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Treatment outcomes of biological and non-biological reconstruction methods in patients with osteosarcoma around the knee joint

Introduction:

Osteosarcoma (OS) of the knee can be treated with various biological (B) and non-biological (NB) reconstruction methods following wide resection. Joint preservation is a major goal in musculoskeletal tumor surgery. Both reconstruction strategies have inherent benefits and disadvantages. Pediatric and adolescent patients comprise the majority of this patient cohort and this group deserves special emphasis due to growth-related problems. The purpose of this study is to compare advantages and disadvantages in terms of complication rates and oncological and functional outcomes of biological and endoprosthetic reconstruction in pediatric patients with osteosarcoma of the knee.

Patients and Method:

We retrospectively reviewed 81 (M/F : 46/35) patients who were treated for osteosarcoma of the knee between 1990-2014 and who were younger than 17 years of age at the time of operation. Biological reconstruction was applied in 30 patients whereas non-biological reconstruction was applied in 51. Tumor was located in the distal femur in 49 patients, proximal tibia in 31 and proximal fibula in 1. In the NB group, 1 male patient with OS of proximal fibula and 1 female patient with OS of proximal tibia were excluded from the study due to insufficient follow-up.

The patients in group B were followed up for a mean duration of 62,6 months. The resection level was through the metaphysis in 11 patients, the physeal plate in 11, the epiphysis in 6 and intra-articular in 2 patients. The mean length of resected segment was 16,0 cm. A total of 30 free vascular fibula grafts (FVFG) with a mean length of 20,7 cm were harvested from 28 patients. FVFG and shell combination was used in 19 patients, cryopreservation technique in 18, fibula transposition in 2, autoclaving in 1 and massive allograft in 1 patient.

The patients in group NB were followed up for a mean duration of 52,6 months. The mean length of reconstructed distal femur segment was 16,3 cm and the mean length of proximal tibia segment was 16,5

cm. All non-biological reconstruction was done with tumor prostheses.

Results:

The mean leg length discrepancy (LLD) was 4,2 cm and the mean MSTs score was 23 (76,7%) in group B. The oncological status of the patients in group B at the time of last follow-up were no evidence of disease (NED) in 17, continuously disease free (CDF) in 7, dead of disease (DOD) in 3, alive with disease (AWD) in 2 and metastatic (MET) in 1. Local recurrence (LR) was observed in 4 (13,3%) patients treated with biological methods. Fourteen (46,7%) patients in group B underwent an average of 2,0 additional major surgical interventions for the treatment of complications.

The mean leg length discrepancy (LLD) was 1,7 cm and the mean MSTs score was 18 (60,0%) in group NB. The oncological status of the patients in group B at the time of last follow-up were DOD in 21, NED in 15, CDF in 8 and MET in 5. Local recurrence (LR) was observed in 9 (18,4%) patients treated with non-biological methods. Twenty (40,1%) patients in group NB underwent an average of 1,7 additional major surgical interventions for the treatment of complications.

Conclusion:

Although non-biological reconstruction usually provides good treatment outcomes in the short to medium-term, endoprosthesis revision surgery is an inevitable problem for survivors of the osteosarcoma. On the other hand, biological reconstruction, which usually requires very demanding surgery, patient cooperation and patience, provides durable solutions in the long-term, facilitates more effective treatment of complications and allows revision to endoprosthesis when all else fails. The better functional and oncological and outcomes in group B might indicate a selective bias towards biological methods for patients with more favorable prognostic criteria. Successful treatment with each reconstruction method is possible depending on careful patient selection. Endoprosthetic reconstruction provides a more standardized solution while biological reconstruction necessitates an experienced and skilled surgical team. It must be kept in mind that time works for biological but against non-biological methods.