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ORIGINAL ARTICLE

Long-term clinical and radiographic outcome of rotator cuff repair with a synthetic interposition graft: a consecutive case series with 17 to 20 years of follow-up

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Background: Treatment options for irreparable cuff tears include synthetic interposition grafts, but whether such grafts can maintain acceptable shoulder function and prevent cuff tear arthropathy in the long-term is unknown.

Method: This was a retrospective case series of 13 consecutive patients treated with a synthetic interposition graft made of Dacron (DuPont, Wilmington, DE, USA). Patients were examined with bilateral ultrasonography, bilateral x-ray imaging, Constant-Murley score, and Western Ontario Rotator Cuff score.

Results: After a mean of 18 years (range, 17-20 years), 1 patient had died, and 12 were available for x-ray imaging and 10 also for ultrasonography and clinical scores. Cuff tear arthropathy (Hamada grade ≥2) had developed in 9 of 12 (75%; 95% confidence interval, 43%-95%), including 3 patients operated on with arthroplasty in the follow-up period. The mean absolute Constant-Murley score was 46 (standard deviation, 26), and the mean Western Ontario Rotator Cuff score was 59 (standard deviation, 20). In 7 of 10 patients (70%) with available ultrasonography, the graft was interpreted as not intact. All patients had a contralateral full-thickness tear, and 7 of 12 patients (58 %; 95% confidence interval, 28%-85%) had contralateral cuff tear arthropathy. The number of patients with cuff tear arthropathy was not significantly different between the shoulder repaired with a Dacron graft and the contralateral shoulder ($P = .667$).

Conclusion: These results indicate that a synthetic interposition graft with screw fixation could not prevent cuff tear arthropathy and preserve cuff integrity in a long-term perspective.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Shoulder; rotator cuff; synthetic graft; cuff tear arthropathy; long-term follow-up; ultrasonography

Treatment of rotator cuff tears that are not directly repairable to the greater tuberosity remains a great challenge in symptomatic patients not responding to nonoperative treatment. Such rotator cuff defects are associated with inferior outcomes,[16] and preventing arthropathy, if possible, is a

The Regional Ethics Committee in Linköping approved this study (Dnr 2013/330-31).

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long-term goal. In 1986, Ozaki et al[29] published a series of 25 patients with massive tears repaired with synthetic grafts, with promising results, and other early attempts with artificial ligaments produced varying results in the short-term.[29,30,41]

In recent years, there has been a renewed interest in synthetic and biological graft procedures for covering a defect and for protecting or augmenting a tendon-to-bone suture, a subject covered in several recent reviews.[9,13,35] One of the graft options for covering a defect has been a synthetic polyester graft such as Dacron (DuPont, Wilmington, DE, USA). Concerns regarding the biocompatibility of nondegradable synthetic grafts have been raised,[4,25] especially their tissue induction ability, where a shortcoming of not producing a mechanically stable construct over time could be suspected.

Short-term results of clinical cases operated on with Dacron grafts have been published,[1,27] as well as results for other synthetic grafts used as augmentations to reinforce a cuff repair,[7,21,31] but to our knowledge, there is only one case report on long-term results after synthetic interposition graft,[37] and the potential of such grafts to prevent development of arthropathy is unknown. The aim of this study was to retrospectively investigate the clinical and radiologic results 17 to 20 years after a bridging rotator cuff repair with a Dacron graft and specifically whether these operations had prevented cuff tear arthropathy.

Materials and methods

Study design and setting

This was a retrospective case series of all patients treated with a Dacron graft for rotator cuff tear at a university hospital. All participating patients gave written consent.

Patient characteristics

Between 1992 and 1996, a consecutive series of 13 patients (11 men and 2 women), with a mean age of 55 years (range, 38-72 years) at the time of surgery, underwent operations with a Dacron patch (Science Et Medicine; Acropole Group, Creteil, France) to cover the defect of an irreparable rotator cuff tear. Irreparable tears were defined as tears that could not be brought back to the greater tuberosity, even after a meticulous release. All patients with marked pain and shoulder dysfunction due to a confirmed rotator cuff tear at arthroscopy or on magnetic resonance imaging (MRI) during this period were considered for this operation. Five patients had previously undergone arthroscopic and 3 patients open subacromial decompression when the reparability of the rotator cuff was assessed. An attempt of an open cuff repair had failed in 2 patients. Demographics and perioperative tendon status are presented in Table I. Indications for the operation were pain and loss of function due to an irreparable rotator cuff tear in the absence of glenohumeral osteoarthritis.

Surgical technique and postoperative care

All operations were done by one of the senior authors (R.N). An open operation using a superolateral skin incision was used in all cases, and the anterolateral part of the deltoid muscle was detached along with splitting of the muscle fibers between the middle and anterior portion. In all patients, a bursectomy was done and an open acromioplasty was performed as needed. After confirmation that the tendon stump was not repairable to the greater tuberosity, the tip of the greater tuberosity was resected, taking off an approximately 1-cm-thick slice of the most cranial part of the greater tuberosity.

An appropriately sized Dacron graft was sutured to the remaining edge of the tendon medially and fixed to bone laterally with a fully threaded 6.5-mm cancellous screw with a washer (Synthes, Zuchwil, Switzerland). Due to removal of bone, sufficient fixation of the graft was not possible by the suture anchors available at the time. A screw and washer was used instead, which allowed a stable

Table I Demographic data and tendon status at primary operation with a synthetic interposition graft for irreparable cuff tear

Patient	Sex	Age at surgery (yr)	Dominant side op	Etiology	Manual laborer	Rotator cuff tear	Biceps	Earlier operations
1	M	44	Yes	T	Yes	Ssp + Isp	Intact	ASD
2	M	59	Yes	T	Yes	Ssp + Isp + Ssc	Tear	OSD
3	F	63	Yes	T	Yes	Ssp + Isp	Intact	OSD
4	M	50	Yes	T	Yes	Ssp + Isp	Intact	ASD
5	M	58	Yes	Deg	No	Ssp	Dislocated	ASD
6	M	51	No	T	Yes	Ssp + Isp	Dislocated	
7	F	58	Yes	T	Yes	Ssp + Isp	Intact	
8	M	71	Yes	Deg	Yes	Ssp + Isp + Ssc	Dislocated	2 ASD
9	M	46	Yes	Deg	Yes	Ssp	Intact	2 cuff repairs + ACR
10	M	45	No	T	Yes	Ssp + Isp	Tear	OSD
11	M	38	Yes	T	*	Ssp	Intact	Cuff repair
12	M	66	Yes	Deg	*	*	*	*
13	M	67	Yes	T	No	Ssp + Isp	Dislocated	2 ASD

M, male; *T*, trauma-related tear; *Ssp*, supraspinatus; *Isp*, infraspinatus; *ASD*, arthroscopic subacromial decompression; *Ssc*, subscapularis; *OSD*, open subacromial decompression; *F*,female; *Deg*, degenerative, nontraumatic tear; *ACR*, open acromioclavicular resection.
* Missing data.