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Anteromedial approach for shoulder arthroplasty: Current indications, complications, and results

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Hypothesis: The anteromedial approach to the shoulder with detachment of the anterior deltoid from its clavicular and anterior acromial origins is a method of enhancing exposure for difficult shoulder arthroplasty cases. The aim of this study is to describe the current frequency of use, indications, complications, and results of this approach.

Materials and methods: Between 2000 and 2003, 723 consecutive shoulder arthroplasties were performed. In 110 (15%) an anteromedial approach was used. Patient data; previous surgery; indications for surgery; pain, motion, and strength before and after surgery; complications; and the need for reoperation were assessed.

Results: This approach was used in 9.5% of primary cases and 39% of revision cases. Seventy percent had had previous surgery. For primary arthroplasty, the most frequent diagnoses were osteoarthritis and the sequelae of fractures. In revision cases the most common diagnoses were instability and glenoid loosening. The structural indications for the anteromedial approach were severe scarring, protection of a frail deltoid, improvement in rotator cuff or glenoid exposure, protection of osteopenic bone, or enhancement of exposure in oncologic cases or resections. Ninety patients had more than 2 years of follow-up. Pain improved after primary and revision arthroplasty. Motion only improved in primary arthroplasty. There was little change in strength. No proximal deltoid detachments or other approach-related complications were identified.

Conclusions: The anteromedial approach is a reliable technique to improve surgical exposure in difficult shoulder arthroplasty cases. When performed adequately, it can be applied safely without anterior deltoid detachment or clinically evident major complications.

Level of evidence: Level IV, Retrospective Case Series, Treatment Study.

Keywords: Anteromedial; shoulder exposure; deltoid muscle; shoulder arthroplasty; revision arthroplasty

The deltopectoral approach is the current standard for exposure during shoulder arthroplasty.[1,7] An alternative anteromedial approach with development of the deltopectoral interval and detachment of the deltoid origin from the clavicle and anterior acromion has been identified as a method of enhancing exposure in difficult shoulder arthroplasty cases such as reoperations and those with severely scarred joints, the presence of a posterior-superior rotator cuff tear that needs to be repaired, an anterior deltoid that will not tolerate retraction, or a severely osteopenic humerus at risk for fracture during the procedure.[2] The strength of the anterior deltoid is associated with successful results after shoulder arthroplasty,[2] and disruption of its proximal origin as a consequence of surgical detachment and

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failure to heal in the postoperative period has severe adverse consequences.[4] Consequently, several surgical techniques directed at preserving the integrity of the deltoid have been described.[3,5,6] A previous study reported on the surgical technique and results of the anteromedial approach when it was used as a routine part of uncomplicated shoulder arthroplasty.[2] Since then, no information has been published, to our knowledge, describing the current indications, results, or complications when using this approach as a method for more extensile exposure in shoulder arthroplasty cases.

The aim of this study is to define the current indications for this method of surgical exposure during shoulder arthroplasty and define the clinical results and any complications or revisions that have been necessary in association with this method of surgical exposure.

Materials and methods

This study was performed with internal review board approval. During 2000 to 2003, 723 consecutive shoulder arthroplasties were performed at our institution. Clinical records were reviewed to collect patient diagnostic and surgical data. Of the cases, 613 were performed through the deltopectoral approach and 110 through the anteromedial approach. In these 110 cases the surgical data were carefully studied and indications for the anteromedial approach were identified. Throughout this period, for preoperative and postoperative visits and subsequent joint registry analysis, information was collected by use of specific shoulder data sheets to be sure of the uniformity of the data collected. Pain was reported on a scale ranging from 1 to 10, with 1 indicating no pain. Active elevation and external rotation were recorded in degrees and internal rotation as the upper spinal level reached with the thumb. Strength was assessed by manual muscle strength testing on a scale from 1 to 5, with 5 indicating normal; 4, good; 3, active movement against gravity; 2, visible contractions; and 1, paralysis. Care was taken to identify any issues with the anterior deltoid including strength of muscle contraction or deltoid dehiscence. Patient follow-up was continued indefinitely but was interrupted by death or a complication requiring revision surgery. Ninety patients had 2 or more years of follow-up. The mean follow-up by examination at our institution was 3.7 years (range, 1.5 months to 8.2 years). Additional patient contact continued by survey, telephone call, and reports from outside orthopaedic surgeons. This length of follow-up was a mean of 4.7 years (range, 2-8.2 years).

The surgical technique was the same as described earlier.[2] The deltopectoral interval was fully developed, allowing the cephalic vein to fall medially. The release of the deltoid began on the top of the clavicle between the deltoid and trapezius muscles. The deltoid muscle, as well as all of its attached fascia, was then carefully elevated from its J-shaped attachment on the clavicle. The incision continued laterally over the acromioclavicular joint, leaving a portion of the thickness of that joint capsule intact. We then continued the incision farther laterally over the anterior acromion, again carefully incising and elevating the fascia and muscle from this bone while preserving the attachment of the coracoacromial ligament. At the conclusion of the case, No. 2 suture was placed through the bone of the acromion, through the acromioclavicular joint capsule, through the fascia and muscle of the trapezius, and through bur holes in the clavicle to securely reattach the deltoid muscle. Postoperatively, the limb was protected in a sling or shoulder immobilizer for 5 to 6 weeks. Passive movement of the shoulder was allowed during that time. At 5 to 6 weeks, a progressive, active-assisted motion program was started. Strengthening was deferred until 8 to 12 weeks.

For statistical analysis, continuous variables were contrasted with the normal distribution with the Kolmogorov-Smirnov test. Differences in pain and mobility were assessed with paired t tests. Changes in strength were evaluated with the Wilcoxon signed rank test. We used the χ^2 test to identify any differences in the frequencies of the categorical variables between the treatment groups.

Results

Of the 723 shoulder arthroplasties, 382 were performed in female patients and 397 in male patients. Of those undergoing the deltopectoral approach, 325 were female patients (53%), and of those in the anteromedial approach group, 57 were female patients (52%). For the 723 shoulders, the mean age at the time of surgery was 66 years (range, 15-90 years). For those undergoing the deltopectoral approach, the mean age was 67 years, and for those undergoing the anteromedial approach, the mean age was 59 years ($P < .001$). For the 723 shoulders, the mean body mass index (BMI) was 30. For those undergoing the deltopectoral approach, the mean BMI was 30. For those undergoing the anteromedial approach, the mean BMI was 28.

The diagnoses leading to surgery are outlined for primary arthroplasty in Table I and for revision shoulder arthroplasty in Table II. In each of these tables the numbers of operations using the deltopectoral approach or the anteromedial approach are indicated by diagnosis. Overall, 55 shoulders, 9.5% of the primary arthroplasties, underwent the anteromedial approach for arthroplasty. Related overall to the frequency of a diagnosis, more anteromedial approaches were performed in the primary surgical procedures in cases with osteoarthritis or traumatic arthritis because of old proximal humeral fractures. However, the anteromedial approach was proportionally used more often in either chronic dislocations or resection of a bone or soft-tissue tumor. Of the revision shoulders, 55 (39%) were approached through the anteromedial exposure. In those cases undergoing revision surgery, the largest number undergoing the anteromedial approach had shoulder instability, glenoid loosening or wear, or conversion of a humeral head arthroplasty to a total shoulder arthroplasty. The highest proportion of revision cases undergoing surgery through the anteromedial approach had humeral loosening, glenoid and humeral loosening, reimplantation after resection arthroplasty, or revision surgery because of instability.

Considering all shoulders, we found that 110 of 613 shoulders (18%) undergoing the deltopectoral approach had previous surgical shoulder surgery whereas 77 of 110 shoulders (70%) undergoing the anteromedial approach had