

Treatment of chronic acromioclavicular joint dislocation in a paraplegic patient with the Weaver-Dunn procedure and a hook-plate

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Abstract

In case of patients with spinal cord injury and concomitant acromioclavicular (AC) joint-dislocation the treatment is challenging, as in this special patient group the function of the shoulder joint is critical because patients depend on the upper limb for mobilization and wheelchair-locomotion. Therefore the goal of this study was to examine, if the treatment of chronic AC-joint dislocation using the Weaver-Dunn procedure augmented with a hook-plate in patients with a spinal cord injury makes early postoperative wheelchair mobilization and the wheelchair transfer with full weight-bearing possible. In this case the Weaver-Dunn procedure with an additive hook-plate was performed in a 34-year-old male patient with a complete paraplegia and a posttraumatic chronic AC-joint dislocation. The patient was allowed to perform his wheelchair transfers with full weight bearing on the first postoperative day. The removal of the hook-plate was performed four months after implantation. At the time of follow-up the patient could use his operated shoulder with full range of motion without restrictions in his activities of daily living or his wheel-chair transfers.

Introduction

Injuries of the acromioclavicular (AC) joint are common. In the general population, the incidence of AC-joint dislocation in the age group 15-64 years is 18/100,000 for men and 1/100,000 for women.¹ Traumatic spinal cord injury is often associated with further injuries, and therefore, concomitant injuries of the shoulder joint in massive trauma are common.

The Weaver-Dunn operation is a well-established

procedure for the treatment of chronic AC-joint instability.^{2,4} A major disadvantage of the Weaver-Dunn procedure is a reduction in the strength of the transferred coracoacromial ligament compared with the intact coracoclavicular ligament complex.² This reduction in strength is a risk-factor for developing re-dislocations. Thus, alternative techniques have been developed in which the transferred coracoacromial ligament is augmented with PDS-suture, cerclage, tight-ropes, autografts or hook-plates.^{2,5,6}

Currently, descriptions of the treatment options for an AC-joint dislocation in paraplegic patients in the literature are lacking. In this special patient group, the function of the shoulder joint is critical because patients depend on the upper limb for mobilization. Furthermore, the forces on the shoulder joint are intense because this joint is used continuously during transfers or daily wheelchair locomotion.

We report on our experience in the treatment of post-traumatic chronic AC-joint instability in a paraplegic patient using the Weaver-Dunn procedure and an additional fixation with a hook-plate. Thirty-two months after the removal of the plate, which took place four months after the implantation, the patient was examined clinically and by radiographs.

The goal of this study was to evaluate whether the Weaver-Dunn procedure with an additional hook-plate is a treatment option for paraplegic patients, who experience strong forces on the shoulder joint. Additionally, we assessed whether the use of the hook-plate resulted in a fast, active rehabilitation.

Case Report

A 34-year-old, right-handed male patient suffered a fracture to the 12th thoracic vertebra that resulted in complete paraplegia. In addition to the fracture of the 12th thoracic vertebra, he contracted a Rockwood-II-AC-joint-dislocation. The patient was initially conservatively treated for this AC-joint dislocation after the trauma. Because of increasing pain and weakness in the right shoulder seven years after the trauma, surgical stabilization of the shoulder joint was performed. At the time of admission, he was able to move his wheelchair with both arms. However, movement of the injured shoulder joint was mostly supported by the elbow joint. Clinical exam and radiography revealed a higher position of the lateral clavicle compared to the contralateral uninjured upper extremity with dislocation of the AC-joint. During the first operation, the Weaver-Dunn procedure with an additive hook-plate was performed (Figure 1).

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Operative technique

Exposure was performed under general anesthesia with the patient placed in the beach-chair-position, and the patient was administered a single dose of antibiotic prophylaxis. The anterior approach to the lateral part of the clavicle was used performing a 7 cm incision. The capsule was incised longitudinally, and the AC-joint was exposed. After the removal of the degenerated intra-articular meniscus, approximately 1.5 cm of the lateral part of the clavicle was resected. The coracoacromial ligament was detached from the acromion and transferred to the lateral clavicle. The clavicle was repositioned with the coracoacromial ligament using fiber-wire No. 5 for fixation. In this reduced position, the hook plate was adapted and fixed to the clavicle using four cortical screws. Next, the clavipectoral fascia sleeve was sutured to augment the horizontal stability of the joint. The operation ended with routine closure in layers and a x-ray verification.

Postoperative course and follow-up protocol

On the first post-operative day, the patient was allowed to perform his wheelchair transfers and to move the shoulder to 90 degrees in abduction, external rotation and flexion.

Four months after surgery, removal of the

hook-plate was performed. After this second procedure, postoperative rehabilitation was performed without any restrictions of the operated shoulder.

Thirty-two months after the second surgery, the patient did not report on any complications or required further medical treatment after removal of the hook-plate. Upon clinical examination, he had full range of motion of the right shoulder (Figure 2). His incision healed without complications, and there were no signs of tenderness. The Constant-scores for the right and left shoulders were 88 and 91 points, respectively. The overall patient satisfaction score was 10 on a scale ranging from 1 (low

satisfaction) to 10 (high satisfaction). The score in the simple shoulder test was 12. Radiographs showed the characteristic image of a shoulder joint after a Weaver-Dunn procedure with a bone defect of the lateral clavicle. There were no signs of re-dislocation with the lateral clavicle being in an anatomical position (Figure 3).

The patient reported that he had no restrictions in his activities of daily living or his wheelchair transfers. The range of athleticism, in which he was limited preoperatively because of the right shoulder joint, improved after surgical stabilization of the clavicle. At follow-up examination, he was able to practice bodybuilding and play basketball for paraplegic patients without any restrictions.

Discussion

Various strategies in the treatment of acute and chronic AC-joint dislocation have been described in the literature. Conservative management is commonly considered as treatment for type 1 and 2 dislocations according to the Rockwood classification.^{2,7} The treatment for type 3 dislocations depend on the hand-dominance, the profession and the athletic requirements of the patient.² However, most of these type 3 dislocation cases can also be treated conservatively.^{2,7,8} Higher grade AC-joint dislocations such as type 4-6 according to the Rookwood-classification should be treated operatively.^{2,7,8}

Therefore, some surgical reconstructive techniques for the AC-joint have been developed for open and arthroscopic treatment.^{2,5,9-14} In addition to techniques like Kirschner-wire transfixation,¹² stabilization with a coracoclav-

icular screw,⁹ stabilization with a hook-plate,^{5,13} stabilization with PDS-bands,¹⁰ and stabilization with a transfer of soft-tissues like the conjoined tendons,¹¹ the coracoacromial ligament,⁴ or a vascular graft,¹⁴ have been described. The Weaver-Dunn procedure is recommended in patients with secondary arthritis of the AC-joint in chronic dislocations.^{2,4}

Arthritis of the AC-joint without initial trauma is a common issue in paraplegic patients because of the intense forces that are applied to the shoulder joint during daily transfers and wheelchair locomotion. Ballinger and colleagues reported that up to 31% of the patients with paraplegia have signs for arthritis of the AC-joint like joint space narrowing and calcifications in their shoulder radiographs.¹ Furthermore, patients with spinal cord injury suffer from post-traumatic arthritis of the AC-joint after dislocation.

In the literature, descriptions of the surgical treatment of AC-joint arthritis in patients with spinal cord injury are rare. Budoff and colleagues described a case of a 76-year-old paraplegic patient with chronic AC-joint dislocation treated with a conjoined tendon transfer.¹⁵ Thirty-eight years after the operation, this patient had excellent shoulder function with equal amount of forward flexion, internal and external rotation and a loss of 10° of abduction compared to the uninjured left shoulder.

In our case, we treated a patient with post-traumatic chronic AC-joint dislocation with the Weaver-Dunn procedure and an additive hook-plate. The primary symptom was pain rather than instability. Therefore, the lateral part of the clavicle was resected, and vertical stabilization of the clavicle was performed with a ligament transfer according to the procedure described by Weaver and Dunn.⁴

The use of an hook-plate solitary or additive



Figure 1. Postoperative radiograph after the Weaver-Dunn-Procedure augmented with a hook-plate.



Figure 2. Range of motion at the time of the follow-up examination.



Figure 3. Radiographs at the time of the follow-up showed anatomical repositioning of the lateral clavicle.

with soft-tissue procedures for patients with AC-joint injuries is well described in the literature.^{5,13,16-18} The main advantage of this procedure is that early active post-operative rehabilitation is possible because the hook-plate stabilizes the AC-joint, thereby allowing the ligament structures to heal even during active movements.^{16,18} This is important during the post-operative care to avoid limitations of the shoulder functions caused by stiffness. Kienast and colleagues showed in a population of 225 patients with type Rockwood 3-4 AC-joint dislocations that the use of an AC-hook-plate can be successful as measured by an average Constant-score of 92.4 points and a complication rate of 10.6%.¹⁶ Due to the advantage of early active postoperative rehabilitation after this procedure, we decided to use this technique in our patient. The use of an additional hook-plate enabled our patient to start active movements of the injured shoulder and to use his wheelchair with few limitations during the early postoperative stage, which allowed him to be independent.

However, in addition to the advantages of this technique, there are also drawbacks. A study by Bostrom Windhamre and colleagues showed that patients treated by the Weaver-Dunn procedure and augmented with the hook-plate had more pain with movements and functional outcomes and did not improve compared to patients treated with the Weaver-Dunn procedure and augmented with a PDS-braid.⁵ The major disadvantage of using a hook-plate is that it must be removed, which results in an additional surgical procedure.

Conclusions

The stabilization of the AC-joint with the Weaver-Dunn procedure and augmented with a hook-plate is a valuable therapy option for patients with chronic AC-joint dislocation and spinal cord injury, especially as it allows for early post-operative movements of the shoulder. Early post-operative movements are essential for paraplegic patients because they depend on the upper extremity for their activities of daily living a wheelchair locomotion. In

this special cases the advantages of this approach can outweigh the risks associated with a second operation to remove the plate.

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