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Background: The traditional resection technique for malignant tumors of the scapula is a procedure termed the Tikhoff-Linberg procedure. This procedure involves surgical removal of the entire scapula, portion of proximal humerus and the distal third of the clavicle. Patients' limbs were left flail or the proximal humerus was stabilized to the remaining clavicle or rib. Total scapula prostheses were eventually engineered to replace the shoulder girdle and hopefully improve function and reduce complications. The latest version of the prosthesis provides a constrained mechanism that in theory substitutes for the resected rotator cuff by preventing upward migration of the humeral head with deltoid contraction. Theoretically this would improve function and shoulder girdle stability and reduce complications particularly glenohumeral dislocation.

Questions/ Purposes: Our goal in this study was to evaluate the functional outcomes, range of motion, and complications associated with reconstruction using a constrained total scapular endoprosthesis following scapulectomy.

Patients and Methods: We retrospectively analyzed charts of 6 patients from 2003-2015. There were 3 males and 3 females with sarcomas arising in the scapula. The average age at time of surgery was 35 years (range: 9-62 years). In all patients, the deltoid, trapezius, latissimus, rhomboids, serratus anterior and axillary nerve were capable of being preserved which permitted implantation of the total scapula prosthesis. At final follow-up, all patients were assessed for outcome according to the Musculoskeletal Tumor Society (MSTS) score. Pain, range of motion of the shoulder and elbow, local tumor control, implant survival, and complications were also assessed.

Results: Average length of follow-up was 87.2 months (range: 66-120 mos). All patients are alive and without evidence of disease. Diagnoses included Ewing Sarcoma (n=2), Fibrosarcoma (n=1), Fibromatosis (n=1), Chondrosarcoma (n=1), and Multicentric Epithelioid Hemangioendothelioma (n=1). All patients had a functional upper extremity for activities of daily living. MSTS scores ranged from 26-28 (average: 27.3). Patients were primarily limited in athletic activities. Patients were either pain free or had mild intermittent mostly positional pain. No patient had debilitating pain. All patients had a stable shoulder and could position their hand above shoulder level. Range of motion of the elbow and hand were normal for all patients. Shoulder abduction ranged from 20 to 45 degrees. External rotation ranged from neutral to minus 10 degrees. All patients had full internal rotation. Major complications included a non-displaced fracture of the humerus secondary to a fall, intraoperative fracture due to underlying MHE, 2 dislocations that were successfully reduced. No patients experienced infection, local recurrence, chronic swelling, neuropraxia, vascular injury or revision/amputation.

Conclusions: Constrained total scapula endoprosthesis provides a safe and reliable method of reconstruction following total scapula resection for musculoskeletal tumors in selected patients. Overall function is good for activities of daily living. Patients in this study had very little if any pain in the shoulder. The prosthesis provides patients with good cosmesis, a stable shoulder and normal elbow and hand function. The procedure should only be performed in patients where the deltoid, trapezius, latissimus, rhomboids and axillary nerve can be preserved.