

Short Communication

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Postoperative Deltoid Dysfunction after Open Shoulder Surgery: Incidence and Prevention Strategies

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Abstract

Deltoid dysfunction is an often-underrecognized complication following open shoulder procedures, particularly those requiring deltoid detachment or extensive dissection. This short communication summarizes reported incidence rates, outlines key risk factors, and highlights evidence-based strategies for prevention and early rehabilitation. Given the deltoid's vital role in shoulder function, preserving its integrity is crucial to optimizing patient outcomes.

Introduction

The deltoid muscle plays a central role in shoulder biomechanics, particularly in abduction and forward elevation [1]. Open surgical approaches to the shoulder—such as for proximal humeral fractures, open rotator cuff repairs, and tumor resections—often require manipulation of the deltoid muscle [2]. Although advances in arthroscopy have reduced the frequency of deltoid splitting, certain indications still necessitate open exposure [2]. Unfortunately, iatrogenic injury to the deltoid can result in functional deficits that are difficult to reverse [3].

Incidence and Clinical Relevance

Deltoid dysfunction postoperatively may present as weakness, fatigue, limited range of motion, or a noticeable loss of shoulder contour. The incidence varies by procedure and technique. Reports suggest deltoid impairment occurs in approximately 5–15% of open shoulder surgeries involving anterior deltoid detachment [4]. In reverse total shoulder arthroplasty, where the deltoid acts as the primary elevator of the arm, even minor compromise can severely

affect outcomes [5].

Mechanisms, Risks, and Management of Deltoid Injury in Shoulder Surgery

Deltoid muscle injury during shoulder surgery can occur through various mechanisms. Iatrogenic damage, including partial detachment or rupture, is a recognized complication of open rotator cuff repair and reverse total shoulder arthroplasty [6,7]. The risk increases with extensive acromioplasty. Incisions extending beyond 5–7 cm from the acromion may damage the axillary nerve, crucial for deltoid function. Postoperative deltoid ruptures can occur without trauma, particularly in patients with previous rotator cuff repairs [8]. Deltoid deficiency can be debilitating, affecting shoulder function and mobility [9]. Treatment options include trans-osseous suture repair, which has shown promising results in restoring function. Clinicians should be aware of deltoid anatomy, potential injuries, and preventive measures to preserve normal functioning during shoulder surgeries.

Preventive Strategies

Surgical planning and meticulous technique are fundamental to minimizing the risk of postoperative deltoid dysfunction. Whenever feasible, minimally invasive techniques such as arthroscopic or mini-open approaches are preferred, as they significantly reduce the extent of deltoid manipulation and the risk of iatrogenic injury [10]. In cases where a deltoid split is necessary, it is critical to limit the incision to no more than 4 cm distal to the anterolateral corner of the acromion to avoid damage to the anterior branch of the axillary nerve, which courses approximately 5–7 cm below the acromion [11].

When the deltoid origin must be detached—commonly seen in extensive humerus fractures or tumor resections—secure reattachment is crucial. The use of robust fixation methods such as trans-osseous sutures or suture anchors, preferably with nonabsorbable material, has been shown to optimize healing and reduce the risk of postoperative weakness or detachment failure [12]. Protection of the axillary nerve is particularly important in revision surgeries or trauma settings, where scarring and distorted anatomy may increase the risk of inadvertent nerve injury.

Finally, postoperative rehabilitation should aim to initiate deltoid engagement as early as safely possible. Extended immobilization, though sometimes necessary for tendon or bone healing, can lead to rapid deltoid atrophy and neuromuscular dysfunction [13]. A carefully structured mobilization program that gradually reintroduces deltoid activation has been associated with improved functional outcomes and reduced complication rates [14].

Postoperative Assessment and Recovery

Electromyography (EMG) and dynamic ultrasound can be used postoperatively to evaluate suspected deltoid dysfunction. However, early clinical detection is often based on functional testing, such as weakness in resisted abduction with an intact cuff. Rehabilitation strategies focus on gradual deltoid activation, isometric exercises, and neuromuscular re-education. In rare cases where detachment fails to heal or axillary nerve injury is permanent, tendon transfers or revision surgeries may be considered.

Conclusion

Deltoid dysfunction after open shoulder surgery remains a relevant clinical challenge. While relatively uncommon, its impact on shoulder function can be substantial. Emphasizing careful surgical technique, nerve protection, and timely rehabilitation are key pillars in preventing this complication. Further studies are needed to quantify the long-term functional impact and refine prevention protocols, especially in elderly and trauma populations.

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Conflict of Interest

No conflict of interest.

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