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Surgical treatment of unstable intertrochanteric fractures by bipolar hip replacement or total hip replacement in elderly osteoporotic patients

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Abstract A retrospective study was conducted to assess the complications, clinical and functional outcomes at 5 years of follow-up of a series of elderly osteoporotic patients with an unstable intertrochanteric fracture treated by bipolar or total hip replacement. Fifty-four patients with an A2 intertrochanteric osteoporotic fracture were identified between 1996 and 2000. The average age of the patients was 81 years (SD=5). The follow-up time was 5 years. Patients received a bipolar or total hip replacement. During follow-up, we analyzed postoperative complications, mortality rate, functional results using the Harris hip score, time to return to normal activities, and radiographic evidence of healing. One patient died intraoperatively; two patients died on the third and eighth postoperative days and seven patients died within 1 year. Twenty-five patients were living at the 5-year follow-up. Harris hip score at 1 month was 64±8 (mean±SD); at 3 months, 75±5; at 1 year, 76±5; and at 5 years, 76±9. Weight-bearing was permitted immediately after surgery, as tolerated. Time to return to normal daily activities was 27±5 days. No loosening or infection of the implants were observed. In elderly osteoporotic patients with an unstable intertrochanteric fracture, bipolar or total hip replacement in association with reduction of the greater trochanter is a valid alternative to the standard treatment of internal fixation. This surgical technique permits a more rapid recovery with immediate weight-bearing, and a maintenance of a good level of function, with little risk of mechanical failure.

Key words Functional outcome • Hip replacement • Intertrochanteric fracture • Osteoporotic fracture • Surgical technique

Introduction

A debated topic in trauma surgery is the type of operation and the short- and long-term results of reduction and fixation of unstable trochanteric fractures. Many methods for treating intertrochanteric fractures (IF) have been developed, from medial displacement osteotomy [1] and condylocephalic intramedullary Ender nailing [2], to use of the more modern sliding hip screw [3–5], cephalomedullary nails (such as the gamma nail) [3, 6, 7], external fixators [8–12] and their variants, which now represent the gold standard in this kind of surgery.

Regardless of the method of fixation of the IF, the incidence of general complications ranges between 22% and 50% [13, 14]. Complications are also related to the recovery

time after surgery, such as immobility, bed rest, physical therapy and weight bearing [15]. Local complications (such as cutting out of the fixation devices from the femoral head, nonunion, shortening and external rotation of the limb, varus neck shaft angle deformity) [1, 2, 4, 10, 12, 16–19] are also considerable, as is mechanical failure of the fixation or loosening of the reduction in the postoperative period. The main causes of mechanical failure are comminuted or unstable fractures [18, 19] and osteoporotic bone [16, 17]. In the elderly, the coexistence of unstable, comminuted fractures with osteoporosis worsens the prognosis [16].

The aim of this study was to describe the surgical treatment and report on the complications and the functional results obtained in a series of elderly osteoporotic patients with an unstable IF and treated by cemented bipolar hip replacement (BHR) or total hip replacement (THR).

Materials and methods

A consecutive series of 54 patients with A2.2 and A2.3 IF (according to the Muller classification) [20] aged ≥75 years, mentally healthy, with bone mineral density (BMD) lower than 2.5 T score was treated between 1996 and 2000. There were 42 females and 12 males, aged 81±5 years. In all cases the IF was caused by low-energy trauma.

Surgical technique

All patients were operated within 48 hours of admission. Patients were operated under spinal or general anesthesia. They were prepared for surgery as for a routine total hip replacement, and positioned in supine position on a radiolucent plane table. The direct lateral approach according to Hardinge [21] and as modified by us was used in all cases. The anterior lateral part of the gluteus medius tendon was gently detached from the greater trochanter and retracted proximally. The capsula was exposed and removed with a T-shaped incision. Then, the femoral neck was exposed.

To avoid a further displacement of the fragments, with the limb maintained in traction by the surgical assistant, osteotomy of the femoral neck was performed prior to the surgeon's dislocating the hip joint. The femoral head was removed. In 22 patients (aged 75–79 years), the acetabulum was prepared and a cemented Contemporary cup (Stryker Howmedica) was implanted. In 32 patients (aged ≥80 years), the acetabulum was not replaced, but a bipolar cup was implanted instead (Centrax; Stryker Howmedica). By external rotation and adduction of the limb, the proximal femur was positioned. The fragments of the greater trochanter were repositioned and temporarily fixed by using 1 or 2 bone forceps. The femoral canal was carefully detected with a long spoon and reamed; a cemented Definition stem (Stryker Howmedica) was inserted with careful positioning inside the canal (Fig. 1).

In 16 cases, the fragments of the greater trochanter appeared unstable after cementation, so trochanteric fixation was performed using Howmedica's Dall-Miles Cable System. Two cables were passed around the femoral epiphysis from the greater to the lesser trochanter and through the cable grip, obtaining reduction of the trochanteric fragments. Using the cable tensioner, the desired tension was achieved and the cable ends were then cut.

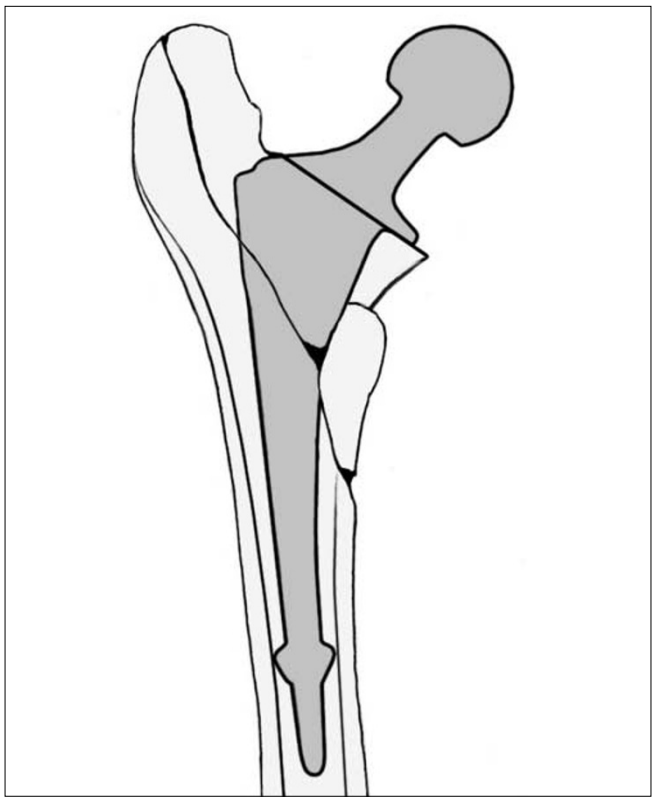

Fig. 1 An A2.2 intertrochanteric fracture in which the segment of the greater trochanter appeared stable after insertion of the cemented prosthetic stem

In the remaining 38 cases in which the fragments of the greater trochanter appeared stable after cementation, the joint was repositioned, the gluteus medius muscle fibers were sutured at the level of the greater trochanter to the vastus lateralis muscle, routine closure was performed and vacuum drainage was placed.

Isolated displacement of the lesser trochanter fragment was usually left unreduced.

Postoperative and rehabilitation regimens

Physiotherapy began on the first postoperative day and consisted of gentle passive movements of the operated hip, isometric exercises and foot pumps. Then, all patients received physiotherapy twice a day according to the following criteria: (1) on the first or second postoperative day, patients were allowed to sit on the side of the bed or upright in a chair, avoiding excessive flexion of the hip; (2) gait training was begun on the first postoperative day and weight-bearing was permitted immediately after surgery, as tolerated. Considering that all the patients were elderly, they

required a walker for balance during gait training. A pillow between the thighs was used for the first 2 weeks to prevent excessive adduction while lying on the unoperated side.

The vacuum drains remained in place for 48 hours and were then removed. The level of hemoglobin was carefully controlled during the first 3 postoperative days, and the need for blood transfusion was studied for each patient.

Patients were transferred to a rehabilitation center 5–12 days after surgery to continue physiotherapy until they could return to independent living.

Patients were evaluated clinically according to the Harris hip score and radiographically in out-patient facilities at monthly follow-ups for 6 months and then at 1 year, 3 years and 5 years.

Results

A total of 54 elderly osteoporotic patients with unstable intertrochanteric fractures underwent bipolar or total hip replacement. The mean operative time was 95 minutes (range, 45–155 minutes). Average intraoperative blood loss was 247 ml (range, 110–400 ml) and the average postoperative drainage was 145 ml (range, 10–240 ml). An average of 2 units of supplemental transfused blood was required within the first 3 days.

One patient died intraoperatively. Two patients died on the third and eighth postoperative days of pulmonary embolus and pulmonary edema, respectively. Seven patients died within 1 year from the fracture (4 died before 3 months). Another 19 patients died of causes unrelated to the fracture. Twenty-five patients were still living at the 5-year follow-up. Thus, the overall mortality rate in the study was 46% but the 1-year mortality rate was 19%.

The Harris hip score at 1 month was 64±8 (mean±SD); at 3 months it was 75±5; at 1 year 76±5 and at the 5-year follow-up it was 76±9. Patients returned to their normal daily activities after 27±5 days.

Radiography at the last available follow-up showed that all fractures had healed (Figs. 2, 3). In 16 cases the

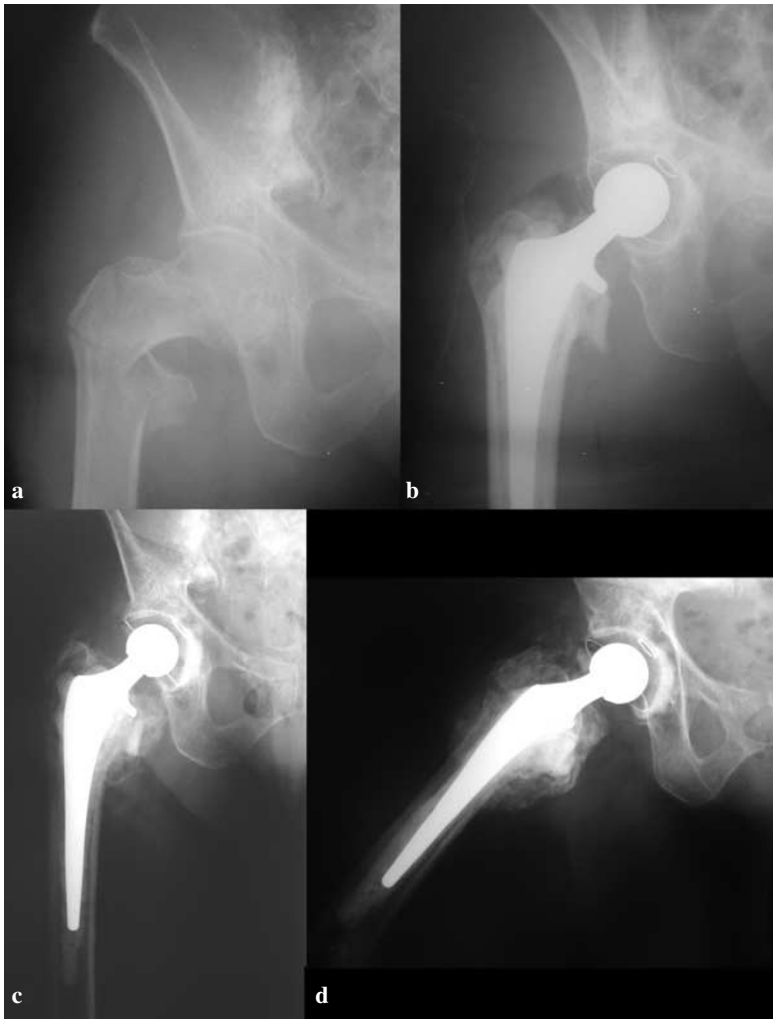

Fig. 2a-d *A2.2 intertrochanteric fracture in a 77-year-old patient.* **a** Preoperative radiograph. **b** Radiograph after total hip replacement. **c, d** Radiographic results at the 5-year follow-up

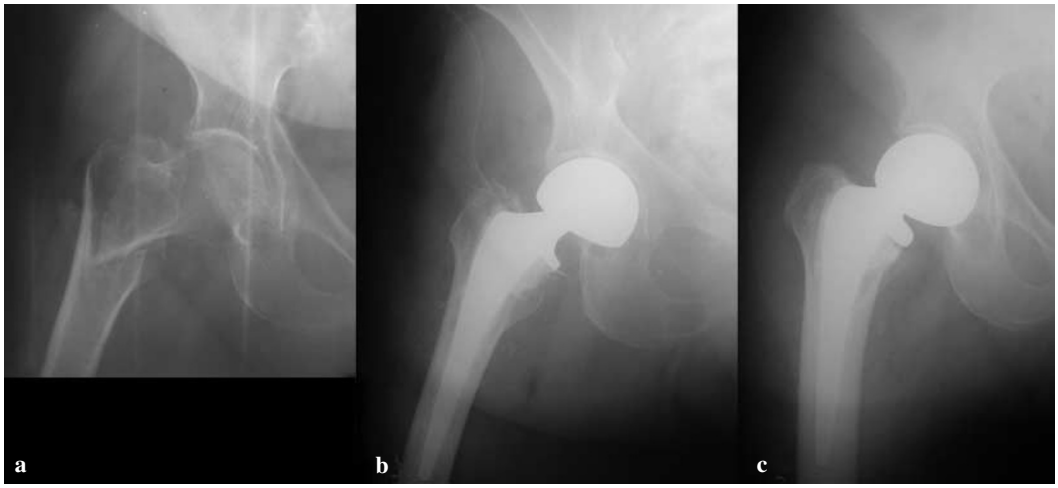

Fig. 3a-c *A2.2 intertrochanteric fracture in an 83-year-old patient with body mineral density (BMD) = -2.7 T score.* **a** Preoperative radiograph. **b** Postoperative roentgenogram after bipolar hip replacement. **c** Radiographic result at the 3-year follow-up

operated hip resulted in greater limb length than the contralateral side (0.5–1.5 cm). No dislocations occurred. No loosening or infection of the implants were observed.

Discussion

A wide range of techniques is available for the treatment of unstable comminuted IF in elderly osteoporotic patients. Tronzo [22] first reported the use of a long straight-stem prosthesis for IF in 1974. Stern and Goldstein in 1979 [23] reported 43 cases of comminuted IF treated by long-stem Leinbach prostheses. Later, many authors suggested the use of hip replacement to treat comminuted IF [24–31], emphasizing the rapid weight-bearing allowed even from the first postoperative day [24, 26, 27, 30], the high success rate in returning the patients to a prefracture ambulatory state [30], and the absence of infection or dislocation [25–27, 29].

Using internal fixation devices, high rates of local and general complications have been reported. The considerable incidence of general complications (such as pulmonary embolism, deep venous thrombosis, pneumonia) is related to a restricted weight-bearing, causing a long bed rest period and consequently a high mortality rate. Mortality rates during hospitalization range from 0.03% [2] to 10.5% [32], while at 1 year mortality reaches 22% [2].

On the other hand, using hip replacement, patients bear weight immediately, they are encouraged to walk, move and exercise the involved limb, and limit bed rest. Moreover, elderly patients, who are often unable to cooperate with partial weight-bearing required after an internal fixation implant [24, 26, 27], accept full weight-bearing more easily.

Considering our experience, we believe that, in A2 IF in elderly osteoporotic patients, BHR and THR in association with reduction of the greater trochanter are valid alternatives to the standard treatment of open reduction and internal fixation. As BHR and THR represent more invasive surgical techniques compared to other fixation techniques, a higher risk of intraoperative mortality is expected. However, the rapid mobilization of these patients, in association with the reduced bed rest, diminishes the long-term mortality rate. In fact, considering the advanced age of these patients, the first-year mortality rate of our series was low (19%) and similar to what other authors reported with other fixation techniques [13, 14].

Hip replacement, compared with other fixation techniques, permits a more rapid recovery with immediate weight-bearing and facilitates nursing care during hospitalization and at home, especially in the first postoperative month. The clinical evaluation confirmed that the patients were able to regain a degree autonomy, even at 1 month, with progressive improvement in 3 months. All obtained a good level of function, given their age. The last available follow-up showed good function of the operated limb, despite a decline in general function associated with the natural physical or mental aging process. Radiographs showed that implants remained in place over time. All fractures were well healed. Unreduced fractures of the lesser trochanter were not problematic for the patients.

Although this technique may not be ideal for all types of trochanteric fractures, it can be a valid treatment option for mentally healthy, and osteoporotic patients. In fact, this procedure offers quick recovery with little risk of mechanical failure, and enables the patient to maintain a good level of function.

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