

I.C. Vossinakis · L.S. Badras

Management of pertrochanteric fractures in high-risk patients with an external fixation

Accepted: 24 January 2001 / Published online: 12 May 2001
© Springer-Verlag 2001

Abstract In 44 surgical high-risk patients (ASA grade 3 or 4) pertrochanteric fractures were treated with a newly developed external fixator; all fractures healed within 14 weeks. Seven patients had a superficial pin tract infection and in 12 patients the fracture united with a shortening of 18 (5–30) mm. No implant failures or limitation of knee movements were recorded. Nine patients died during the first 6 months. The “pertrochanteric fixator” is a valuable alternative for treating high-risk, elderly patients.

Résumé Chez 44 patients présentant des problèmes médicaux majeurs (ASA grade 3 ou 4) nous avons utilisé un nouveau “fixateur trochantérien”. Toutes les fractures ont consolidé en 14 semaines. Les complications à noter ont été l’infection superficielle des fiches (7 patients) et le raccourcissement du membre inférieur de 18 (5–30)mm (12 patients). Il n’y a pas eu de complications liées au matériel (rupture ou lâchage des fiches) ni de limitation de mobilité du genou. La mortalité observée a été 21% en 6 mois. Le “fixateur trochantérien” est une alternative valable pour des patients âgés à risque opératoire très élevé.

Introduction

Pertrochanteric fractures account for significant morbidity and mortality among elderly patients; the treatment of choice is surgery. It is aimed at facilitating nursing care

and allowing early mobilization to avoid complications such as respiratory and urinary infections or pressure sores, which are closely associated with prolonged bed rest [1, 11, 19]. There are a variety of fixation methods, the most commonly used being the dynamic hip screw [8, 18]. However, a significant number of those elderly patients are quite frail and present a high surgical risk [14]. For such patients prolonged anesthesia and intraoperative blood loss are not well tolerated, posing contraindications for the commonly used surgical procedures. Conservative treatment is an unacceptable alternative, since it has been associated with mortality of up to 60% [10, 14].

Our previous satisfactory experience with the Hoffman apparatus [1] has encouraged us to use a new fixation device (Orthofix Pertrochanteric Fixator, Busolengo, Italy) specifically developed for the treatment of pertrochanteric fractures (Fig. 1). The aim of this prospective study was to test the fixator in a group of high-surgical-risk, elderly patients.

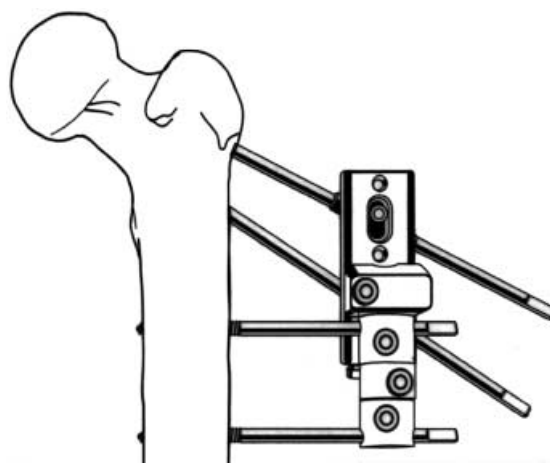


Fig. 1 Schematic illustration: The fixator and its application on the femur

I.C. Vossinakis (✉)
Weston General Hospital, Weston-Super-Mare, UK
e-mail: yannisx@vossinakis.freemove.co.uk
Tel.: +44-1454-202490

L.S. Badras
Orthopaedic Department, Volos General District Hospital,
Polymeri Str., Volos, Greece

I.C. Vossinakis
58 Ferndene, Bradley Stoke, Bristol, BS32 9DF, UK

Materials and methods

Between 1995 and 1997, 41 (11%) of the 375 patients with pertrochanteric fractures admitted to our department, were classified by the anesthetist as ASA grade 3 or 4 and considered not suitable for conventional fracture fixation. The medical conditions causing the patients to be considered high risk are shown in Table 1. In addition, three other patients would not accept a necessary blood transfusion for religious reasons (Jehovah's Witnesses). Thus, we treated 44 patients who had sustained pertrochanteric fractures with the Orthofix Pertrochanteric Fixator. There were 18 male and 26 female patients with a mean age of 84 years (76–98 years). In 20 cases, the right hip was involved and, in the remaining 24, the fracture occurred in the left hip. The fractures were classified according to the modified Evans classification [9, 12] (37 of the fractures were unstable and seven were stable).

The operation was performed under spinal anesthesia. The patient was placed on a fracture table and a closed reduction of the fracture was performed under image intensification. A guide wire was inserted percutaneously at a 125°–130° angle approximately into the center of the femoral neck and head. Two long, 6.5-mm, self-drilling and self-tapping pins were inserted manually on each side of the guide wire within the confines of the femoral neck. The pins were advanced to about 10 mm from the subchondral bone of the head. The device attached to the proximal pins acted as the guide for the insertion of the two distal pins. The fixator can be used in two configurations, open or closed; in relation to its length we preferred the closed position. The mean operative time was 18 min, ranging from 10 min to 30 min.

Postoperatively the patients were mobilized, fully weight bearing, on a Zimmer frame the day following surgery. Only two very senile patients, who were non-ambulatory before the occurrence of the fracture, were not able to walk postoperatively, but they were mobilized out of bed within the first week. Daily pin site care was performed and the patients' families were given instructions on continuing the care after discharge from hospital. Home visits by nursing staff for the inspection and cleaning of the frame were done regularly. Hospitalization was 6 days on average (4–11 days). Outpatient visits were arranged every month until the fracture was united and the fixator was removed. Final follow-up was at 6 months.

Table 1 Medical conditions increasing the surgical risk

Condition	Patients (n)
Cardiac failure	22
Severe anemia	15
Recent myocardial infarction	6
Cardiac arrhythmia	5
Uncontrolled hypertension	3
Diabetes	7
Respiratory failure	3
Recent cerebro-vascular accident	4
Renal failure	3

Patients often had more than one condition present

Table 2 Patient accommodation pre- and postoperatively

Nine patients were dead at final follow-up

	Own home	Nursing home	Psychiatric hospital	Geriatric hospital
Prefracture	34	2	1	7
Discharge	29	7	1	6
6 months	28	3	0	4

Results

No patient required blood transfusion postoperatively. The fixator did not interfere with sitting or lying and there was no restriction of knee movements. The average time for fracture union was 11 weeks (9–14 weeks). No fracture failed to unite and we encountered no implant failures (Fig. 2). Preoperative and postoperative accommodation arrangements of the patients are described in Table 2.

There were no cases of pin loosening, breakage or penetration of the femoral head. Twelve patients had, on average, a limb shortening of 18 mm. This ranged from 5 to 30 mm and was the result of some impaction and/or collapse in varus that occurred in some unstable

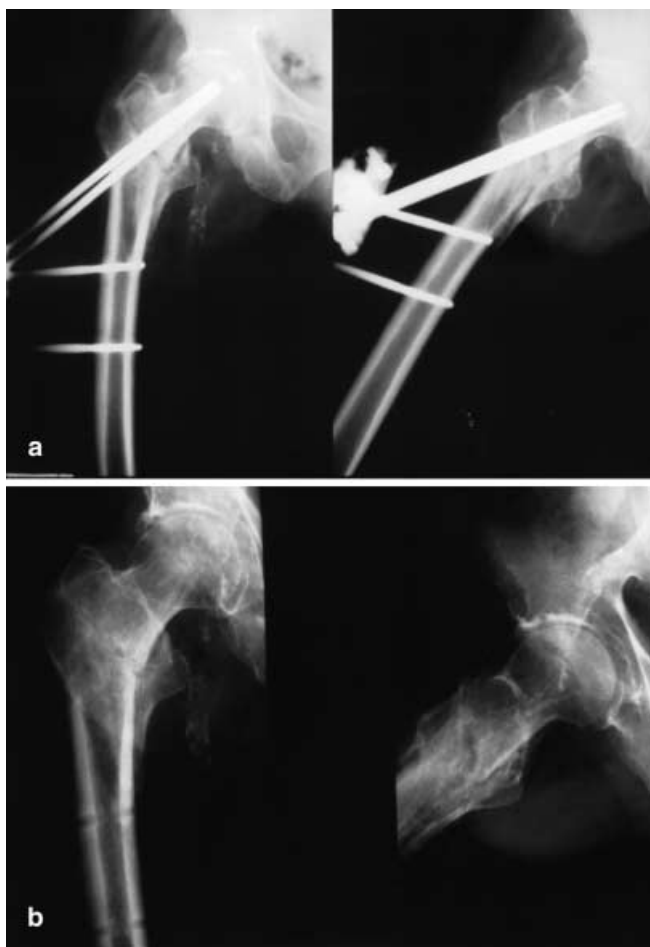


Fig. 2 a An unstable pertrochanteric fracture following fixation. b After complete fracture union the device has been removed

fractures. On two occasions, the shortening was due to initial reduction and fixation in varus.

Seven patients developed superficial pin tract infection. This usually involved the proximal pins. The infections were successfully treated with oral antibiotics and daily cleansing with antiseptic solutions. One patient had to be readmitted in hospital for a week because of poor social conditions. There were no deep infections and in no case did the pins have to be removed before completion of treatment.

During the 6-month follow-up period nine patients died from causes unrelated to the operation. One patient died in hospital from cardiac arrest and two more died before fracture union. Most of the 35 surviving patients at 6 months returned to their prefracture ambulatory status. Only two who used a stick preoperatively had to use a walker at the most recent follow-up.

Discussion

Improvements in health services (among other factors) have resulted in a significant increase in life expectancy. This has been accompanied by an increase in the incidence of pertrochanteric fractures, which mainly occur in the elderly [18]. The demands on hospital resources and beds for the treatment of these fractures have also significantly increased. Elderly patients with a host of medical conditions who sustain a pertrochanteric fracture usually require prolonged hospitalization following conventional fixation of their fracture. The need to reduce the risks of fracture fixation, permit early mobilization, and reduce hospital stay has prompted several authors to propose external fixation as an alternative treatment option for these elderly, high-risk patients [1, 2, 4, 6, 7, 10, 13, 16, 17].

The present study has confirmed the advantages of external fixation for treating pertrochanteric fractures in elderly, high-risk patients. The operative time of 18 min is significantly reduced compared to internal fixation (mean 32 min in our department). Blood loss is negligible and the surgical stress for the patient minimal. Postoperative pain is minimal and easily controllable, making the nursing and mobilization of these patients easier. In addition, the 21% mortality rate in the 6-month follow-up period compares well with the rates reported for the conventional dynamic hip screw [11, 14, 19]. However, in this group of patients the surgical risk was significantly greater than normal. The alternative would be conservative treatment, which is known to be accompanied by significant complications and an unacceptable mortality rate [10, 14]. Taking this into account, we conclude that treating those patients with external fixation actually results in reduction of the fracture-associated mortality rate, as previously suggested [10].

Despite these evident advantages, external fixation has failed to become popular with most surgeons because of the significant reported complications in previous studies, infection being the most common. Cases of

deep infection that required pin removal or repositioning have been reported [4, 7, 10, 13]. Although most authors do not comment on the incidence of superficial pin tract infection, it is common [1, 7]. In the present series, there were no cases of deep infection but superficial pin tract infection occurred in 16% of the patients.

Certain principles were followed for the application and care of the frame. The pins were inserted through spacious wounds to avoid soft tissue tension. High-speed power tools were avoided to prevent thermal necrosis of the bone. Daily cleaning of the skin, pins, and frame was performed even after discharge under the supervision and guidance of visiting nursing staff. Early signs of infection were treated promptly with oral antibiotics, preventing further progression. We believe that adhering to these principles can significantly reduce the incidence of infection. Urine incontinence has been implicated as a cause of infection and is considered a contraindication for the use of external fixation [16]. However, it was successfully managed with long-term catheterization in our patients as previously suggested [10].

Another well-described problem associated with external fixation in the femur is postoperative knee stiffness caused by fixation of the fascia lata and vastus lateralis by the distal pins [2, 4, 13]. This problem was eliminated in our series with the use of the very short pertrochanteric fixator, which allowed the placement of the distal pins quite proximally in the femur.

Shortening because of collapse and varisation of the femoral neck is a well-recognized complication of both internal and external fixation in unstable fractures or in the presence of severe osteoporosis [4, 5, 15]. However, although it also occurred in our study, it was not associated with implant failure or cut out. The device used in this study offers enough stability to allow full weight bearing without compromising fracture healing. In a previous report the proximal pins penetrated into the hip joint in three cases [1]. This complication was not encountered in our series. The lack of mechanical complications with external fixation is intriguing. It has been attributed to the large contact surface between the pins and the bone and to a degree of controlled sliding [16]. Although the proximal pins are not free to slide within the pertrochanteric fixator, their smooth shaft could slide in relation to the lateral cortex, allowing a degree of impaction at the fracture. It has also been suggested that the elasticity of the fixation, due to the increased distance of the fixation device from the femur, promotes early, florid callus formation that allows the early participation of the bone in load bearing, thus reducing the stresses on the fixation [3]. However, these theories require documentation by appropriate biomechanical studies.

Finally, the presence of osteolysis around the pins without infection has been reported [7]. It has been attributed to incorrect surgical technique without further clarification. It is possible that it was the result of thermal necrosis following high speed drilling. We did not observe any signs of osteolysis and we attribute this to our atraumatic technique.

We believe that the use of appropriate external fixation for the management of pertrochanteric fractures in elderly patients of poor health is a valuable alternative. External fixation is minimally invasive and causes no additional tissue trauma. In elderly patients of poor health (ASA 3 or 4), who are often malnourished, stable fixation without surgical trauma could be vital for a faster recovery and mobilization, reduced morbidity and mortality.

Statement on conflict of interest No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

Acknowledgements The authors would like to thank Mrs E. Ragou for her assistance with the French abstract.

References

1. Badras L, Skretas E, Vayanos ED (1997) The use of external fixation in the treatment of trochanteric fractures. *Rev Chir Orthop* 83:461–465
2. Barros JW, Ferreira CD, Freitas AA, Farah S (1995) External fixation of intertrochanteric fractures of the femur. *Int Orthop* 19:217–219
3. Dahl A, Singh SS (1996) Biological fixation of subtrochanteric fractures by external fixation. *Injury* 27:723–731
4. Dahl A, Varghese M, Bhasin VB (1991) External fixation of intertrochanteric fractures of the femur. *J Bone Joint Surg [Br]* 73:955–958
5. Davis TR, Sher JL, Horsman A, Simpson M, Porter BB, Checketts RG (1990) Intertrochanteric femoral fractures. Mechanical failure after internal fixation. *J Bone Joint Surg [Br]* 72:26–31
6. Demangos J, Biasibetti A, Aleoti S, Cartesegna M (1990) La fissazione esterna nelle fratture persottotrochanteriche complete. *Min Ortop Traum* 10:599–602
7. Diaz Jimenez M, Martin Galera R (1993) Complex fractures of the upper third of the femur treated with external fixation, Ender nailing, blade plate and locked intramedullary nailing: a retrospective comparative study. *Int J Orthop Traum* 3 [Suppl 3]:69–71
8. Doppelt SH (1980) The sliding compression screw. Today's best answer for stabilisation of intertrochanteric hip fractures. *Orthop Clin North Am* 11:507–524
9. Evans EM (1949) The treatment of trochanteric fractures of the femur. *J Bone Joint Surg [Am]* 49:190–203
10. Gotfried Y, Frish E, Mendes DG, Roffman M (1985) Intertrochanteric fractures in high risk geriatric patients treated by external fixation. *Orthopedics* 6:769–774
11. Hornby R, Grimley Evans J, Vardon V (1989) Operative or conservative treatment for trochanteric fractures of the femur. *J Bone Joint Surg [Br]* 71:619–623
12. Jensen JS, Michaelsen M (1975) Trochanteric femoral fractures treated with McLaughlin osteosynthesis. *Acta Orthop Scand* 46:795–799
13. Kamble KT, Murthy BS, Pal V, Rao KS (1996) External fixation in unstable intertrochanteric fractures of femur. *Injury* 27:139–142
14. Kenzora JE, McCarthy RE, Lowell JD, Sledge CB (1984) Hip fracture mortality: relation to age, treatment, preoperative illness, time of surgery and complications. *Clin Orthop* 186:45–56
15. Leung KS, So WS, Shen WY, Hui PW (1992) Gamma nails and dynamic hip screws for peritrochanteric fractures. A randomised prospective study in elderly patients. *J Bone Joint Surg [Br]* 74:345–351
16. Scarante S, Ranelluci M, Lavini F (1993) The Dynamic Axial Fixator in the treatment of pertrochanteric fractures of the femur. *Int J Orthop Traum* 3 [Suppl 3]:58–60
17. Scott IH (1957) Treatment of intertrochanteric fractures by skeletal pinning and external fixation. *Clin Orthop* 10:326–334
18. Sernbo I, Johnell O, Gentz CF, Nilsson JA (1988) Unstable intertrochanteric fractures of the hip: treatment with Ender pins compared with a compression hip screw. *J Bone Joint Surg [Am]* 70:1297–1303
19. Williams GR, De Lee JC, Rockwood CA (1990) Extracapsular fractures. *Curr Orthop* 4:165–176