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## Unstable subtrochanteric fractures—gamma nail versus dynamic condylar screw

Accepted: 12 June 2003 / Published online: 26 August 2003  
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**Abstract** We reviewed the operative treatment of subtrochanteric fractures. Before 1999, 15 fractures were treated with a dynamic condylar screw (DCS) and after 1999, 11 fractures were treated with a gamma nail (GN). The mean age of all patients was 70 (31–92) years, and the mean follow up was 16 (9–30) months for the DCS group and 14 (6–26) months for the GN group. All fractures united. There were no infections or implant cut out. In the DCS group, there was one malunion in varus and one late fracture of the implant. In the GN group, there was one malunion in internal rotation and three intraoperative fractures. Functional evaluation showed no significant differences in pain, range of movement, or walking ability, but recovery was significantly earlier in the GN group.

**Résumé** Nous avons revus le traitement opératoire des fractures sous-trochantériennes. Avant 1999, 15 fractures ont été traitées avec une vis dynamic condylar (DCS), et après 1999, 11 fractures ont été traitées avec un clou gamma (GN). L'âge moyen de tous les malades était 70 ans (31–92) et le suivi moyen était de 16 mois (9–30) pour le groupe DCS et de 14 mois (6–26) pour le groupe GN. Toutes les fractures ont consolidé. Il n'y avait aucune infection ni démontage des implants. Dans le groupe DCS il y avait un cal vicieux en varus et une fracture tardive de l'implant. Dans le groupe GN il y avait un cal vicieux en rotation interne et trois fractures opératoires. L'évaluation fonctionnelle n'a pas montré de différences notables dans douleur, l'amplitude des mouvements ou les capacités de marche, mais la récupération était beaucoup plus précoce dans le groupe GN.

### Introduction

Subtrochanteric fractures of the femur represent a difficult problem. In adults, they are usually the result of high-energy trauma, often comminuted with bone loss and associated injuries. In older patients, the need for early mobilization and osteoporotic bones makes the election of implant an important issue. Many clinical and biomechanical studies have analyzed the results of different implants. These studies often include different types of fractures (i.e., subtrochanteric and intertrochanteric), making the interpretation of results difficult.

The aim of this study was to compare the results of the dynamic condylar screw (DCS) (Synthes) and the gamma nail (GN) (Stryker Howmedica) in the treatment of unstable subtrochanteric fractures.

### Material and methods

We studied all subtrochanteric fractures treated with DCS between 1996 and 1999. From July 1999, a prospective study was designed using a standard (SGN) or long (LGN) gamma nail in the same type of fractures. Patients with intertrochanteric fractures, femoral neck fractures, pathological fractures, and Russell Taylor type II fractures were excluded. A total of 26 patients were included, 15 in the DCS group and 11 in the GN group (seven with SGN and four with LGN). The mean age was 69.5 (31–92) years, 14 patients were men and 12 were women.

All patients were operated by a single surgeon in an orthopedic department using spinal anesthesia and a traction table. In the DCS group, an open anatomical reduction was achieved using implants that secure distal fixation of the fracture of at least six cortices.

In the GN group, an SGN (220 mm) or an LGN (320 mm) was used, depending on the extension of the fracture to assure distal locking of the nail. An image intensifier was used for indirect reduction and location of the entry point in the trochanteric area. Front-cutting drills were used, allowing manual insertion of the nail to the final position. Through a small skin incision, lag screw and distal locking were carried out using the target device.

First-generation cephalosporin (Cefamezin) was given postoperatively for 24–48 h and 5,000 IU of heparin before and after the operation until discharge. Early mobilization on the second or third day after surgery was encouraged. In the DCS group, partial weightbearing was allowed after 2 weeks and full weightbearing

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**Fig. 1** **a** A 67-year-old woman on admission. **b** Broken dynamic condylar screw (DCS) plate 9 months after surgery



after 1 month. In the GN group, full weightbearing was allowed immediately.

## Results

All patients under 50 years (nine cases) had high-energy trauma involving falling from heights or vehicle accidents, and all patients over 65 (17 cases) had low-energy trauma from simple falls. There were no patients between 50 and 65 years.

According to AO classification, five fractures were type A (all subtype A3), 15 were type B (two B1, four B2, and nine B3), and seven were type C (five C1 and two C2). According to Russell Taylor classification, ten were type IA and 16 type IB. There were no significant differences in age or type of fractures between the DCS and GN groups.

The mean time between admission and surgery was 16 (7–24) days in the DCS group and 19 (10–32) days in the GN group (range 10–32). Patients were treated with skeletal traction until surgery. The mean follow-up was 18 (9–30) months for the DCS group and 14 (6–26) months for the GN group.

Intraoperatively, a semiopen reduction was necessary in four patients in the GN group to allow insertion of the nail. In the GN group, there were three trochanteric fractures in relation to insertion of the nail, all within the

first six patients. Only one fracture was displaced, but none of the fractures influenced the final outcome.

There were three postoperative complications. In the DCS group, a fracture united in 7° varus, and in the GN group there was a malrotation with 10° of internal rotation. One case with a broken DCS plate had the implant exchanged with a Kuntscher nail (Fig. 1). Subsequently, the fracture healed without any other complications. There were no cases of infection or implant cut out. All fractures united (Fig. 2). The mean time to union was 15 (8–26) weeks in the DCS group and 10 (8–17) weeks in the GN group. There were no mortalities within the first 90 days. After 1 year, four patients (two in each group) had passed away.

Functional evaluation of 22 cases at the final follow-up showed that 20 patients were pain free and two had occasional pain that was relieved with antiinflammatory drugs. At this time, there were no differences between the groups.

All nine patients under 50 years recovered to their preinjury activity level, two of them with limitations in abduction and flexion. Of 13 patients over 65 years, three were in need of one or two crutches to walk and one only walked with assistance. In eight patients, there was a restricted range of motion (six in DCS group and two in the GN group).

**Fig. 2** **a** A multiply injured 45-year-old man on admission.  
**b** Postoperative radiographs.  
**c** Fracture healed 13 months after surgery



## Discussion

Subtrochanteric fractures have been treated with numerous implants, including intramedullary and extramedullary fixation. There are few comparative studies involving only these fractures, and none were found that compared the results between the DCS and the GN.

Rantanen et al. [14] compared the GN and the intramedullary hip screw and found a higher complication rate with the GN, especially postoperative refractures and fixation failures. Other studies emphasize intraoperative fractures with the GN attributable to the surgeon's learning curve [7]. Multicenter studies [2, 18] cannot demonstrate clearly if such fractures are related to the implant it-

self or to the surgeon's experience. In the present study, all patients were operated by one surgeon, clearly showing the relevance of the learning curve as all intraoperative complications occurred in the first six patients.

In other studies, the biomechanical advantages of the GN over other implants have been described [4, 5, 9, 15] associating the principle of intramedullary nailing and of the sliding screw plate in a rigid implant. Immediate full weightbearing was allowed in the GN group and, as in many reports [1, 2, 12, 13, 14, 16, 17, 18], there was no failure of fixation or refracture, which have been reported by other authors [6, 10]. In this study, both implants allowed early mobilization, but walking ability and range of motion were restored earlier with the GN. This fact

has special relevance in older patients to avoid complications associated with a prolonged recovery period in a nonambulatory status.

The mortality rate at 3 months was nil, which is in accordance with some reports [6] but in contrast to others [2, 3]. In both groups, all fractures united. This has been previously reported [2, 6], while others have shown a reoperation rate between 2 and 8% to achieve union [8, 13, 16, 18].

It should be noted that in both groups there was a significant delay between admission and surgery of 2–3 weeks. This may be of special relevance in particular in the DCS group where open reduction determines more manipulation and devascularization of comminuted fragments.

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## References

- Adams CI, Robinson CM, Court-Brown CM, McQueen MM (2001) Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. *J Orthop Trauma* 15:394–400
- Barquet A, Francescoli L, Rienzi D, López L (2000) Intertrochanteric subtrochanteric fractures: treatment with the long Gamma nail. *J Orthop Trauma* 14:324–328
- Edward SA, Pandit HG, Clarke HJ (2000) The long gamma nail: a DGH experience. *Injury* 31:701–709
- Haynes RC, Miles AW (1997) Comparative dynamic evaluation of the sliding/characteristics of the Gamma nail: a biomechanical analysis. *Proc Inst Mech Eng (H)* 211:411–417
- Haynes RC, Poll Rg, Miles AW, Weston RB (1997) Failure of femoral head fixation: a cadaveric analysis of lag screw cut-out with the gamma locking nail and AO dynamic hip screw. *Injury* 28:337–341
- Hotz TK, Zellweger R, Kach KP (1999) Minimal invasive treatment of proximal femur fractures with the long gamma nail: indication, technique, results. *J Trauma* 47:942–949
- Kukla C, Heinz T, Gaebler C, Heinze G, Vecsei V (2001) The standard Gamma nail: a critical analysis of 1,000 cases. *J Trauma* 51:77–83
- Madsen JE, Naess L, Aune AK, Alho A, Ekeland A, Stromsoe K (1998) Dynamic hip screw with trochanteric stabilizing plate in the treatment of unstable proximal femoral fractures: a comparative study with the Gamma nail compression hip screw. *J Orthop Trauma* 12:241–248
- Mahomed N, Harrington I, Kellam J, Maistrelli G, Hearn T, Vroeme J (1994) Biomechanical analysis of the Gamma nail and sliding hip screw. *Clin Orthop* 304:280–288
- Park SR, Kang JS, Kim HS, Lee WH, Kim YH (1998) Treatment of intertrochanteric fracture with the Gamma AP locking nail or by a compression hip screw—a randomised prospective trial. *Int Orthop* 22:157–160
- Parker MJ, Handoll HH (2000) Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures. *Cochrane Database Syst Rev*
- Parker MJ, Prior GA (1996) Gamma versus DHS nailing for extracapsular femoral fractures. Meta analysis of ten randomized trials. *Int Orthop* 20:163–168
- Pervez H, Parker MJ (2001) Results of the long Gamma nail for complex proximal femoral fractures. *Injury* 32:70–77
- Rantanen J, Aro HT (1998) Intramedullary fixation of high subtrochanteric femoral fractures: a study comparing two implant designs, the Gamma nail and the intramedullary hip screw. *J Orthop Trauma* 12:29–52
- Roberts CS, Nawab A, Wang M, Voor MJ, Seligson D (2002) Second generation intramedullary nailing of subtrochanteric femur fractures: a biomechanical study of fracture site motion. *J Orthop Trauma* 16:231–238
- Valverde JA, Alonso MG, Porro JG, Rueda D, Larrauri PM, Soler JJ (1998) Use of the Gamma nail in the treatment of fractures of the proximal femur. *Clin Orthop* 350:56–61
- Van den Brink WA, Janssen IMC (1995) Failure of the Gamma nail in a highly unstable proximal fracture: report of four cases encountered in the Netherlands. *J Orthop Trauma* 9:53–56
- van Doorn R, Stapert JW (2000) The long gamma nail in the treatment of 329 subtrochanteric fractures with major extension into the femoral shaft. *Eur J Surg* 166:240–246