

Proximal femur reconstruction in the first decade of life: the challenge of hip reconstruction in a growing patient

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a. Background: Proximal femur (PF) is a very rare location for bone sarcoma in first decade of life. Reconstruction is difficult, mainly for the small size of the acetabulum.

On 238 children of this age group, affected by HG Bone sarcomas and surgically treated at author's Institution in the last twenty years, only 20 cases (8,4%) involved the PF. The authors reviewed the results of these cases where a functional reconstruction of the hip joint was pursued by different implants.

b. Patients and Methods: From 1994 to 2013, 20 children (13 females and 7 males, age range 1-10, median 8) with a localised bone sarcoma (7 Osteosarcoma, 13 Ewing's Family Tumors) were surgically treated by intrarticular resection of the PF and by a limb-salvage procedure with reconstruction of the hip.

Two patients received a modular total femur (TF) megaprosthesis (1 mechanically expandable) with hinged knee and uncemented smooth tibial stem.

In 13 cases (since 1994) PF was reconstructed by an allograft/prosthesis composite (APC) with a small stem cemented into the massive bone allograft (MBA), then fixed to the residual femur by a plate.

According to the acetabular size, the femoral head was reconstructed by fixed heads in 3 children between 1 and 4 years of age (22mm in one case and 32 mm ceramic in two) and by bipolar cups (36-44mm) in 12 cases (age 6-10).

In five small children (4 or 5 y/o) an original reconstructive technique was applied: the ipsilateral proximal fibula was autotransplanted with its vascular supply to the hip, with the fibular head inside the acetabulum, and with the diaphysis inserted inside a MBA, fixed to the distal femur by a plate.

Functional results were evaluated through MSTS functional score in all the patients available at last follow-up (F-up).

d. Results: At a mean F-up of 94 months (18-220) 13 patients are alive (65%) six after the skeletal maturity. In the 5 patients with biological reconstructions, only one girl maintained the original surgery and at 17 year follow-up displays a fascinating remodelling of the autotransplant with a normal gait. All the other four children are alive but showed mechanical (3 cases) or early septic failure (1 case) of the implant and were revised by an APC. All primary APC patients recovered walking autonomy in the first postoperative year.

One out of the 12 primary bipolar heads and two out of the 4 secondary ones were revised with uncemented acetabular cups at an interval from 5 to 17 years after the primary surgery.

In the 13 survivors the functional results at last F-up were scored as Excellent in 4, Good, in 5, Fair in 4.

e. Conclusions: Hip reconstruction in children is a challenge. In youngest children, APC with a small prosthetic stem cemented into a MBA reconstruct the bone stock and allow a early adequate function. Bipolar cups represent an effective and durable method that preserves the acetabulum during the skeletal growth but also fixed prosthetic heads may be useful in smallest patients.