

RESECTION ARTHROPLASTY OF THE PROXIMAL TIBIA

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Custom made total arthroplasty of the knee with resection of the upper third of the tibia was performed in two cases. The follow-up results showed good function 1 year later. The procedure is recommended in benign as well as selected malignant tumors of the proximal tibia.

Key words: arthroplasty; bone tumors

Accepted 25.vii.82

Resection arthroplasty has to a limited extent been used in the treatment of benign tumors of bone (Sim et al. 1979, Johnston 1980).

Little has been published about replacement of the upper tibia and the application of resection arthroplasties is still in the experimental stage. (Sim et al. 1979).

The purpose of this paper is to present a preliminary report on the technique and results following upper tibial replacement.

OPERATIVE TECHNIQUE

A custom made total knee prosthesis of constrained type with a polyethylene spacer for replacement of the bone was manufactured (Sct. Georg, Link, Hamburg), based on the roentgenograms indicating the level of resection. Delivery took approximately 4 weeks.

The operation was performed under tourniquet control with administration of prophylactic antibiotics (methicillin and dicloxacillin). The patellar tendon and pes anserinus were transected at the tibial insertion. The proximal tibia was dissected extraperiosteally. The menisci and cruciates were removed at the femoral level with the proximal tibia, whereas the fibrous knee capsule was preserved as a soft tissue sleeve.

After preparation of the femoral condyles and shaft the femoral component was fixed in place with methyl-

methacrylate bone cement. The tibial shaft was reamed, the tibial component checked for fit and the location of the patellar tendon and pes anserinus insertions marked at the polyethylene spacer. Three anchorage holes for the patellar tendon and two for the pes anserinus were drilled and a twisted polyester suture of considerable strength introduced (Certilen no. X, Rohland, Neustadt a.D.). The polyethylene spacer was then cemented to the stem of the tibial component, and then cemented to the tibial shaft. The tendons were reinserted in the polyethylene spacer with Bunnell sutures and the soft tissue sleeve sutured.

Postoperatively the patient was kept in bed and given knee flexion exercises for 1 week, followed by full weight bearing mobilization with a posterior splint and two crutches for 6 weeks. A contralateral crutch was, however, recommended for permanent use.

CASE HISTORIES

Case 1

Female cleaner, aged 38 years. Admitted March 1979 with a cystic tumor in the lateral tibial condyle. Biopsy showed giant cell tumor, probably aneurysmatic bone cyst or osteoclastoma. Excochleation and bone grafting were performed. One year later the bone cyst had recurred and involved both tibial condyles, measuring 5 × 5 × 5 cm. Another excochleation and bone grafting was performed.



Figure 1. Radiogram of recurrent aneurysmatic bone cyst in proximal tibia.



Figure 2. Macroscopic appearance of aneurysmatic bone cyst after resection of tibia.



Figure 3. Radiogram after resection arthroplasty of the knee.

In December 1980 the tumor had recurred (Figures 1 and 2). A resection arthroplasty was performed (Figure 3). (Microscopy showed an aneurysmatic bone cyst without any signs of malignancy).

At follow-up 1 year later the patient complained of slight pain on long distance walking and the knee motion was 0/35 degrees. No radiological signs of loosening of the prosthesis were observed.

Case 2

Female cleaner, aged 66 years. Previous history of follicular thyroid carcinoma in 1977, treated by radioactive iodine. The past 2 years in good health with normal walking capacity, although known metastasis in right shoulder, 8th rib and upper part of left tibia. Admitted with a spontaneous, pathological fracture through the left tibial condyles (Figure 4). Bone scintigrams and roentgenograms showed the tumor to be limited to the proximal tibia. During the manufacturing period the patient suffered from severe hypercalcemic symptoms, but a resection arthroplasty was performed in spite of a poor general condition. Microscopy confirmed a metastatic follicular thyroid carcinoma with invasion in the surrounding soft tissue, but no tumor tissue at the resection level of the bone.

The postoperative course was uneventful and the patient regained her health rapidly. After 12 weeks she was able to walk upstairs for 3 floors and returned to her work after 20 weeks.



Figure 4. Pathological fracture in tibial condyles due to metastasis from thyroid carcinoma.



Figure 5. Suspected metastasis in medial femoral condyle 9 months after resection arthroplasty.

At the 9-month follow-up the knee motion was 0/90 degrees and no pain was encountered. Roentgenograms and bone scintigrams, however, showed relapse of metastasis in the medial femoral condyle (Figure 5) and in the distal part of the ipsilateral tibia, as well as in other parts of the skeleton.

DISCUSSION

Benign bone tumors can usually be treated by local surgery. In case of aggressive or recurrent growth more extensive surgery can be demanded. (Enneking & Shirley 1977). In metastatic bone lesions with pathological fracture a similar situation is faced.

One possible method might be excochleation of the tumor, replacement with bone cement and application of internal fixation (Persson & Wouters 1976). In subchondral osteolytic tumors in the weight bearing proximal tibia this is unlikely to be successful and in benign cases the durability of such procedures is uncertain. In a number of cases the only previously applicable method has thus been amputation, either through-knee or above-knee.

It has been pointed out (Sim et al. 1979) that resection arthroplasty is still experimental. With the purpose of restoring function, however, major resection arthroplasty of the proximal tibia is well indicated in benign cases as an alternative to amputation.

In malignant, metastatic bone tumors with fracture and possibly more generalized metastasis it is also justified, if the anticipated life span is more than a few months, in order to mobilize the patient. Even economic considerations are in favour of this alternative. In the second case presented in this report there were signs of recurrence in the distal tibia and suspected recurrence in the femoral condyle, but these did not influence function. The alternative would have been amputation, which would have been unacceptable for the patient, who regained function of the leg and returned to work after the arthroplasty.

The 1-year follow-up showed acceptable results and no signs of loosening, but the long term prognosis is uncertain.

Technical problems with reinsertion of the tendons around the knee were not encountered in our cases, but full weight bearing without support is not recommended for the first postoperative month.

In conclusion, resection arthroplasty of the proximal tibia can be recommended as an alternative to amputation in recurring or aggressive benign tumors and in extensive metastatic tumors with pathological fracture. The method might also be considered in some primary malignant bone tumors as an alternative to amputation, but the long term results of such procedures are not yet available.

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