The Reverse Delta Prosthesis – A New Approach to Combined Arthritis and Instability and Rotator Cuff Deficiency of the Shoulder: Early Experience and Lessons Learned

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In the absence of a functioning rotator cuff and supporting coracoacromial arch, the glenohumeral joint may lack sufficient stability for the deltoid to function effectively in elevating the arm. The result is often referred to as ‘pseudoparalysis’ of the shoulder. The stability required for deltoid function may be lacking in primary cuff tear arthropathy (Figure 1), failed cuff surgery that included surgical sacrifice of the coracoacromial arch (Figure 2), failed shoulder arthroplasty complicated by instability, (Figure 3) and failed fracture surgery where the tuberosities fail to properly unite. In these situations, standard reconstruction by cuff repair and / or conventional arthroplasty cannot restore the needed fulcrum for deltoid function. Until recently, there was no solution to these problems. A creative approach was implemented in Europe by Grammont in which a hemispherical ball was fixed to the glenoid and a concave metaphyseal component was fixed to the humerus (Figure 4). The European results from the last decade have indicated that in the absence of complications this prosthesis was very effective in restoring comfort and function to previously unreconstructable shoulders and that the perioperative complication rate has been high, including such major problems as infection, fracture of the acromion, humerus and glenoid, nerve palsies, and dislocations. In some series the early revision rates have been as high as 60%!

This reverse prosthesis was recently made available in the United States. A year ago, the Shoulder and Elbow Services at the University of Washington Medical Center trained in this technique and cautiously instated a clinical series with a goal to minimizing the risk of complications. Cadaver dissections and laboratory studies enabled the team to understand the unique geometry of this prosthesis as well as strategies by which it can be most safely applied.

Our technique emphasizes the anterior deltopectoral approach because of its familiarity, ease of glenoid and humeral exposure and its extensile nature. The glenosphere is positioned low on the glenoid to avoid notching and to enable the inferior locking screw to engage the robust bone of the axillary border of the scapula (Figure 5). The tension in the deltoid is carefully controlled by the amount of bone resection and the height of the polyethylene spacer. We strive to achieve no gap between the humeral and glenoid articular surfaces with gentle distraction on the humerus (Figure 6).

To this point we have only short-term follow-up on our patients. Fourteen patients have an average of three months functional data. At this point we have been able to avoid the perioperative complications described above. What we are presenting here is (1) the severe degree of functional compromise of the patients before surgery and (2) the early functional return realized by some patients with this type of surgical reconstruction (see Table 1) (Figure 7).

We are encouraged to continue in applying this method to carefully selected patients and are following
Figure 2: Sequential radiographs showing attempted arm elevation by a patient with a failed rotator cuff repair and acromioplasty. This inability to elevate the arm is referred to as pseudoparalysis.

Figure 3: Failed arthroplasty with anterosuperior escape. (clinical and radiographic images.)

Figure 4: The reverse Delta prosthesis.

our patients carefully to evaluate their function over time.

**Recommended Reading**


Figure 5: Desired screw placement in the axillary pillar of the scapula.

Figure 6: Postoperative radiograph of reverse prosthesis.