

Osteosarcoma of the humerus: surgical treatment and functional outcome

Christoph Böhler, Stephan Brönimann, Stephan Puchner, Reinhard Windhager, Philipp T Funovics

Medical University of Vienna Department of Orthopaedics

Währinger Gürtel 18-20, 1090 Vienna, Austria

Background: Besides the femur and the tibia, the humerus is the third most common localization of osteosarcoma (OSA). Treatment comprises neo-adjuvant and adjuvant chemotherapy as well as wide surgical resection. In general surgical techniques allow limb salvage, but shoulder function and stability is often compromised due to muscle resection. It is still discussed controversially if sacrificing the whole deltoid muscle (DM) is necessary to achieve adequate resection margins.

Purposes: The aims of this study were (I) to investigate the oncological outcome of patients with osteosarcoma of the humerus, (II) to compare the functional outcome and local recurrence rate after either resection of DM, or resection of the rotator cuff (RC) and the DM or preservation of both, and (III) to evaluate complication rates of humeral implants by using the International Society of Limb Salvage (ISOLS) classification.

Patients and Methods: This single-center study retrospectively analyzed data of 65 patients with OSA of the humerus, who have been treated between 1980 and 2014. Besides surgical resection, all patients received standardized chemotherapy. Resection and endoprosthetic reconstruction was performed in 49 (74.5%) patients, 10 (15.4%) patients underwent resection-replantation, four (6.2%) underwent resection and biological reconstruction and one patient was primary amputated. The mean follow up was 57 months (range, 1 to 319 months). We used the Musculoskeletal Tumor Society (MSTS) score to evaluate the functional outcome. Revision-free survival (RFS) was estimated for the prosthesis group as well as for patients without endoprosthetic reconstruction by using a Fine-Gray model for competing risk analyses for univariate and multivariable regression.

Results: One- and five-year survival rates were 92% and 60%, retrospectively. Eighteen (28%) patients developed metastases and two (3%) suffered local recurrence. The MSTS score was significantly higher in patients where RC and DM could be preserved than in patients where DM was resected or where both muscle groups were resected (see Figure 1; $p=0.021$). We found no differences between these groups in the occurrence of local recurrence or in the achievement of wide surgical margins. At five years RFS was 73% in the prosthesis group and 58% in the non-prosthesis group.

Conclusions: The multimodal treatment of osteosarcoma shows satisfactory oncological results. According to our data preservation of DM and RC can be performed in selected cases with better functional outcome and equal risk of local recurrence. However, wide surgical margins are the primary goal in oncological surgery.

Level of evidence: Level III: retrospective comparative study.

Figure 1: Differences of achieved MSTS scores in different resection groups.



