

# Single-Event Multilevel Surgery of the Upper Extremity: A Case Report

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## ABSTRACT

Single-event multilevel surgery has been used successfully to treat pediatric patients with cerebral palsy for decades; however, it has not been widely used to treat adult patients. Tendinopathies of the arm often coexist, and performing single event surgery to correct one joint pathology may further exacerbate coexisting tendinopathies. Accordingly, performing single-event multilevel surgery in the appropriate patient allows for the correction of multiple conditions of the same limb in a single surgery. Single-event multilevel surgery offers many benefits, including cost savings, convenience for the patient, less potential complications owing to a single anesthetic and hospitalization event, and a shorter overall rehabilitation period. We present an adult patient with multiple tendinopathies of the left upper extremity, including subacromial impingement syndrome, bicipital tendinitis, lateral epicondylitis, and trigger finger. He underwent single-event multilevel surgery for all mentioned musculoskeletal pathologies, resulting in successful surgical correction without complications or adverse outcomes.

**Keywords:** Tendinopathy, Upper Extremity, Orthopaedic Procedures

## INTRODUCTION

Single-event multilevel surgery has been used for decades to treat pediatric patients with cerebral palsy (CP), and it is considered by many to be the standard of care.<sup>1</sup> Single-event multilevel surgery allows for multiple musculoskeletal pathologies to be corrected at the same time, resulting in a single anesthetic event, hospitalization, and rehabilitation period.<sup>1,2</sup>

There is a paucity of literature evaluating the role of single-event multilevel surgery in adult patients without CP, and it is common for orthopaedic patients to have multiple, concurrent upper-extremity pathologies within the same limb.<sup>3,4</sup> Walker-Bone et al<sup>3</sup> reported that patients with shoulder pathology (eg, rotator cuff tendinitis, bicipital tendinitis, subacromial bursitis,

and acromioclavicular joint dysfunction) were often found to have coexisting pathologies, including lateral epicondylitis, medial epicondylitis, De Quervain's tenosynovitis, and carpal tunnel syndrome. At times, these coexisting pathologies can be exacerbated if not addressed during the initial surgery. For example, a 72-year-old man presented to our clinic 6 weeks after undergoing a right-rotator cuff repair. He had signs and symptoms of acute exacerbation of chronic carpal tunnel syndrome that ultimately required a second surgery for its resolution. This is consistent with findings from Harada et al,<sup>5</sup> who examined complications of the fingers and hands after 41 arthroscopic rotator cuff repairs. The authors reported that twelve (29%) of the patients reported hand and finger symptoms after arthroscopic rotator cuff repairs, including pain, numbness, edema, and joint stiffness.<sup>5</sup> Of the 12 patients, flexor tenosynovitis was diagnosed in 10 patients, carpal tunnel syndrome in 3 patients, and cubital tunnel syndrome in 2 patients.<sup>5</sup>

Our experiences with exacerbations of coexisting pathologies in the same extremity after arthroscopic shoulder surgery prompted us to 1) evaluate for coexisting conditions in all patients before surgery, and 2) perform single-event multilevel surgery in appropriate patients when multiple pathologies of the same limb are identified.

We present a case report of one patient and case series of two additional patients who underwent single-event multilevel surgery.

## CASE REPORT

A 63-year-old man presented to our institution with pain in his left anterolateral shoulder, radiating posteriorly for several months. No traumatic injury was reported; however, the patient, an electrician by trade, stated that the pain was aggravated by overhead motion. His physical examination findings were concerning for subacromial impingement syndrome. An x-ray of the left shoulder was unremarkable except for mild arthritis of the acromioclavicular joint.

**Table 1.** Upper Extremity Single-Event Multilevel Surgeries Performed in 2018\*

Gender/Age	SEMLS Performed	Complications
Male, 63	Left shoulder distal clavicle excision, Left shoulder subacromial decompression and acromioplasty, Left shoulder arthroscopic-assisted subpectoral bicep tenodesis, Left open debridement of extensor carpi radialis brevis, Left index trigger finger release	None
Male, 74	Right arthroscopic rotator cuff repair, Right subacromial decompression and acromioplasty, Right arthroscopic-assisted subpectoral bicep tenodesis, Right open carpal tunnel release, PRP supplementation to rotator cuff	None
Female, 51	Right open debridement of extensor carpi radialis brevis and common extensor origin, Right open release of the carpal tunnel	None

PRP, Platelet Rich Plasma

\*The above surgeries were performed as expected, without any delays in healing, complications, or need for further physical therapy

The patient was treated conservatively with a home exercise program and a corticosteroid injection into the subacromial space. The patient returned to the clinic approximately 4 weeks later with less shoulder pain; however, he now reported pain and catching of his left index finger and left lateral elbow pain. He was treated conservatively for lateral epicondylitis with a corticosteroid injection, counterforce brace, and physical therapy. He was also diagnosed with index trigger finger and treated with a corticosteroid injection. He returned to the clinic 4 weeks later with recurrent waxing and waning left shoulder pain, persistent lateral epicondylitis, and trigger finger. Three months later, a platelet rich plasma (PRP) injection was administered at the point of maximal tenderness of the lateral epicondyle and in the extensor carpi radialis brevis tendon under ultrasound guidance. Although the PRP provided some relief, the patient continued to have residual lateral pain in the elbow, adjacent to the lateral epicondyle.

Ultimately, magnetic resonance imaging (MRI) of the left elbow and left shoulder were ordered owing to pain refractory to corticosteroid injection, PRP, nonsteroidal anti-inflammatory drugs, rest, counterforce bracing, physical therapy, and home exercise program. The MRI of his left elbow confirmed a partial tear of the common extensor tendon origin. The MRI of his left shoulder showed bicep tendinitis, a superior labral tear, and acromioclavicular joint degenerative joint disease.

A couple of weeks after the MRI of the left shoulder (6.5 months after initial presentation), the patient returned to the clinic with concerns of an acute exacerbation of his left shoulder pain while lifting, in which he sustained a traction type injury and felt a tearing sensation. He also reported that his left elbow and left index finger continued to cause pain. Based on worsening symptoms despite extensive conservative treatment, the patient was consented for arthroscopic subacromial decompression of the left shoulder,

distal clavicle excision, bicep tenodesis, left elbow debridement of extensor carpi radialis brevis origin, and left index trigger finger release.

A month and a half later (8 months after initial presentation) the surgeries were performed as a single-event multilevel surgery without complications. The patient was given a standard physical therapy protocol, with restrictions limiting active range of motion of the elbow until 4 weeks postoperatively and limiting strength training until 3 months postoperatively.

At his 6-week follow up, the patient had minimal shoulder pain. He showed 170° of forward flexion and 60° of external and internal rotation to the level of the thoracic spine, comparable to the contralateral side. He also showed full range of motion at the left elbow and left index finger without any pain or tenderness to palpation. At 3 months postoperatively, the patient continued to show promising results. He was cleared to transition to strength training and released to follow-up as needed.

## DISCUSSION

Multilevel surgery has been used successfully in pediatric patients with CP for more than 30 years; however, its role in other patient populations has remained largely unexplored. Based on our experience and supporting literature, surgical correction of one joint can result in exacerbations of orthopaedic conditions of the same extremity.<sup>5</sup> Although the pathology underlying this relationship is not well understood, possible explanations include proximal nerve irritation, joint swelling, joint immobility, and activation of inflammatory mediators after surgery.

This case showed that a single-event multilevel surgery is an effective strategy for managing coexisting musculoskeletal pathologies of the upper extremity in a suitable patient. We performed two additional single-event multilevel surgeries, which also showed successful healing without complications (Table 1). In appropriate patients, the benefits of single-event multilevel surgery

are quite pronounced, including convenience for the patient, less potential complications owing to a single anesthetic and hospitalization event, less overall healing time as patients are healing concomitantly, and cost savings. A recently published study<sup>6</sup> examined 302 California hospitals for the cost of care in the operating room, in which they found the average cost per minute to be approximately \$37. There is an opportunity for substantial cost savings by combining several surgeries into one.

A possible disadvantage of single-event multilevel surgery is increased pain with recovery because of the involvement of multiple joints. This case report emphasizes 1) the benefit of appropriately interviewing and examining patients for coexisting pathologies prior to surgery, and 2) the importance of selecting appropriate patients for single-event multilevel surgery.

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