PATHOLOGICAL FRACTURES OF THE PROXIMAL FEMUR WITH IMPENDING SHAFT FRACTURES TREATED BY THR AND CEMENTED INTRAMEDULLARY NAILING

A REPORT OF NINE CASES

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We have used total hip replacement combined with cemented intramedullary nailing to treat a selected group of nine patients with pathological fractures of the proximal femur and impending fractures of the shaft due to metastases. One patient died from cardiopulmonary failure on the third postoperative day, but the others were able to walk within the first week after operation.

Complications included one recurrent dislocation of the THR and one fracture of an osteolytic lesion of the femoral shaft during nail insertion. Both were managed successfully.

The hybrid osteosynthesis which we describe is an alternative to the use of tumour or long-stem prostheses; it has the advantage of preserving bone stock and muscle attachments.

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The treatment of metastatic disease of bone has been improved during the past two decades by advances in chemotherapy, radiotherapy and new surgical techniques. Pathological fractures are usually due to advanced disease with limited life expectancy, and the treatment of choice is therefore stable internal fixation or prosthetic replacement to alleviate pain, restore function and facilitate nursing care.

The addition of polymethylmethacrylate bone cement to improve stability and fill cortical defects allows more rapid mobilisation and weight-bearing (Harrington et al 1976). The use of definite criteria for the prophylactic fixation of impending fractures has decreased their incidence (Beals, Lawton and Snell 1971; Fidler 1981).

Pathological fractures of the femoral neck are best treated by total hip replacement, as are some fractures of the intertrochanteric region. Others require internal fixation using condylar plates reinforced with methylmethacrylate or the Zickel nail (Mickelson and Bonfiglio 1976; Habermann et al 1982). For all types of fracture of the proximal femur it is essential to have radiographs of the entire femur to detect any additional distal lesions so that they can be bypassed by long-stem or special tumour prostheses (Habermann et al 1982; Helwig, Ritschl and Katz 1992).

We have developed an alternative method for treating such proximal fractures with simultaneous lesions of the femoral shaft by a hybrid combination of total hip replacement (THR) with cement-augmented intramedullary nailing. We report the results in nine patients.

PATIENTS AND METHODS

From 1987 to 1995, at the Department of Trauma Surgery, University Clinic, Essen, we treated 115 pathological fractures or impending fractures of the proximal femur by prosthetic replacement or internal fixation. Nine patients with femoral-neck, intertrochanteric or subtrochanteric fractures and impending lesions of the femoral shaft were treated by a combination of THR and cement-reinforced intramedullary nailing. All nine were able to walk before their fracture.

Five of the patients had breast carcinoma, two had multiple myeloma, one carcinoma of the lung and one of the kidney. Seven were female and two male; their mean age was 59 years (44 to 82). On admission, anteroposterior radiographs of the pelvis and anteroposterior and lateral radiographs of the entire femur showed six fractures or impending fractures of the femoral neck (Fig. 1) and two intertrochanteric (Fig. 2 and 3) and one subtrochanteric fracture. All nine patients had one or more additional osteolytic lesions of the femoral shaft. The risk of fracture at these sites was quantified by the method of Mirels (1989), giving scores of between 9 and 11 (mean 9.7) which indi-

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Fig. 1a

Fig. 1b

A pathological fracture of the femoral neck with multiple osteolytic metastases in the pelvis and the shaft of the femur (a). The acetabulum was reinforced with a Schneider ring and a hybrid osteosynthesis was performed with a cemented intramedullary nail and a Spotorno THR (b).

cates a 65% risk of fracture. All the patients had at least one lesion which involved more than 50% of the cortex. All had operations within 48 hours of their fracture.

Operative technique. With the patient supine and the affected leg draped free, the hip is exposed by a lateral approach. The capsule is opened and the neck cut at the appropriate level and angle for the THR. The femoral head and the capsule are removed, the acetabulum is reamed and an appropriate socket is selected. In six patients there was some destruction of the acetabulum with inadequate bone stock. For those we used a Müller or Schneider reinforcement ring with screw fixation before cementing the socket.

An entry hole for a femoral guide rod is then made near the piriform fossa using a tip-threaded cannulated reamer (AO/ASIF instruments and internal fixation devices). A guide rod is introduced and the femur reamed to between 14.5 mm and 16 mm depending on the size of the medullary cavity. The proximal femur is reamed for the femoral component of the THR prosthesis (Spotorno or Müller stem).

An intramedullary nail of a diameter 2 mm less than the last reamer is chosen. The total length of the nail and the stem of the prosthesis to be mounted on the end of the nail is decided by use of an image intensifier. Through a second

Fig. 2a

Fig. 2b

A pertrochanteric fracture with osteolysis of the femoral shaft and impending fracture (a). A Müller reinforcement ring and a cemented intramedullary nail were used in combination with a Spotorno THR (b).

Fig. 3a

Fig. 3b

A fracture of the femoral neck with osteolytic destruction of the proximal femur (a). There was an iatrogenic fracture of the femoral shaft during nail insertion (b) with death at three days due to cardiopulmonary failure.

lateral incision a small window is made in the distal femoral cortex and the entire medullary canal is filled from both ends under high pressure with cement. The nail-stem assembly is then inserted from above. When the cement has set, a prosthetic head of appropriate size and neck length is placed on the trunnion and the hip is reduced. The stability of the arthroplasty is confirmed through a full range of motion.

Patients are encouraged to walk with external support and full weight-bearing as soon as their general condition allows. Antibiotic prophylaxis with three doses of 2 g of cephazoline per day is started during the operation and continued for 48 hours. Patients with carcinoma of the breast or lung or multiple myeloma received postoperative chemotherapy, but none had local radiation therapy.

We recorded intraoperative and postoperative complications, the duration of the operation, blood loss, the duration of intensive care, the time in hospital and survival time.

RESULTS

The average operating time was 3 hours 45 minutes (2h 20 to 6h 20). The average blood loss which was replaced was 1860 ml (1000 to 4000). After operation patients required an average of 2.6 days in the intensive-care unit. One patient died on the third postoperative day from cardiopulmonary failure.

Complications. One patient had dislocation of the THR secondary to angulation of the acetabular component. The same patient also had blocking of the patellofemoral joint caused by extrusion of cement through a perforation of the distal femoral cortex during reaming. The acetabular socket was exchanged and the cement removed by arthrotomy. The only intraoperative complication was a fracture through a nearly complete osteolytic lesion in the proximal diaphysis which occurred during insertion of the nail (Fig. 3). There were no wound infections.

The patients were mobilised after the removal of suction drains at three to five days, and all were able to walk with walking-aids by the end of the first postoperative week. All the patients were able to walk with crutches at the time of discharge from hospital at an average time of 25 days (20 to 36). The average survival time for the seven patients who died was 8.9 months. Two patients are still alive after three months and 15 months, respectively.

DISCUSSION

It is generally agreed that pathological fractures of the femur require surgical stabilisation and that impending fractures also merit fixation. The method of fixation must be chosen carefully since bone union will be delayed or never occur, and many of these patients are unable to walk with partial weight-bearing because of their systemic metastatic disease.

Intramedullary devices like the Zickel or Russel-Taylor nails are recommended for subtrochanteric fractures (Mick-

elson and Bonfiglio 1976; Harrington 1982; Yazawa et al 1990; Weikert and Schwartz 1991), and the importance of secure fixation and the use of adjunctive bone cement have been emphasised (Harrington et al 1976; Miller et al 1987). Condylar plates have been combined with an intramedullary plate to reinforce the medial cortex augmented with bone cement (Isler 1990).

Pathological fractures of the proximal femur with additional bone destruction lower in the shaft may be managed by the use of long-stem prostheses or by the resection of all the metastatic lesions and reconstruction by a modular tumour prosthesis (Helwig et al 1992).

We have found that a hybrid osteosynthesis of a standard THR with an intramedullary nail augmented by bone cement has good mechanical strength. It provides internal reinforcement without loss of bone stock and preserves soft tissue, such as muscle attachments. In most patients with pathological fractures, the radical resection of metastases is not necessary because of general disease. It is helpful that standard THRs and intramedullary nails are available in nearly every hospital and are less costly than modular tumour prostheses.

We classified impending fractures by the score described by Mirels (1989). Five of the shaft lesions involved more than 50% of the femoral diameter and four more than 75%; these carried fracture risks of 60% and 80%, respectively (Fidler 1981).

The technical problems encountered in our series were relatively minor, although one case of recurrent dislocation necessitated revision. Yazawa et al (1990) reported two dislocations in 13 similar patients and Helwig et al (1992) six in 34 patients. One iatrogenic fracture was caused at nail insertion (see Fig. 3) but was stabilised by the intramedullary device. Both Behr, Dobozi and Badrinath (1985) and Van der Hulst et al (1994) reported a few perioperative iatrogenic fractures.

The failure rate of stabilisation of pathological fractures of the proximal femur varies from 0% to 23% (Mickelson and Bonfiglio 1976; Habermann et al 1982; Behr et al 1985; Yazawa et al 1990). Van der Hulst et al (1994) reported that five of 31 patients with pathological fractures or impending fractures of the shaft or trochanteric region had a femoral-neck fracture on the same side. We had no refractures after stabilisation. The use of methylmethacrylate cement during intramedullary nailing helps to prevent secondary fracture. A 20% fracture rate after stabilisation of impending fractures has been reported, but normally no additional surgery is needed (Van der Hulst et al 1994).

Conclusions. A combination of THR and cemented intramedullary nailing was successful in a highly-selected group of patients (7.8% of pathological fractures of the proximal femur). This technique is a rewarding alternative to the use of tumour or long-stem prostheses for the treatment of these lesions.

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References

- Beals RK, Lawton GD, Snell WE.** Prophylactic internal fixation of the femur in metastatic breast cancer. *Cancer* 1971;28:1350-4.
- Behr J, Dobozi WR, Badrinath K.** The treatment of pathologic and impending pathologic fractures of the proximal femur in the elderly. *Clin Orthop* 1985;198:173-8.
- Fidler M.** Incidence of fracture through metastases in long bones. *Acta Orthop Scand* 1981;52:623-7.
- Habermann ET, Sachs R, Stern RE, Hirsh DM, Anderson WJ, Jr.** The pathology and treatment of metastatic disease of the femur. *Clin Orthop* 1982;169:70-82.
- Harrington KD.** New trends in the management of lower extremity metastases. *Clin Orthop* 1982;169:53-61.
- Harrington KD, Sim FH, Enis JE, et al.** Methylmethacrylate as an adjunct in internal fixation of pathological fractures: experience with three hundred and seventy-five cases. *J Bone Joint Surg [Am]* 1976;58-A:1047-55.
- Helwig U, Ritschl P, Katz R.** Therapie von Knochenmetastasen der unteren Extremität mit dem modularen Tumorendoprothesensystem KMFTR. *Chirurg* 1992;63:938-43.
- Isler B.** Surgical measures in metastatic lesions of the extremities and pelvic bones. *Unfallchirurg* 1990;93:449-56.
- Mickelson MR, Bonfiglio M.** Pathological fractures in the proximal part of the femur treated by Zickel nail fixation. *J Bone Joint Surg [Am]* 1976;58-A:1067-70.
- Miller GJ, Vander Griend RA, Blake WP, Springfield DS.** Performance evaluation of a cement-augmented intramedullary fixation system for pathological lesions of the femoral shaft. *Clin Orthop* 1987;221:246-54.
- Mirels H.** Metastatic disease in long bones: a proposed scoring system for diagnosing impending pathologic fractures. *Clin Orthop* 1989;249:256-64.
- Van der Hulst RR, van den Wildenberg FA, Vroemen JP, Greve JW.** Intramedullary nailing of (impending) pathologic fractures. *J Trauma* 1994;36:211-5.
- Weikert DR, Schwartz HS.** Intramedullary nailing for impending pathological subtrochanteric fractures. *J Bone Joint Surg [Br]* 1991;73-B:668-70.
- Yazawa Y, Frassica FJ, Chao EY, et al.** Metastatic bone disease: a study of the surgical treatment of 166 pathologic humeral and femoral fractures. *Clin Orthop* 1990;251:213-9.