

Standardized Operative Fixation Technique Improves Clinical Function of the Shoulder for Scapular Spine Fractures after Reverse Shoulder Arthroplasty

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INTRODUCTION:

Scapular spine fractures (SSF) are a challenging complication after reverse shoulder arthroplasty (RSA) leading to persisting pain, loss of function, or instability. So far there is no established surgical procedure for a successful treatment. The aim of this study was therefore to examine the clinical and radiological outcomes after double plate fixation with augmentation using an autologous iliac crest bone graft of patients with SSF after RSA.

METHODS:

Monocentric consecutive cohort study of surgically treated SSF after RSA presenting between 2016 and 2021. Retrospective analysis of all SSF treated with a self-devised fixation technique using a double plate fixation augmented with an autologous iliac crest bone graft. Preoperative CT-scans and X-ray images were analyzed regarding the fracture localization and classified according to Seebauer (modified Levy classification). This classification includes 3 types of fractures: Insufficiency or chronically eroded acromion fractures are classified as type I; Type II are acromial edge fractures with IIa affecting the posterolateral edge and IIb the isthmus of the acromial spine; Type IIIa are scapular spine fractures and IIIb are sagittal trans scapular fractures. Patient records were reviewed for demographic data, comorbidities, injury mechanism, and time between implantation and fracture. For the 16 patients whose previous operation had been performed at our department, implant specifications were reviewed. Clinical analysis at regular intervals included range of motion, level of pain, and daily function. Radiological analysis included fracture consolidation and implant positioning.

RESULTS:

In total 25 SSF were surgically treated between 2016 and 2021. Of those 22 SSF were treated with the standardized operative technique with an average follow up of 15 months. Mean patient age was 75 years, 91% were female. Five were traumatic fractures; the remaining 17 were insufficiency fractures. Fractures developed on average 22 months post RSA. Ten patients showed signs of delayed union with callus formation but no bone bridging on the preoperative CT-scan. There was one type I fracture, 5 type IIa, 1 type IIb, 10 type IIIa, and 4 type IIIb fractures according to Seebauer. In total, 32% of the patients had osteoporosis, 23% inflammatory arthritis, 14% Parkinson's disease, and 24% had undergone revision shoulder arthroplasty with RSA. Implant specifications showed an average stem size of 11.6 mm and a glenoid size of 41.5 mm. On average 3 to 4 baseplate screws were used and in 38% of the cases glenoid augmentation had been performed with a composite bone graft. In 6% a lateralized glenosphere (+4mm) had been implanted, 6% had a humeral component lengthening spacer, and 13% had an inlay higher than 3 mm.

Clinical follow up showed a significantly improved active abduction from 44° preoperatively to 82° postoperatively ($p = 0.004$), active flexion from 47° to 82° ($p = 0.005$), and active external rotation from 17° to 28° ($p = 0.363$) within 12 months. In 21 patients fracture consolidation was confirmed on radiological follow up (95.5%). In one case with a type IIIa fracture nonunion of the scapula spine persisted radiographically after surgical treatment. This fracture had showed signs of nonunion preoperatively. The osteosynthesis was revised as a single-stage procedure after which microbiologic examination produced 1 positive biopsy with staphylococcus capitis. After revision clinical function improved. Complications included 5 iliac crest fractures and 1 fracture lateral adjacent to the plate. 2 patients complained about irritation of the plate along the spine and the material was removed.

DISCUSSION AND CONCLUSION:

Double plate fixation with autologous iliac crest augmentation of unstable SSF in the presence of RSA reliably leads to fracture consolidation and seems to improve clinical function significantly. Care must be taken when harvesting an autologous iliac crest graft in this population of patients with poor bone quality and in our practice a prophylactic plate osteosynthesis is now applied.