

Custom made 3D implants for glenoid tumor reconstruction should be designed as reverse total shoulder arthroplasty

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Abstract

Intro:

Bone tumors isolated to the glenoid portion of the scapula are exceedingly rare occurrences. We initially sought to reconstruct those bone resection using 3D printed shoulder glenoid hemiarthroplasties. Upon our initial functional results, we changed our design towards a total reverse shoulder arthroplasty using a custom made 3D printed glenoid component.

Materials and methods:

Four patients were treated for isolated glenoid tumors between 2018 and 2022. Patients 1 and 2 underwent a custom-made glenoid hemiarthroplasty and patients 3 and 4 underwent a custom-made reverse shoulder arthroplasty. Surgical technique involved a double approach anterior and posterior, and the use of cutting jigs positioned on the posterior aspect of the scapula. The position of the jig inherently damages the suprascapular neurovascular bundle. The design of the hemiarthroplasty glenoid component was solely reproducing the bony aspect of the articular surface, and not the total surface comprising the labrum and the bone. Standard immediate follow-up procedures, including antibiotic prophylaxis, physiotherapy, and length of hospital stay, were consistent across all patients. Immediate mobilization was initiated to facilitate the recovery of ranges of motion (ROM), with a restriction on rotational movements for the initial 4 weeks. We assessed the post-operative evolution through radiological imaging, ROM examination and Visual Analog Scale (VAS).

Results:

Following a significant decline in joint amplitudes, increased pain, and joint destruction on imagery, patients 1 and 2 required revision surgery for humeral resurfacing. When comparing joint mobilities, statistically significant difference was identified between the two groups only for the internal rotation (p-value = 0.015). Abduction, external rotation and antepulsion showed no statistically significant difference (p-values = 0.806, 0.237 and 0.656 respectively).

Upon comparing the VAS scores between the two groups, an average score of 5.1 ± 3.1 was observed for glenoid hemiarthroplasties, whereas total shoulder arthroplasties exhibited an average score of 1.5 ± 1.5 .

Discussion:

The articular contact surface discrepancy between a normal glenoid with the labrum and our custom glenoid hemiarthroplasty component explains why glenoid hemiarthroplasties demonstrated a rapid joint destruction. Furthermore, the damage to the suprascapular neurovascular bundle has inevitably an impact on the supra- and infra-spinatus muscle function although not demonstrated by our ROM analysis.

Therefore, in cases of bone tumors where the rest of the scapula may be savaged, custom made 3D printed implants are a valuable option. However, we recommend using a total reverse shoulder arthroplasty construct from the onset to address the aforementioned challenges more effectively.