ABSTRACT

Purpose. To evaluate surgical outcomes of ipsilateral femoral neck and shaft fractures.

Methods. Between April 1997 and September 2004, 29 men and 8 women (mean age, 37 years) underwent fixation of femoral neck and shaft fractures using a dynamic compression plate plus a dynamic hip screw or screws. There were 30 femoral neck and 7 pertrochanteric fractures. Functional results were assessed according to the Friedman and Wyman classification.

Results. The mean follow-up period was 49 months. Of the femoral neck fractures, 34 united in a mean of 4 months; 33 of them healed anatomically and one with a 6° varus angulation. No osteonecrosis of the femoral head was noted. Of the femoral shaft fractures, 32 united in a mean of 6 months, 5 were non-unions (2 persisted even after revision surgery). Seven patients developed infections (5 superficial and 2 deep), which resolved with debridement and antibiotic treatment. Functional results were good in 29 patients, fair in 5, and poor in 3.

Conclusion. The use of dynamic hip screws and compression plates for ipsilateral femoral neck and shaft fractures is reliable in achieving bone union with few complications.

Key words: bone plates; bone screws; femoral neck fractures; hip fractures

INTRODUCTION

The incidence of ipsilateral femoral neck and shaft fractures is low, ranging from 2.5 to 6% of all femoral fractures. Most are due to high-energy trauma. Attributed mechanisms include axial compression against the acetabular roof, with hip adduction or abduction. Various techniques and implants have been developed to manage such fractures including: (1) an antegrade intramedullary nail with cannulated cancellous screws, (2) a dynamic compression plate (DCP) with a dynamic hip screw (DHS) or cannulated cancellous screws, (3) a retrograde intramedullary nail with cancellous screws, and (4) a reconstructive intramedullary interlocking nail.
patients with femoral fractures in our hospital, 44 (3%) had ipsilateral femoral neck and shaft fractures. Among these, 29 men and 8 women aged 18 to 69 (mean, 37) years underwent fixation with a DCP plus a DHS or screws (Figs. 1 and 2). 26 patients were injured in traffic accidents and 11 fell from a height. There were 30 neck and 7 pertrochanteric fractures. 15 patients had multiple injuries including cranial and chest trauma, and limb fractures.

General and extradural anaesthesia were used in 29 and 8 patients, respectively. All of them were operated on in a supine position through a lateral approach. A traction table was not used. If traction was needed, it was performed by the surgeon’s helper. The neck fracture was fixed first when it was not or little displaced. In other cases, the shaft fracture was fixed first. All displaced neck fractures were openly reduced using the Watson-Jones approach with 2 to 3 lag screws (in 12 patients) or by a DHS (in 25 patients). Femoral shaft fractures were fixed by a 10-hole to 16-hole DCP. When the shaft fractures were very proximal (in 6 patients), the plate was placed in a more anterior position or a 2-hole plate was used for the DHS.

Postoperatively patients were instructed to mobilise early without weight bearing. Weight bearing was increased according to the extent of callus formation noted on follow-up radiographs. Radiographic union was defined as extension of trabeculae across the fracture, the presence of bridging callus, and obliteration of the fracture line. Time to union was defined as the time between the first surgical intervention and radiographic union. Functional results were assessed according to the Friedman and Wyman classification (Table 1).

RESULTS

Patients were followed up for 22 to 82 (mean, 49) months (Table 2). Regarding the femoral neck fractures, 34 (92%) achieved union in a mean of 4 (range, 2–5) months, of which 33 (89%) healed anatomically. One patient had a 6° varus angulation and 3 (8%) had non-union (one refused revision surgery and 2 underwent valgus intertrochanteric osteotomy and healed 3.6 and 3.9 months later). No osteonecrosis of the femoral head was noted.

Regarding the femoral shaft fractures, 32 (87%) achieved union in a mean of 6 (range, 4–8) months
and 5 (14%) endured non-union (2 persisted even following revision surgery and iliac bone grafting after changing the DCP).

Seven (19%) patients developed infections (5 superficial and 2 deep) and resolved following debridement and antibiotic treatment. No patient sustained a hip infection or fat embolism. 29 (78%) of the patients had a good functional result, in 5 (14%) the result was fair, and in 3 (8%) it was poor.

**DISCUSSION**

Ipsilateral femoral neck and shaft fractures are challenges to orthopaedic surgeons. In a meta-analysis of 659 such fractures, traffic accidents accounted for 78% of the cases and 13% were due to other types of trauma. Most of the patients were young men and had multi-system injuries.

In a study of 52 such fractures, 55% involved the basilar neck area (compared to 60% in our study), 35% involved the intra-capsular neck, and 10% were pertrochanteric. The diagnosis of femoral neck fracture is easily missed if an anteroposterior radiograph of the pelvis is not taken. Therefore, patients with femoral shaft fractures should undergo thorough radiographic evaluation of the femoral head and neck (with the hip in internal rotation).
Although some femoral neck fractures are not displaced, surgical treatment is required to prevent displacement later. The treatment goal is to stabilise both the neck and shaft fractures with good alignment, as optimal treatment of one fracture may interfere with treatment of the other.\textsuperscript{7,8}

Antegrade intramedullary nailing (for shaft fractures) plus pins or screws placed in the anterior part of the neck (for neck fractures) has been reported to result in a non-union rate of 16 to 18\% in the femoral necks.\textsuperscript{4,13} It is difficult to place 2 or 3 pins or screws adjacent to an antegrade nail.

Retrograde femoral nailing with multiple screws has been reported to result in unions with 5\% to 7\% of varus angulation and avascular necrosis of the femoral head.\textsuperscript{7} It is suggested that priority be given to femoral neck fractures. This treatment strategy may involve morbidity associated with an arthrotomy, and sometimes difficulty in removing the nail, as the entry point for the nail is the knee joint.\textsuperscript{9,14}

Reconstructive intramedullary interlocking nailing enables rigid fixation of concomitant femoral neck and shaft fractures with a single implant, with a 100\% union rate of the femoral neck and shaft fractures reported.\textsuperscript{8,9,15} Nonetheless, further displacement of femoral neck fractures was frequently noted after the interlocking nail insertion.\textsuperscript{5,14} It is important to fix the neck fracture first before inserting an interlocking nail to avoid displacement of the neck.

Technically, it is much easier to fix such fractures with a plate plus screws or DHS (than an intramedullary nail with screws or a reconstruction nail). It achieves a union rate of 77 to 93\% in the femoral shaft and 93 to 100\% in the femoral neck, with 77 to 93\% of patients achieving good outcomes.\textsuperscript{6,16,17}

A high incidence of infection was reported after plating for femoral shaft fractures.\textsuperscript{49} In our series, 2 (5\%) patients developed deep infection, which resolved after debridement and antibiotic treatment. Other series reported 2 to 6\% of patients developed deep infection.\textsuperscript{16,17} In our series, no avascular necrosis of the femoral head occurred, consistent with a lower incidence among patients with ipsilateral femoral neck and shaft fractures than in solitary femoral neck fractures (3\% vs 10\%).\textsuperscript{14,18}

Compared to other techniques, fixation using a DCP and a DHS for ipsilateral femoral neck and shaft fractures is a reliable means of achieving bone union with few complications.

REFERENCES