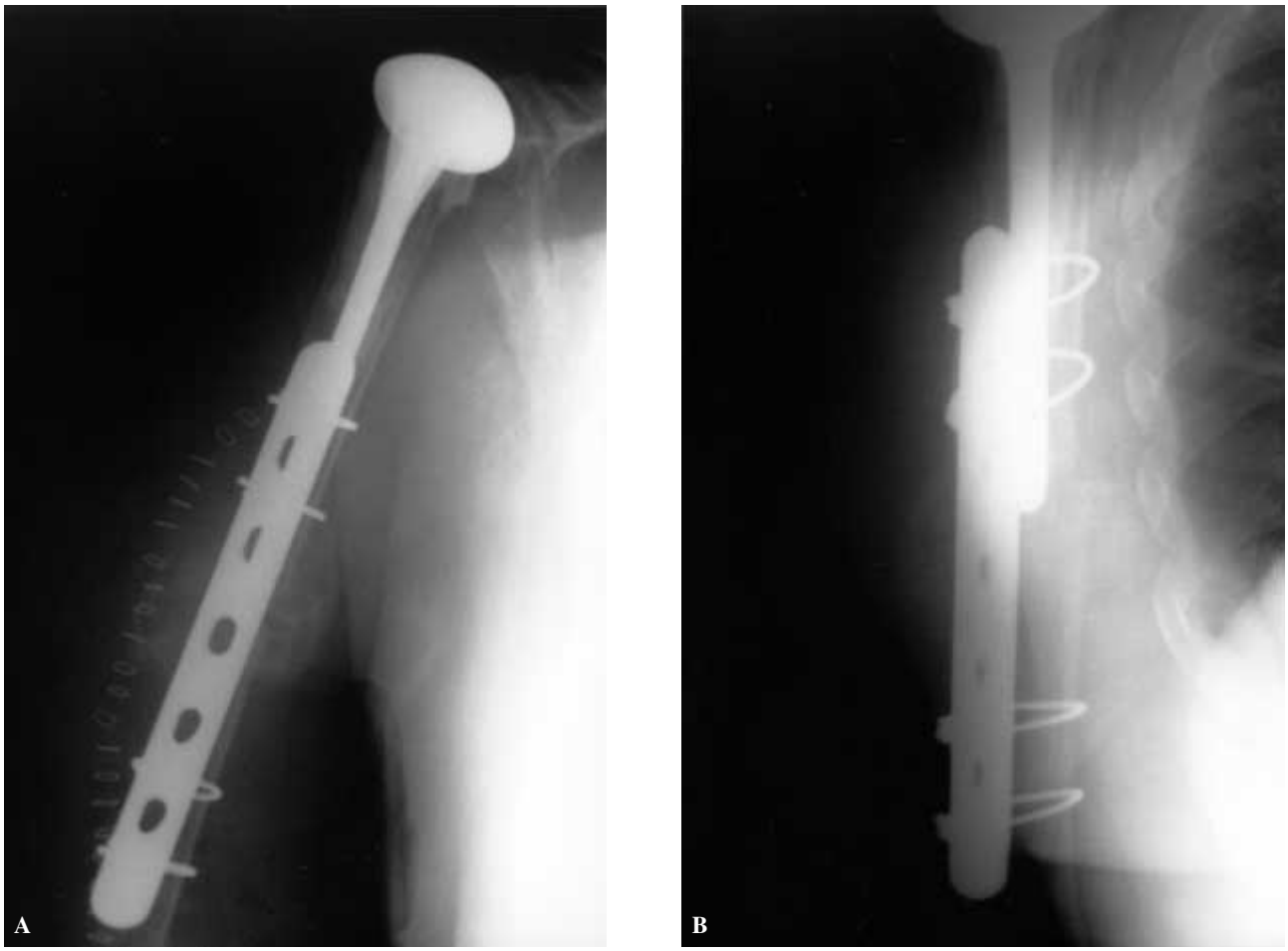

Fig. 2. — Radiographs showing the fixation of the periprosthetic fracture with the use of a Dall-Miles plate and cables. **A :** antero-posterior view, **B :** lateral view.

fracture healed in only one case. Groh *et al* (5) reported four cases of periprosthetic fractures of the humerus and suggested conservative management. Wright and Cofield (8) suggested that conservative treatment should be considered for spiral fractures if skeletal alignment is acceptable and that transverse or short oblique fractures at the distal end of the stem should be treated operatively. In general, fractures around the tip of the prosthesis did not unite when treated non-operatively (1, 2, 8). Limited glenohumeral motion results in increased torsional stress concentrated at the tip of the prosthesis (2). The disruption of the endosteal blood supply is a contributing factor which results in delayed healing of these fractures (8).

To the best of our knowledge there is no reference, considering Dall-Miles plate and cables system, as a treatment option for periprosthetic humeral fractures. Herein we present a method in which the Dall-Miles plate and cables system provided a safe and satisfactory outcome. The use of a plate and screws in this case would not have provided adequate support at the fracture site because the prosthetic stem and the cement would not permit the passage of bicortical screws proximally and also the bone was very osteoporotic distally. The use of a plate and cables system was chosen because it seemed to afford extra stability and to be effective in dealing with the implant and the cement at the proximal fragment and also the poor bone quality

distally. Passage of the cables around the humerus, by inserting them through the fracture before its reduction, allowed the cables to be passed around the bone without significant risk to neurovascular structures. The periosteal stripping that occurred at the time of the fracture allowed the cables to be moved into the appropriate position into the slots of the plate.

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