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LETTER TO THE EDITOR

Gunther O. Hofmann
Martin H. Kirschner
Volker Bühren
Walter Land

Allogenic vascularized transplantation of a human femoral diaphysis under cyclosporin A immunosuppression

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Sir: Large osseous grafts stored frozen in bone banks are employed in reconstructive surgery of skeletal defects [4]. Usually, no vascular anastomoses from the recipient to the graft are performed. Histocompatibility between donor and recipient is ignored and no immunosuppression is administered. This results in a high complication rate and provides no permanent solution for the patient [3]. In 1990, a French group first reported grafting a human femoral diaphysis with arterial and venous anastomoses [2]. The patient received no immunosuppression and, therefore, no intraosseous vascularization of the graft could be evaluated. Aebi et al. [1] experimentally proved in dogs that large allogenic grafted bone with vascular anastomoses need immunosuppressive therapy with cyclosporin A for graft survival and osseous integration.

We now present what is, to the best of our knowledge, the first report of an allogenic bone grafting procedure that is completely comparable to allogenic organ transplantation in humans. We would like to emphasize that the human bone graft was fresh, not preserved, and was perfused with preservation solution. Vascular anastomoses were performed during the transplantation, and the recipient was treated with immunosuppressive drugs.

On 1 November 1994 we performed in allogenic vascularized transplantation of the distal half of a femoral diaphysis under cy-

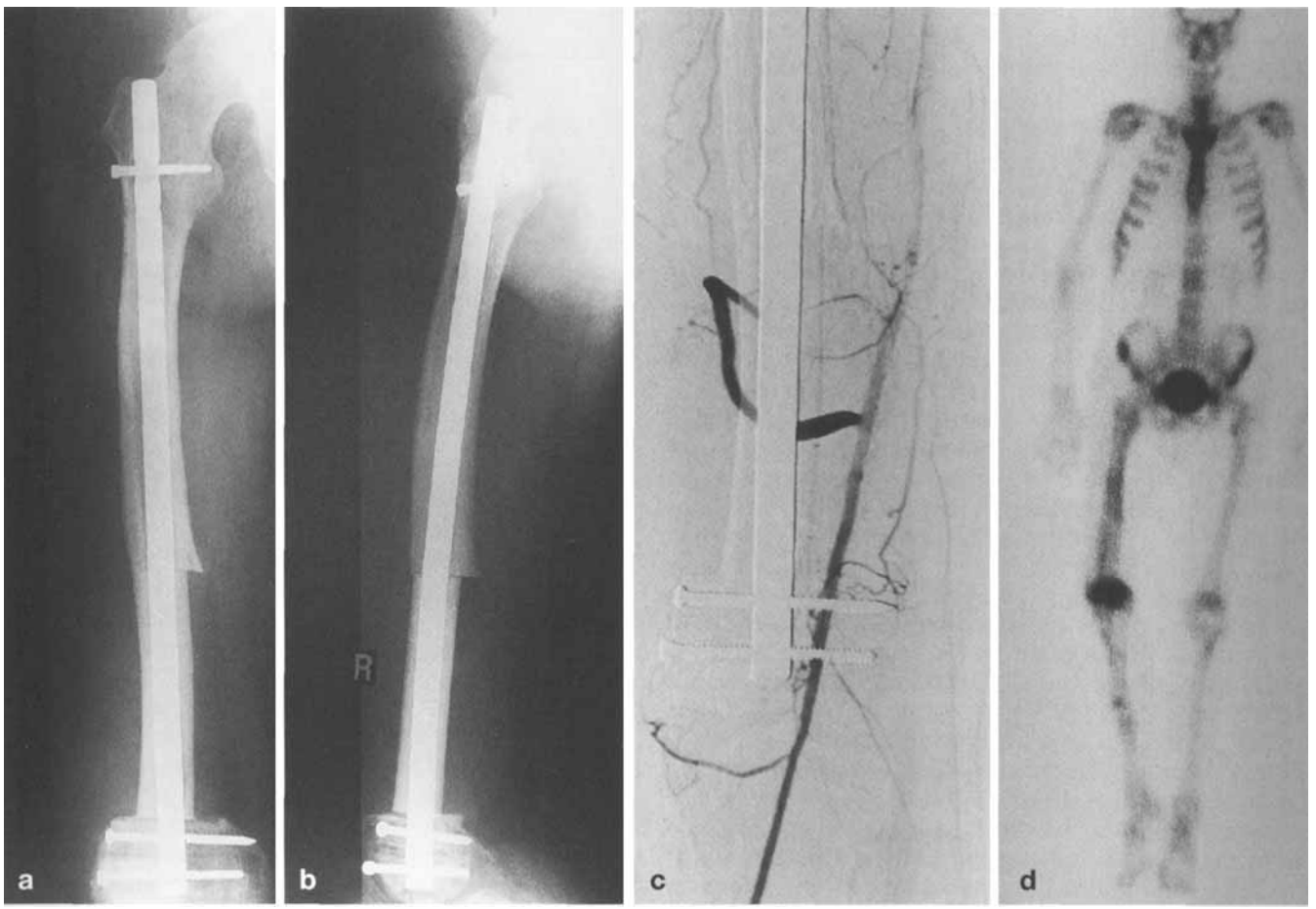

Fig. 1 **a** Postoperative monitoring of the internal compression nail osteosynthesis in sagital view; and **b** lateral view. **c** Angiography of right femoral artery 6 weeks after transplantation; **d** Skeletal scintigraphy demonstrating increased bone metabolism in the graft 6 weeks after transplantation

closporin A immunosuppression in a 54-year-old man. The recipient had suffered a multiple trauma injury in 1986. One of his injuries was a severe fracture of the right femoral shaft. During the following 8 years he had to tolerate 32 surgical interventions on his right leg caused by infections. The final result was an osseous defect measuring half the length of the femur.

For a number of reasons it was impossible to perform a callus distraction procedure. Therefore, we grafted a fresh, perfused human femur from a multiorgan donor (MOD). This was performed with blood group compatibility (O to A) after a negative crossmatch, respecting the HLA match as much as possible. The right leg of a 15-year-old female MOD was perfused with 3 l University of Wisconsin (UW) solution. Osteosynthesis was performed using an intramedullary nail (Fig. 1 a, b). This fixation seems to be more reliable than plate fixation using large allografts [5]. The graft vessels were anastomosed end-to-side to the superficial femoral artery and to the femoral vein of the recipient. Cold ischemia time of the graft was 16 h. Immunosuppression was started immediately after reperfusion with cyclosporin A (1.5 mg/kg body weight) using the central venous line and later continued by oral application (6 mg/kg body weight).

Angiography of the right femoral artery showed good perfusion of the graft 6 weeks after transplantation (Fig. 1 c). Skeletal scintigraphy using ^{99}m-Tc-DPDdemonstrated an increased bone metabolism in the graft compared to the contralateral side (Fig. 1 d). Up until now, only one suspected acute rejection, accompanied by fever and pain, occurred after 3 weeks. Using methylprednisolone (250 mg for 3 days), this crisis could be managed.

Vascularized allogenic grafting of long bone segments may be a further therapeutic approach in patients with large osseous defects following trauma or resection of benign bone tumors. Malignant bone tumors remain a contraindication for this procedure because of the obligatory immunosuppression following transplantation.

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G. O. Hofmann (✉)[1] · Walter Land
Transplantation Unit,
Department of Surgery,
University of Munich,
Marchioninistr. 15
D-81377 Munich, Germany

M. H. Kirschner
BG-Unfallklinik Murnau,
Prof.-Küntscher-Strasse 8,
D-82418 Murnau/Staffelsee, Germany

V. Bühren
BG-Unfallklinik Murnau,
Prof.-Küntscher-Strasse 8,
D-82418 Murnau/Staffelsee, Germany

Present address:
[1] BG-Unfallklinik Murnau,
Prof.-Küntscher-Strasse 8,
D-82418 Murnau/Staffelsee, Germany
Fax: + 49 8841 482 203