Current Problem Case

Reaction to Methylmethacrylate in Bone Metastases Treated by Surgical Curetting and Filling with Acrylic Cement

Histological Study of a Case

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Summary. A femur bone metastasis from breast carcinoma was treated by curetting and filling with acrylic cement and osteosynthesis.

The histological study of the resected proximal third of the femur five months after surgery shows a thin layer of connective tissue between bone and cement.

There are no neoplastic cells in this connective tissue nor in the spongious bone of the proximal femur.

Instead the diaphyseal channel is fully invaded with neoplastic cells.

Pathogenesis and validity of surgical treatment by the emptying and filling with acrylic cement of bone metastases are discussed.

Introduction

Bone metastases may be surgically treated by curetting and filling with acrylic cement and performing an internal fixation with devices commonly used in traumatology (Burrows 1974; Fares et al. 1975; Harrington et al. 1972; Higinbotham and Marcove 1965; Monticelli and Santori 1975; Scheuba 1966).

The local treatment of the metastases does not increase survival time, but is justified by the improved quality of life of these patients.

The restored continuity of bone makes it possible to get an early and good functional recovery.

The internal fixation and the filling of the bone defect with cement are not followed by local recurrence if the surgical curetting has been complete. Moreover, acrylic cement contributes to the sterilization of the neoplastic focus, as the polymerizing reaction is exothermic; on the bone-cement surface there appears a temperature varying from 70 to 90°C, according to the type of cement used (Charnley 1970; Feith 1975).

This produces an osteonecrosis about five millimeters deep, as has been observed in hip prostheses fixed with acrylic cement (Charnley 1970).

With time the necrotic bone is absorbed and new bone laid down, while on the bone-cement surface a thin layer of connective tissue is formed.
Fig. 1a-d. C.A., 80 years old. Right femur metastasis from breast carcinoma. a Before surgery: there is an engaged pertrochanteric fracture. b The osteolysis was curetted and filled with acrylic cement, while an osteosynthesis with AO 130° plate was performed. c Five months after surgery plate breakage was observed. d The proximal third of the femur was resected and replacement with total hip prosthesis was performed.

This tissue at first is rich in vessels, then it grows into a scarring connective tissue (Charnley 1970; Willert et al. 1974).

A bone metastasis from breast carcinoma has enabled us to perform a morphological study on the reaction of bone to the acrylic cement used to fill the osteolysis.

Case Report

C.A., an 80-year-old woman was admitted in our hospital for a pathological pertrochanteric fracture of the right femur from a breast carcinoma metastasis (Fig. 1a).

The primary neoplasm was not previously diagnosed and pathological fracture was the first symptom of the disease.

After verifying the absence of other metastases in the bones and other organs, an internal fixation was performed with an AO 130° plate, while the osteolysis was curetted and filled with acrylic cement (Fig. 1b).

Afterwards a right mastectomy was performed and an antineoplastic therapy started.

Functional recovery was good and two months after the first operation the patient was able to walk with a cane.

Five months after internal fixation, during a mountain excursion, she had sudden pain in the right hip which made it difficult for her to walk.

Roentgenograms revealed breakage of the plate (Fig. 1c).

As general condition was good and no other metastatic foci were evident, the proximal third of the right femur was resected and replaced with a total hip prosthesis (Fig. 1d).

Materials and Methods

From the resected proximal third of the right femur the following specimens were taken, as indicated in the drawing (Fig. 2):

1) Spongious bone in contact with cement
2) Cortical bone in contact with cement
3) Periosteum and muscle in contact with cement
4) Spongious bone of the femoral neck and head
5) Tissue contained in the diaphyseal channel.

The specimens, fixed in neutral formalin 10%, were decalcified in nitric acid 5% and embedded in paraffin.

Seven micron thick slices were stained with haematoxylin-eosin and photographed with a Leitz Orthoplan microscope.

Observations

1) Between spongious bone and cement we found a layer of connective tissue from 2 to 4 mm thick, with many fibroblasts and vessels. In the matrix collagen fibers formed bundles, but it was not possible to detect a prevailing direction. Bone trabeculae in contact with this connective tissue had the normal aspect of bone remodelling, with