

## **Customized reconstruction of proximal femur after pertrochanteric femur resections**

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**Background:** There are few dependable methods to reconstruct the proximal femur after pertrochanteric resection for sarcoma, and total femur replacement is often the default option. Creative methods are needed to preserve the hip joint and adjacent muscles. Particularly in young patients, every effort should be made to retain the hip joint and prevent the need for multiple subsequent reconstructions. Preservation of the gluteus medius, gluteus maximus, and psoas attachments creates a more functional lower extremity and may reduce the need for walking aids that are typically required by patients with total femur replacements. The purpose of this report is to present an alternative method to save the proximal femur after major sarcoma resections.

**Methods:** This retrospective report culls 9 cases from 32 years' personal experience with customized proximal femoral implants designed for use with alternative fixation methods that relied on uncemented very short stems with fixation extending anywhere from the lower border of the lesser trochanter to 3 shaft diameters below the lesser trochanter. The fixation was supplemented with interlocking reconstruction screws into the femoral head with or without lateral side-plates. Implants were porous coated titanium with hydroxyl apatite coating. Interlocking screws were oriented based on femoral anteversion analysis determined by preoperative CT scans of the femur.

There were 8 males and 1 female, with ages ranging from 18 to 35 years. All tumors and reconstructions were of the femora. Diagnoses were osteogenic sarcoma (n=5), chondrosarcoma (n=1), Ewing sarcoma (n=2), and malignant giant cell tumor (n=1). Six patients had prior deep periprosthetic infections. Outcomes were assessed for adjacent joint preservation, prosthetic retention, and prosthetic survivorship.

**Results:** All adjacent joints were preserved, the intercalary reconstructions succeeded and all implants achieved osteointegration. After a mean of 9 years of follow up, three of nine patients needed other operations for prosthetic implant fracture (n=2) or loosening of the knee prosthesis (n=1). Revision surgeries were all successful, easily replacing the segmental implant failures. All adjacent joints were retained, achieving the surgical goals. No total femur replacements were needed.

**Conclusions:** Customized proximal femoral implants with porous ingrowth, hydroxyl apatite-coated stems and interlocking reconstruction screws into the femoral head and neck, with or without a lateral side plate, were uniformly successful, preserved the adjacent hip joint, and avoided the need for a total femur replacement. This method was ultimately successful even when the bony resection extended to the mid portion of the lesser trochanter. When the imaging studies establish that tumor resection and limb preservation is possible, preservation of the hip can be achieved. However, zealous efforts to retain the femur should be avoided to prevent local recurrence of cancer.