



## **Abstract: Lengthening of the Free Fibular Graft after Sarcoma Resection of the Humerus: Case Report**

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### *What was the question?*

Is lengthening of the free fibular graft after sarcoma resection possible? Free fibular graft is a well-established salvage procedure for segmental bone defect with good functional outcomes after tumor resection in children. However, when the growth plate is resected, the graft does not provide longitudinal growth. This results in progressive limb length discrepancy, which has functional and cosmetic ramifications. To our knowledge, there are no reports in the literature regarding lengthening of the free fibular graft after sarcoma resection with a monolateral fixator. We report our experience with such a case.

**Methods:** A 13-year-old patient presented to us with 9-cm discrepancy in the length of the humerus. He was diagnosed with osteogenic sarcoma of the right proximal humerus at the age of four years. He underwent resection of the tumor followed by reconstruction with fusion between free fibular graft and scapula. He became left-handed after this surgery. On our exam his shoulder motion through the scapulothoracic joint was limited to 30 degrees of flexion, 20 of abduction. Elbow and wrist range of motion and neurovascular status was normal. Osteotomy of the humerus through the matured fibular graft area for gradual lengthening was planned. Osteotomy was done through \_\_ inch incision and monolateral pediatric external fixator (EBI, Parsippany, NJ) was applied. Distraction started on the 10th day at \_\_ mm three times per day for ten days; after that it was changed to \_\_ mm two times a day. EBI bone stimulator was applied 3 weeks after surgery. Lengthening of 70 mm was planned.

### *What are the results?*

Pin sites remained clean and dry. Patient reported no pain. He was not taking any pain medications or antibiotics during treatment. Wrist and elbow range of motion remained within normal limits as well as neurovascular status. After achieving the planned 70 mm of distraction, the patient still had length discrepancy and had maintained full elbow motion and had normal neurological function. The bone formation was good and the patient wanted more length. We continued slow distraction of \_\_ mm per day. He achieved 90mm distraction within 6 months followed by 6 months of fixation during consolidation. However, delayed regenerate formation was noticed during last 2 months of distraction despite the slow rate. This led to thin area at the center of the regenerate of only 0.5cm in

width, which healed well but failed to get thicker despite applied compression forces in the frame and weight bearing exercises. Risk of refracture was thought to be high and the patient was offered prophylactic plating with bone grafting at the time of removal. However, the patient opted for removal only. Frame was removed and a coaptation plaster splint was applied in the operating room. At the first postoperative visit, x-rays showed a low energy oblique fracture through the central part of the regenerate - the narrowest region. A Sarmiento brace was applied and one week later there was angular deformity and minimal shortening. The patient underwent open reduction internal fixation through anterolateral approach with Synthes (Paoli, PA) 12 hole locked small fragment plate with four screws placed in proximal fragment, three in the distal fragment and 5cc of Grafton crunch bone graft substitute. Alignment was corrected however he lost 7mm of length. Also, he developed an incomplete median neuropraxy secondary to compression from the postoperative coaptation splint. At three months follow up after last surgery, the neuropraxia resolved and x-rays showed completely healed fracture and widening of the previously narrow regenerate. He had no infection and has full elbow and wrist motion.

*What are your conclusions?*

Lengthening of the free fibular graft with distraction osteogenesis after sarcoma resection is possible. However, the rate of distraction should be  $\leq$  mm a day or less in order to sustain good regenerate formation and/or limit amount of lengthening to 60-70 mm per treatment. Despite regenerate fracture, a good cosmetic and functional result was achieved.

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