Outcomes of Percutaneous K-Wire Fixation for AC Joint Separation Type lll

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Objective: *To determine the efficacy of the Percutaneous K-wire for Acromio-clavicular joint separation type III.*

Material and Method: *A retrospective chart review of patients who underwent AC joint separation type III by the interested technique during 1993-2009 at department of orthopaedic, Police General Hospital, was done. Only patients with sufficient data recorded were included in the analysis. These patients were placed in the lateral decubital position under general anesthesia. Percutaneous K-wire fixation started after the dislocated AC-joint had been closely reduced under image-intensifier control. Two K-wires (2.0mm) were inserted into the prominent part of acromial process or scapular spine into the distal clavicle. Post-operative sling was subsequently used to limit the heavy duty.*

Results: *Twenty-one patients were included in the analysis, with the mean follow-up duration of 19 weeks (4-135). Painless at full range of shoulder motion was obtained in twenty patients There was only one patient had limitation of abduction (150 degrees abduction). The mean Neer's shoulder score was 94.25 points (50-100). Only 3 cases had unsatisfied outcomes results during the study period.*

Conclusion: *The percutaneous K-wire fixation for the AC-joint Separation was found to be efficacious and safe at an economical cost.*

Keywords: *Percutaneous, Close technique, K-wire fixation, AC joint, separation, Acromio, Clavic*

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The treatment of A-C joint separation type III is still controversial between the Non-operative treatment and the operative treatment. The Non-operative treatments including adhesive strapping, sling, bandages, brace, traction, pressure dressing, and plaster cast were reported having a good outcomes but it yet has many downsides such as skin pressure and ulceration, recurrence of deformity, 8-week sling or brace wearing, poor patient compliance, less interference with activities of daily living, shoulder and elbow motion, soft tissue calcification, late acromio-clavicular arthritis, late muscle atrophy, weakness, and fatigue[1-4].

Previous studies recommended the use of operative treatment for A-C joint separation typeIII, especially in young active adult whose shoulders are regularly utilized[5-7]. These operative approaches can be classified as intra-articular acromio-clavicular fixation, extraarticular coraco-clavicular repairs and ligament reconstruction[8]. Comparing to non-operative treatment, the operative treatment still has comparable complications such as infection, anesthetic risk, hematoma formation, scar formation, recurrence of deformity, breakage or loosening of sutures, erosion or fracture of the distal clavicle, postoperative pain with limited motion, second procedure for removal of fixation, late acromioclavicular arthritis, and soft tissue calcification[9,10].

This study is aimed to demonstrate the clinical efficacy of Percutaneous K-wire fixation as a treatment of A-C joint separation type III.

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Material and Method

Study design

A retrospective chart of patients who underwent the A-C joint separation type III by Percutaneous

K-wire fixation technique during 1993-2009 was carried out. The study setting is the orthopedic department, Police General Hospital. The eligible patients to be included in the study were those who had injury of the shoulder had x-ray diagnosis of A-C joint separation type III and have been differentiated from A-C joint separation type II by the traction or weighting film according to Rockwood's classification[8].

Operative techniques

All patients had the general anesthesia and were in bed in the lateral ducubitus position (Fig. 1). After scrub and drape, the patient's arm can still freely move. The anatomical reduction can be done by the pressing the clavicle and lifting up the arm. The C-arm image intensifier was used to confirm that the A-C joint is anatomical reduction.

Fixation was done by using a 2.0 mm K-wire tied in the small air drill and inserted from the Acromium across the A-C joint to the distal clavicle (Fig 2). We used a 2.0 mm K-wire because the smaller K-wire was found to be difficult in controlling the direction while the bigger K-wire was considered too large for Asian people and may cause fracture in the distal clavicle. Inserting K-wire across the A-C joint created a good anatomical fixation although the distal clavicle was thin as a paddle and this may be not an easy insertion even in a well-experienced surgeon. This can easily insert to the side of the distal clavicle which is larger (KW line in Fig. 3).

A K-wire should be penetrated out the distal cortex intended for good stability and when the K-wire was broken, it can be easily removed. In addition, a K-wire should not be prominence at the skin as it can cause pain. After K-wire fixation, the stability and ROM should be examined by the traction and C-arm image intensifier check to prevent entrapment of the soft tissue.

A K-wire was bended perpendicularly to the skin and at the deepest cutting point to avoid painful K-wire or infection caused by the penetration of K-wire to the skin. When a K-wire penetrated to the skin, to dressing in order to wipe out the contamination became difficult if it is not perpendicularly inserted to the skin. The second K-wire was inserted in the same manner but should divert intended for good stability. In case of the first K-wire was not properly inserted, the shoulder was held on to temporary splint. After the second K-wire was correctly inserted it can be changed to the good position (Fig. 4).

Fig. 1 The patient was put in the lateral decubitus position. The drawing outline demonstrates the bony prominent of the distal clavicle and the acromium

Fig. 2 Anatomical reduction of the A-C joint when the nurse assistant presses down the clavicle and lifts up the arm. The surgeon inserts the 2.0 mm. K-wire from the acromium into the distal clavicle between the index and long finger

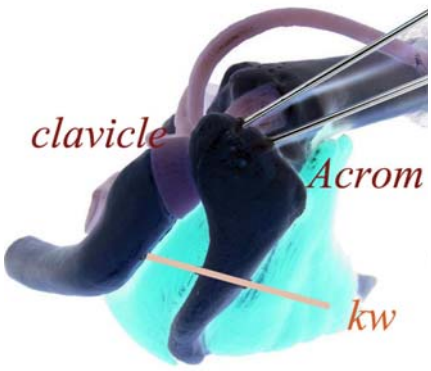

Fig. 3 The insertion of K-wire from the acromium to the thin distal clavicle. (The alternative point can be varied up to the KW line)

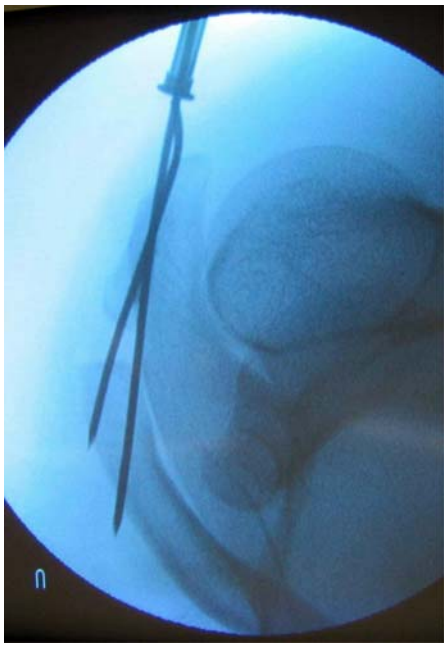

Fig. 4 Image from the C-arm image intensifier showing the second K-wire insertion

The surgical hole should be sealed and then put the arm in the arm-sling. The patients were advised to having the Pendulum Exercise. The elevation of the arm was prohibited for two months and the intense activities should be avoided for three months.

Neer's evaluation

The Neer's score was evaluated during the follow-up examination[11]. Total 100 points were measured in the following aspects: (1) Pain 35 points, (2) Function 30 points, (3) Range in Motion 25 points, and (4) Anatomy 10 points. The evaluation was categorized into 4 groups which included excellent (> 89 points) ,satisfactory (80-89 points), unsatisfactory (70-79 points), and failure (< 70 points).

Results

There were total 21 cases (19 males and 2 females) who underwent the A-C joint separation type III by the Percutaneous K-wire fixation. Average age was 29.15 (22-40) years. All were caused from traffic accidents. An average follow-up period was about 19 weeks (4-13weeks). Mean Neer's shoulder score was 94.25 points (50-100). 18 of 21 cases had excellent and satisfactory outcomes. Only 3 cases had unsatisfied clinical outcomes and suffered from the significant complications as described below. The minor unsatisfied outcomes were related to the prominence of the K-wire but all were much improved after the removal of K-wire at the end of the treatment.

Pin tract infections (2 cases)

This is due to the K-wire was not buried underneath the skin. The first case had waited for 2 months and had satisfactory results. The A-C joing fusion was performed in the second patient as he preferred more assured results.

Pin Migration and loss of reduction (1 case)

This patient did not use an arm sling and early exercised his arm. This case then was re-performed percutaneous K-wire fixation and finally had the clinically satisfied result.

Recurrence (1 case)

The removal of K-wire was done at 8th week and the patient went back to routine work. Similarly to those cases with pin tract infections, the A-C joint fusion was performed.

Discussion

Nowadays the efficacy of the A-C joint separation type III treatment is still debated. Some studies reported the clinically satisfactory result by conservative treatments, however, the late pain associated with the A-C meniscus tear, soft tissue inter pose, and joint laxity was occurred in 17-28%[1-3]. Various operative treatments have been reported having the residual pain, redislocation as significant complication after both of coracoclavicular and acromioclavicular fixation roughly 9-28%, 9-11% and 5% respectively[4,12,13]. Previous studies reported experiences of using the open K-wire fixation with repair of the deltoid and the Trapezius and tthe percutaneous pinning joint with the plaster bandage for 6 weeks[7,14].

In this study we used the percutaneous K-wire fixation and sling which seemed to be able to decrease the complications of the operative and conservative treatments[15]. Based on this technique, not only the advantage of operative treatment was still reserved but the wound was also minimal resulting in less pain and short length of stay in the hospital. To avoid the pin tract infections and recurrence, we learned that the K-wire should be deeply buried in the skin and the delay removal of K-wire should be done in patients whose shoulder was heavily used.

Table 1. Neer's shoulder score

1. Pain (35 units)	
a. None, Ignores	35
b. Slight, occasional, no compromise in activity	30
c. Mild, no effect on ordinary activity	25
d. Moderate, tolerable, makes concessions, use aspirin	15
e. Marked, serious limitations	5
f. Totally disabled	0
2. Function (30 units)	
a. Strength	
Normal	10
Good	8
Fair	6
Poor	4
Trace	2
Zero	0
b. Reaching	
Top of head	2
Mouth	2
Belt buckle	2
Opposite axilla	2
Brassiere hook	2
c. Stability	
Lifting	2
Throwing	2
Pounding	2
Pushing	2
Hold overhead	2
3. Range in Motion (25 units)	
Flexion (sagittal plane)	
180	6
170	5
130	4
100	2
80	1
less	0
Extension	
45	3
30	2
15	1
less	0
Abduction (coronal plane)	
180	6
170	5
140	4
100	2
80	1
less	0
External rotation (from anatomical position with elbow bent)	
60	5
30	3
10	1
less	0
Internal rotation (from anatomical position with elbow bent)	
90 (T-6)	5
70 (T-12)	4
50 (L-5)	3
30 (gluteal)	2
less	0
4. Anatomy (10 units) (rotation, angulation, Joint incongruity, retracted tuberosities, failure metal, myositis, non-union, avascular necreosis)	
None	10
Mild	8
Moderate	4
Marked	0 to 2
Total points	100

Excellent = above 89 units, Satisfactory = 80 units, Unsatisfactory = 70 units, Failure = below 70 units

Efficacy of the percutaneous K-wire fixation should be further studied in more number of patients and with sufficiently long follow-up duration. Besides, the standard treatment at early days of treatment with an aim to reduce the complications during learning curve and the well-described advice giving to patients before discharge are needed.

Conclusion

The outcomes of the percutaneous K-wire fixation for the AC-joint Separation were found to be efficacious and clinically encouraged.

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Table 2. Compare ORIF problem and the percutaneous K-wire fixation

ORIF Problem	Percutaneous K-Wire fixation
(1) Infection	(1) Infection is less because of smallest exposure
(2) Anesthetic risk	(2) Anesthetic risk is less because of less operation time
(3) Hematoma formation	(3) Hematoma formation is less because of less tissue trauma
(4) Scar formation	(4) Scar formation is less because of smallest wound
(5) Recurrence of deformity	(5) Recurrence of deformity maybe the same
(6) Metal breakage, migration, and loosening	(6) Maybe the same
(7) Breakage or loosening of sutures,	(7) Breakage or loosening of sutures because of not open
(8) Erosion or fracture of the distal clavicle	(8) Erosion or fracture of the distal clavicle is less because of less trauma to the blood supply
(9) Postoperative pain and limitation of motion	(9) Postoperative pain and limitation of motion is less because of less trauma
(10) Second procedure required for removal of fixation	(10) Second procedure for removal of fixation is easier
(11) Late acromioclavicular arthritis	(11) Late acromioclavicular arthritis maybe the same
(12) Soft tissue calcification	(12) Less soft tissue calcification

Table 3. Compare disadvantage of nonsurgical (conservative) treatment and thepercutaneous K-wire fixation

Disadvantages of nonsurgical treatment	Percutaneous K-Wire fixation
(1) Skin pressure and ulceration	(1) Skin pressure and ulceration because of no need to pressure
(2) Recurrence of deformity	(2) Recurrence of deformity maybe less because of well tolerate of the patient
(3) Necessity of wearing the sling or brace for 8 weeks	(3) Wearing the sling or brace for 8 weeks not for all the time
(4) Poor patient cooperation	(4) Patient cooperation is better
(5) Interference with activities of daily living	(5) Less interference with activities of daily living
(6) Loss of shoulder and elbow motion (in older patients)	(6) Shoulder and elbow motion is better
(7) Soft tissue calcification	(7) Soft tissue calcification maybe the same
(8) Late acromioclavicular arthritis	(8) Late acromioclavicular arthritis maybe the same
(9) Late muscle atrophy, weakness, and fatigue.	(9) Late muscle atrophy, weakness, and fatigue maybe the same

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ผลการรักษาข้อกระดูกไหปลาร้าหลุด ด้วยการผ่าตัดแบบแผลเล็กโดยการแทงด้วยแท่งลวด

พีระชัย ดำรงวานิช, พีระพงษ์ ปิยพิทยานันท์

วัตถุประสงค์*: เพื่อประเมินผลการผ่าตัดแบบไม่มีแผล โดยวิธีแทงลวด (percutaneous K-wire fixation) ในการรักษาผู้ป่วยข้อต่อไหปลาร้าเคลื่อน ระดับที่สาม (acromio-clavicular joint separation type3) ซึ่งเป็นการรักษาแบบทางสายกลาง ที่ลดภาวะแทรกซ้อนที่อาจเกิดจากการผ่าตัดเปิดแผลใหญ่ ลดความทรมานจากการรักษาแบบไม่ผ่าตัด*

วัสดุและวิธีการ*: การศึกษานี้เป็นการทบทวนเวชระเบียนของผู้ป่วยย้อนหลัง ในช่วงปี พ.ศ. 2536-2552 โดยพิจารณาผู้ป่วยที่พบว่ามีกระดูกไหปลาร้าเคลื่อนได้รับการประเมินด้วยการเอกซเรย์ถ่วงน้ำหนัก และได้รับการผ่าตัดด้วยการดมยาสลบและนอนตะแคง การแทงแท่งลวด ขนาดเส้นผ่าศูนย์กลาง 2.0 มม. ผ่านกระดูก acromium ทะลุกระดูกไหปลาร้าให้ปลายอยู่ใต้ผิวหนัง ควบคุมด้วยเครื่องเอกซเรย์ หลังผ่าตัดให้แขวนแขน ห้ามทำงานหนัก*

ผลการศึกษา*: ผู้ป่วยที่มารับการรักษาที่โรงพยาบาลตำรวจ ได้รับการผ่าตัดด้วยวิธีการดังกล่าว มีจำนวน 21 คน อายุเฉลี่ย 29.15 ปี (ช่วงอายุ 22-40 ปี) ติดตามผลได้ เฉลี่ย 19 สัปดาห์(4-135) ผลการประเมินโดยใช้ Neer's shoulder score ได้ค่าเฉลี่ย เท่ากับ 94.25 คะแนน (50-100) การประเมินผลการรักษาหลังผ่าตัดพบว่าได้ผลดีในผู้ป่วยจำนวน18 คน และผลไม่น่าพอใจ 3 คน จากการรักษาระยะแรก*

สรุป*: การผ่าตัด percutaneous K-wire fixation ใน A-C joint separation type3 เป็นเทคนิคการผ่าตัดที่มีประสิทธิผล, ปลอดภัย*