

UNSTABLE FEMORAL NECK FRACTURES TREATED WITH A 130° BLADE PLATE

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We reviewed 32 patients who sustained an unstable intracapsular hip fracture, treated with an AO 130° blade plate. The low incidence in complications (avascular necrosis 7%, delayed union 3%, no nonunion or loss of fracture reduction) compares favorably with previous reports. Experience with this highly demanding surgical technique is however essential to obtain good results.

Keywords : hip ; fracture.

Mots-clés : hanche ; fracture.

INTRODUCTION

Although hip fractures are common in the older patient, the unstable intracapsular femoral neck fracture (AO classification B₂, B₃) is uncommon in the younger age group. The treatment of these fractures remains a challenge since previous studies have documented a high rate of postoperative complications (nonunion, loss of fracture reduction, avascular necrosis) (6, 17, 20, 23). An anatomic reduction (or reduction in a slight valgus angle), rigid internal fixation to obtain primary bone healing, impaction at the fracture site, early operative treatment to reduce the risk of avascular necrosis and early postoperative joint mobilization are the ultimate goal of treatment.

Several implants for internal fixation are being used (2, 5, 10, 17, 18, 23). The rigid nail and plates are currently less frequently used but compare favorably with other devices (13, 18). The department of traumatology at our institution uses the 130° blade plate for the treatment of unstable femoral neck fractures in patients younger than 60 years of age.

MATERIAL AND METHOD

Thirty-two patients with a minimum follow-up of 30 months were reviewed, 22 males and 10 females (this distribution is related to the high impact injuries and is in contrast with the sex distribution in the older age group).

Age at injury ranged from 19 to 60 years with a mean of 45. Causes of the traumatic intracapsular fractures were a private accident in 13 patients, 7 were due to sports injuries, 7 to a traffic accident and 5 to accidents at work.

Fracture types :

- subcapital Garden type 3 : 20 patients
- subcapital Garden type 4 : 4 patients
- midcervical fracture (AO B₂ 283) : 6 patients
- basocervical fracture (AO B₂ 1) : 2 patients

Ten patients were treated urgently, 13 within 24 hours, 7 within 2 days and 2 patients had a surgical delay of 3 days. Five patients presented to the emergency room with some delay : 2 patients one day, one patient one week, one patient 10 days (alcohol abuse), one patient 11 days (transfer from abroad).

Surgery was performed by the head of the department in 17 cases, by a staff member of the trauma department in 11 cases and by residents under supervision in 4 cases. The surgical procedure was standard as described in the AO manual with reduction of the fracture on the orthopedic traction table. Antibiotic prophylaxis was administered intraoperatively and 24 hours post-

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operatively with a first-generation cephalosporin. The mean duration of the operation was 55 minutes (range 35-80 minutes).

The postoperative regimen of physiotherapy consisted of early joint mobilization and 3 months of touch weight bearing (2 patients were allowed to partially bear weight). The mean duration of hospital stay was 12 days with a range of 8 to 21 days.

RESULTS

Twenty-six patients presented for clinical follow-up and for 30 patients the x ray file was available.

Overall results

The rating system we used is shown in table I. There are 57% excellent and 23% good results with 17.5% fair and 8.5% bad. Eighty percent of the patients are in the good or excellent group. The best results were obtained in the younger age group (table II).

Table I. — Ratings

Excellent	No pain, no gait problems, normal work, normal ADL.
Good	Normal work, normal ADL, slight pain or gait problems.
Fair	pain ++, gait ++ problems, ADL slightly disturbed or varus < 100%.
Bad	Two or more conditions of fair.

Table II

Age at follow-up	Excellent	Good	Fair	Bad
< 30	5	0	0	0
N = 5	100%			
30-40	3	0	1	0
N = 4	75%		25%	
40-50	2	4	0	0
N = 6	33%	67%		
50-60	4	1	2	1
N = 8	50%	12.5%	25%	12.5%
> 60	1	1	1	0
N = 3	33.3%	33.3%	33.3%	
Total	15	6	3	2
N = 26	57%	23%	11.5%	8.5%

Working capacity

Eleven out of 12 active working people returned to the same jobs. One patient still has an incapacity of 50% (due to avascular necrosis Ficat stage 3) (3). The mean period of working incapacity was 5.5 months, ranging from 3 to 11 months.

ADL

Two patients had a slight disturbance in activities of daily living (ADL) after their hip fracture (one because of avascular necrosis and the second is a patient with diabetes). Two patients presented with a severe limitation in ADL (a lady with a postoperative cerebrovascular accident (CVA) and hemiplegia and one patient with a delayed union).

Pain

Seventeen patients had no pain, 8 slight and one severe pain (patient with avascular necrosis converted to total hip replacement (THR)).

Gait

Twenty-two patients had no gait disturbance, 3 presented with a slight limp and one with a severe limp (patient with delayed union).

Sports

Before their accident 12 patients were active sportsmen, of which 9 returned to the same level (e.g. volleyball, wall climbing). At present 3 patients are active at a lower level.

Plate removal

Five plates had to be removed, two in young patients on advice of their surgeon, one in a patient with painful avascular necrosis that was treated by a THR. Another was removed in the patient who had a delayed union and one in a patient with pain due to plate perforation.

Complications

Early :

— One superficial and one deep wound infection (in the patient with diabetes).

- One CVA with hemiplegia and only partial recovery in a 58-year-old patient.
- Two nail perforations through subchondral bone, of which one was symptomatic and needed removal (fig. 1).

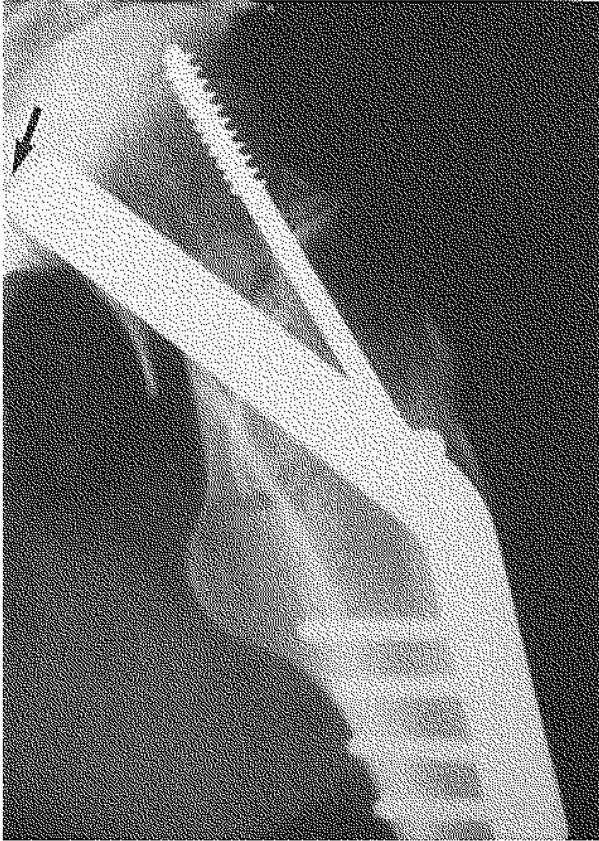


Fig. 1. — Nail perforation inferiorly (arrow).

Late :

- One delayed union and 2 patients with avascular necrosis, Ficat stage 3 and 5 (the latter was converted to a THR with good function and no pain) (fig. 2).

There was no loss of fracture reduction or implant failure.

DISCUSSION

The intracapsular fracture of the hip in the young adult is usually caused by high-energy trauma (6). Factors influencing the healing of these intracapsular femoral neck fractures after internal

fixation are the quality of fracture reduction, positioning of the internal fixation devices and the fracture type (7).

For the stable femoral neck fractures (Garden type 1-2, AO B₁ with good quality of bone and good patient compliance, cancellous bone screws can be used (12, 14, 20).

For the unstable fractures (Garden type 3-4, AO B₂ 1-2-3 and B₃ 1-2-3) several internal fixation devices are being used.

1. Cancellous screws and Knowles pins : several studies could not demonstrate a significant difference in failure rates between multiple screws and a sliding hip screw for the treatment of intracapsular proximal femoral fractures (4, 9, 25).

Martens *et al.* showed a clear correlation between Garden fracture type and pin migration, with a loss of reduction in half of the cases of the Garden type 3 and type 4 (14).

Subtrochanteric fractures occurred more frequently with the use of a screw for treatment of intracapsular proximal femoral fractures (1, 9).

In an experimental study, Van Audekercke *et al.* showed that the Smith Petersen nail has significantly lower strength compared to fixation with pins. They also showed that the use of more than 3 screws did not provide greater strength of fixation, but it altered the failure mode of this device (25).

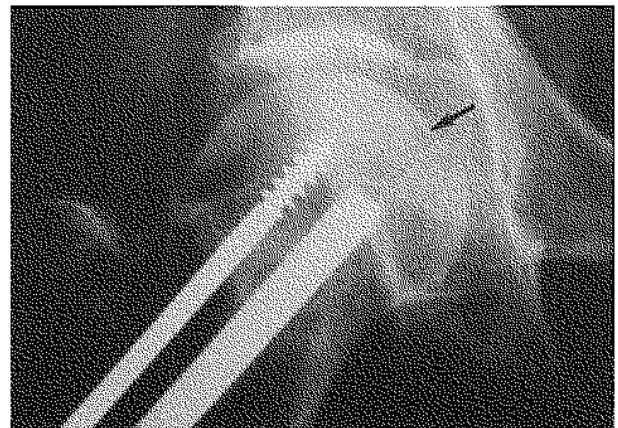


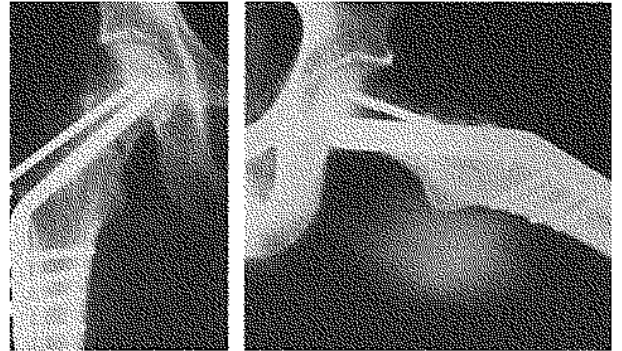
Fig. 2. — Avascular necrosis Ficat stage 3, with collapse of the subchondral bone (arrow).

2. Dynamic hip screw : some authors have shown good results with the use of the DHS in unstable femoral neck fractures (10, 17, 24), but rotational stability, especially in the young patient with good quality of bone and in the very proximal fractures (subcapital) cannot be guaranteed. Adding a more proximal cancellous screw does not improve rotational stability (7, 15, 18). Mills *et al.* showed in a cadaveric study that rotation of the femoral head up to 30° occurs and this is not visible on an image intensifier (15).
3. A nail-plate device assures rigid internal fixation that, in some large series, compares favorably with a dynamic compression device (13, 18). It is however a technically demanding procedure. Several authors found that bone quality was the single most important factor in stability of the bone implant unit (4, 14).
4. Arthroplasty (hemi- or total arthroplasty) has no place in this age group unless a preexisting pathologic process is present (pathological fracture, rheumatoid arthritis, preexisting avascular necrosis) (3, 26).

In our series the rate of complications was relatively low. There was no implant failure, no osteomyelitis and no nonunion. Delayed union occurred in only one patient (3%). Previous reports showed failure of fracture healing due to nonunion or infection in as many as 20% of the cases (23).

Avascular necrosis of the femoral head is the most frequent and most feared complication up to 3 years after the fracture. The incidence in the literature differs in quite a large range from 15% to 90% (20), but most series report an incidence of approximately 25 to 40% (6, 17, 23). A valgus osteotomy might reduce the incidence of ischemic necrosis (19). Quint *et al.* showed that osteosynthesis with a 130° blade plate resulted in a very low incidence of revision surgery caused by femoral head necrosis (18). This has also been a finding in our series in which 2 patients (7%) showed femoral head necrosis and only one of these patients (3%) required conversion to a total hip arthroplasty.

There are some controversies about the delay in treatment causing this ischemic necrosis of the femoral head. Some authors believe urgent treatment within 6 hours is essential (21, 22), while others showed that some delay in treatment did



a



b

Fig. 3. —

- a) AP and lateral view showing apparently good positioning of the fixation devices.
- b) A more oblique view shows minimal perforation (arrow). This patient was asymptomatic.

not cause an increase in the rate of avascular necrosis of the femoral head (6, 18). We also did not find a correlation between timing of operation and avascular necrosis. Probably the anatomic site of the fracture is the most important determining factor in complications (loss of fracture reduction — nonunion — avascular necrosis), the more proximal fractures being the least favorable (6).

Two plate perforations (one without symptoms) could be explained by the technically highly demanding procedure and the relative inexperience of the surgeon (one by a resident and one by a junior staff member). We strongly recommend intraoperative image intensifying not only in an anteroposterior view (AP) and lateral views but also in more oblique views (30°-60°) in order to visualize a possible nail perforation (fig. 3) (16).

In conclusion we can state that for unstable intracapsular femoral neck fractures in the young patient, the AO 130° blade plate gives good results with a relatively low complication rate. However it is technically a highly demanding procedure and surgical experience is required.

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SAMENVATTING

R. DRIESEN, S. NIJS, P. L. O. BROOS, G. FABRY. Onstabiele femurhalsfracturen behandeld met de 130° hoekplaat.

Een follow-up van 32 patiënten met een onstabiele intra-capsulaire heupfractuur, behandeld met de 130° hoekplaat, werd verricht. Er is een lage incidentie aan complicaties (avasculaire necrose 7%, vertraagde bot-heling 3%, geen pseudarthrose of verlies van fractuur reductie) vergeleken met vroeger verrichte studies. Ervaring met deze veeleisende techniek is essentieel voor het bekomen van een goed eindresultaat.

RÉSUMÉ

R. DRIESEN, S. NIJS, P. L. O. BROOS, G. FABRY. Fractures instables du col fémoral traitées par lame-plaque à 130°.

Nous avons revu 32 patients, présentant une fracture intracapsulaire de la hanche, traités par une lame-plaque à 130°. Par rapport à d'autres études, les complications dans notre groupe étaient relativement rares (nécrose avasculaire 7%, retard de consolidation 3%, aucune pseudarthrose ou perte de réduction). La technique chirurgicale est très précise et l'expérience est essentielle pour obtenir de bons résultats.