

# Treating aneurysmal bone cysts with high mechanical performances bio-hybrid bone grafts without osteosynthesis devices – case report

Raimondo Piana <sup>1</sup>, Michele Boffano <sup>1</sup>, Pietro Pellegrino <sup>1</sup>, Laura Rossi <sup>2</sup>, Giuseppe Perale <sup>3,§</sup>

<sup>1</sup> Orthopaedic Oncology Division, CTO Hospital, A.O.U. Città della Salute e della Scienza di Torino, Torino, Italy;

<sup>2</sup> Fond. per la Ricerca sui Tumori dell'Apparato Muscoloscheletrico e Rari Onlus, Torino, Italy;

<sup>3</sup> Industrie Biomediche Insubri SA, Mezzovico-Vira, Switzerland.

§ corresponding author: giuseppe@ibi-sa.com

**INTRODUCTION** - Aneurysmal bone cysts (ABCs), a misnomer pathology, are osteolytic bone neoplasms characterized by several sponge-like spaces. ABCs commonly affect vertebral metaphyses, flat bones or long bones; frequently recorded in 10-30 yrs population, they are commonest pelvis benign tumor in pediatric population. Curettage, marginal resection and cell killing methods at cyst margins are most commonly used surgical approaches, but often cyst dimensions require bone filling and use of fixation devices to ensure load bearing capabilities of lesioned bone (1). Within a clinical study, we developed a fixation devices free surgical methodology to treat ABC, ensuring both immediate loading and robust bone regeneration.

**METHODS** - A skeletally mature female was diagnosed a *de novo* ABC in posterior acetabular and iliac right region, that had impaired almost all segment thickness and partially compromised coxofemoral joint (fig. 1). Surgical approach saw first deep lesion curettage and accurate cleaning of cavity, which then was filled with SmartBone<sup>®</sup> (SB) blocks (Industrie Biomediche Insubri SA, Switzerland). SB is a biohybrid bone graft, being a medical device composed of a bovine-derived mineral porous matrix, reinforced with resorbable polymers and functionalized with RGD-containing collagen fragments (2). Accurate and compact positioning of duly shaped SB blocks within void volume, along major stress directions, together with SB high mechanical properties, allowed avoiding use of osteosynthesis devices, even in presence of thin residual bone walls (fig.1).

**RESULTS** - Surgical follow-up proceeded well and neither complications nor pain nor site morbidity were recorded. Patient was able to immediately start bearing load on right leg. Clinical recovery allowed progressive load bearing till reaching of complete functional restore in short time. SB grafts osteointegration and bone remodelling process were well evidenced by CT

imaging (Fig. 2) after 1 year follow-up: high bone density and good mineralization were well visible and comparable to contralateral district.



Fig. 1: pre-op situation with ABC in posterior acetabular and iliac right region.



Fig. 2: 1 year follow-up, evidencing good SB integration and ongoing bone remodelling.

**DISCUSSION & CONCLUSIONS** – According to authors best knowledge, this new approach to iliac crest post-ABC reconstruction was made possible thanks to careful curettage and precise positioning of SB within cavity along major stress directions, together with SB performances. The closed environment of the clean cavity acted as a “living bioreactor”, hence enhancing SB integration and remodelling, well favoured by immediate load bearing. This meant faster overall recovery and better patient well-being, also for the avoidance of an osteosynthesis removal surgery.

**REFERENCES:** <sup>1</sup> H.J. Mankin *et al.* (2005) *J. Clin. Oncol.* **23** (27): 6756–62. <sup>2</sup> G. Pertici *et al.* (2015) *J. Biol. Reg. & Hom. Ag.* **29** (3): 136-148.