Intra-articular Olecranon Osteotomy and Adhesiolysis for Treatment of Post-traumatic Elbow Stiffness

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Learning Point of the Article:
Mixed intrinsic and extrinsic long standing elbow contractures can be safely and successfully treated by intra-articular olecranon osteotomy and adhesiolysis, along with utilization of indwelling catheter and infusion pump for post-operative pain management and for adequate rehabilitation.

Abstract

Introduction: Loss of motion is common in elbow trauma. Restoration of joint motion in post-traumatic stiff elbow can be a difficult, time consuming, and costly. We report a case of post-traumatic elbow stiffness treated with intra articular olecranon osteotomy and adhesiolysis.

Case Presentation: A 30-year-old female, with right dominant upper extremity, presented 13 months after operated well aligned right intra articular distal humerus fracture with right elbow stiffness. She had a fixed flexion deformity of 20 degrees with flexion arc of 20–30 degrees and completely free supination and pronation. She was unable to perform the activities of daily living with affected right upper extremity. Intra-articular chevron olecranon osteotomy and adhesiolysis were done for the post-traumatic elbow stiffness. Immediate post-operative active and active assisted motion exercises of elbow joint were started. Indwelling infra clavicular catheter with continuous Ropivacaine infusion was kept for analgesia. At 6 month post-operative follow-up, she achieved 10–110 degree elbow flexion arc with completely free supination and pronation. She is able to perform the daily living activities with right upper extremity.

Conclusion: Many different methods of treating post traumatic stiff elbow have been described, intra articular olecranon osteotomy helps in addressing intrinsic and extrinsic pathology with better results.

Keywords: Adhesiolysis, elbow stiffness, intra articular, olecranon osteotomy, post-traumatic.

Introduction

The most common cause of elbow stiffness is trauma. Morrey et al. [1] found the functional arc of elbow motion during activities of daily living to be 100° for both flexion–extension (30° to 130°) and pronation–supination 50° in either direction. A stiff elbow has been defined as one with loss of extension of >30° and flexion of <120° [2]. Elbow stiffness results from pathology of bone, soft tissue, or a combination of both. Early rehabilitation, minimal immobilization, advances in surgical management, and basic science investigation are efforts to improve outcomes in the management of the stiff elbow. Several surgical techniques are described and the recommendation must be made in accordance with patient characteristics and demand, degree of limitation, and surgeon’s skill [3]. Arthroscopic and open surgical techniques can only access limited intra-articular pathology.

We performed an intra-articular chevron olecranon osteotomy and adhesiolysis for post-traumatic elbow stiffness. Early post-operative rehabilitation was started under continuous infusion of Ropivacaine through infra clavicular catheterization. Patient achieved 10–110 degrees of elbow flexion arc and free supination and pronation.

Case Report

A 30-year-old female, with right dominant upper extremity, presented 13 months after operated well-aligned right intra
Extrinsic stiffness was limited to soft-tissues or extra-articular processes. Intrinsic stiffness related to joint processes such as defective consolidation and degenerative joint diseases. Intrinsic contracture often presents an associated extrinsic component and is thus considered to be mixed contracture [5]. Kay described another classification [6] for elbow stiffness, based on the components involved in the process. In type I, there would only be isolated contracture of soft tissues. In Type II, there would be contracture of soft tissues associated with heterotopic ossification. In Type III, there would be contracture of soft tissues associated with a consolidated joint fracture, without dislocation. In Type IV, the contracture of soft tissues would be associated with defective consolidation of the joint fracture. In Type V, a cross-joint bone bar would be present. In this case, it was Mixed contracture (Intrinsic and extrinsic) by Morrey’s classification and Type III by Kay classification.

Intra-articular chevron osteotomy was planned so as to access and remove the intra-articular bony spurs. Fixation of olecranon osteotomy with modified tension band principle was planned to allow early rehabilitation. Procedure was done under infra clavicular block and indwelling catheter was kept for post-operative analgesia (Fig. 5). Patient was placed in a left lateral position and a routine posterior incision was made over right elbow. Medial and lateral skin flaps were raised.

Ulnar nerve was isolated and retracted with rubber tube. Chevron intra-articular osteotomy was done (Fig. 6). The proximal osteotomy fragment was retracted so as to expose the distal humerus articular surface and ulnohumeral joint. Posterior and anterior osteophytes limiting flexion and extension were removed (Fig. 7a, b). Fibrous tissue from the ulnohumeral joint excised thoroughly. Accessing anterior aspect of the ulnohumeral joint was made easy with intra-articular olecranon osteotomy without risk of damaging any
Intraoperative 10–110 flexion arc with free supination and pronation was achieved (Fig. 8a, b). Olecranon osteotomy was fixed with modified tension band principle (Fig. 9). Wound was closed in layers over a closed suction drain. Immediate post-operative active and active assisted elbow flexion, extension, supination, and pronation exercises were started (Fig. 10a, b).

Continuous Ropivacaine infusion through indwelling infra clavicular catheter was given along with intravenous analgesics (Fig. 5, 11). On 7th post-operative day, infra clavicular catheter was removed. Rehabilitation was continued under supervision for 2 months and unsupervised for later 4 months. Olecranon osteotomy united well after 3 months (Fig. 12). Patient was followed up every 15 days.

Six months and 1 year post-operative patient achieved 10–110 degrees of flexion arc (Fig. 13a, b). Free supination and pronation were possible. Patient was able to perform all activities of daily living.

**Discussion**

Post-traumatic stiff elbow is challenging to treat, and thus, its prevention is of paramount importance. When this approach fails, non-operative followed by operative treatment modalities should be pursued. On initial presentation in those who have minimal contractures of 6-month duration or less, static and dynamic splinting, serial casting, continuous passive motion, occupational or physical therapy, and manipulation [7, 8] are non-operative treatment modalities that may be attempted. A stiff elbow that is refractory to non-operative management can be treated surgically, either arthroscopically or open [9, 10] to eliminate soft-tissue or bony blocks to motion. Various approaches have been described for open surgical procedures as anterior capsulotomy [11], lateral approach [12, 13], medial approach, and distraction arthroplasty [14]. None of these are successful in removing intra-articular bony spurs and fibrous tissues completely. These arthroscopic [15] and open procedures are associated with the risk of neurovascular damage.

Intra-articular olecranon chevron osteotomy has advantage of better exposure of the ulnohumeral and radio humeral joint. Hence, extra-articular and intra-articular bony and fibrous obstacles to movements can easily be removed from anterior as well as posterior aspect of the joint. There is no risk of damaging neurovascular structure. Fixation of olecranon osteotomy with modified tension band principle has advantage of allowing early mobilization of the joint with lesser chance of non-union of osteotomy compared to other fixation modalities. Early rehabilitation has better long-term results in terms of improved flexion arc of elbow, supination, pronation, and early return to activities of daily living.
Conclusion

Over the past 20 years, dramatic changes in the approach toward post-traumatic elbow stiffness have been documented. A better understanding of pathological abnormalities and joint biomechanics has made it possible to develop more appropriate surgical techniques. Nevertheless, the post-operative results depend on the disease extent, treatment used, and surgeon's experience.

We believe that mixed intrinsic and extrinsic long-standing elbow contractures can be safely and successfully treated by intra-articular olecranon osteotomy and adhesiolysis. These patients have better functional outcome and early return to activities of daily living.

Clinical Message

Post-traumatic stiff elbow is challenging to treat, and thus, its prevention is of paramount importance. When this approach fails, non-operative followed by operative treatment modalities should be pursued.

Over the past 20 years, dramatic changes in the approach toward post-traumatic elbow stiffness have been documented. Better understanding of pathological abnormalities and joint biomechanics has made it possible to develop more appropriate surgical techniques. Nevertheless, the post-operative results depend on the disease extent, treatment used, and surgeon's experience.

We believe that mixed intrinsic and extrinsic long standing elbow contractures can be safely and successfully treated by intra-articular olecranon osteotomy and adhesiolysis, along with utilization of pain pumps is a unique addition in the management of post-operative pain and for adequate rehabilitation. These patients have better functional outcome and early return to activities of daily living.

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