

원위 쇄골 골절 2a 형에서의 경피적 환상 강선 고정술 -1례 보고-

포천중문의대 분당차병원 정형외과학교실, 구미차병원 정형외과학교실*

김재화** · 이순철 · 조덕연 · 윤형구 · 이윤석*

- Abstract -

Percutaneous Cerclage Wiring in Distal Clavicle Fracture Type 2a - One Case Report -

Jae-Hwa Kim, M.D. Ph.D.** , Soon-Chul Lee, M.D., Duck-Yun Cho, M.D. Ph.D.,
Hyung-Ku Yoon, M.D. Ph.D. and Yoon-Seok Lee, M.D.*

*Department of Orthopaedic Surgery,, Bundang CHA Hospital, College of Medicine, Gumi CHA Hospital
Pochon CHA University, Sung-Nam, Korea*

Distal clavicular fracture frequently requires operative treatment due to high rate of non-union. The operative technique includes the tension band wiring, K- wire fixation, and cerclage wiring etc. Each method has disadvantages somewhat like pin migration or acromioclavicular joint injury and so on. For the distal clavicular fracture type 2a, because of its oblique fracture line, the cerclage wiring is suitable. We performed the cerclage wiring percutaneously under minimal incision without injury to periosteum for the patient who had the distal clavicular fracture type 2a, and the result was favorable.

Key Words: Distal clavicular fracture, Cerclage wiring, Percutaneous

Clavicle fractures are common injuries in both children and adults¹⁾. In the distal clavicle fracture type 2, operative treatment is recommended due to high rate of non-union³⁾. There are many operative

methods such as K-wire fixation, tension band wiring, plating, etc. Almost of these need the open of the fracture site and percutaneous K-wire fixation has the disadvantage of the pin migration. The pur-

※통신저자: 김 재 화**

경기도 성남시 분당구 야탑동 351번지

중문의대 분당차병원 정형외과학교실

Tel: 031) 780-5289, Fax: 031) 708-3578, E-Mail: drjkim@dreamwiz.com

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pose of this study is to introduce the new surgical technique of percutaneous cerclage wiring in the distal clavicle fracture type 2a.

Case report

The patient was 25 year old male who suffered from the distal clavicle fracture type 2a (Fig. 1). We performed the cerclage wiring percutaneously under the C-arm intensifier guide. After the operation, we evaluated the outcomes such as, operation time, bony union, wound problem, and skin irritation symptom.

Operation procedure and results

Under the brachial plexus block anesthesia, the patient was placed supine on



Fig. 1. Preoperative plain radiography shows the distal clavicular fracture type 2a.

the routine operation table with the affected left shoulder draped aseptically. We made two 0.5 cm sized skin incision cross the fracture site along the Langer line. We loaded the wire at the wire passer. At first, the wire passer was inserted beneath inferior cortex of the distal fragment site from the posterior to the anterior (Fig. 2). Then the wire passer was inserted above the superior cortex of proximal fragment, and was removed from wire (Fig. 3-4). The end of wire was fastened and the fracture line was reduced (Fig. 5). The same procedure was performed for the distal portion of fracture site. And the two knot of wire were placed beneath the skin. Anatomical reduction was achieved (Fig. 6). Surgical wound was closed (Fig. 7). Velpeau bandage was applied.

The operation time from incision to wound closure was 20 minutes. The fracture site was firmly fixed. There was no wound problem and skin irritation sign. The radiological bony union was documented at 8 weeks postoperatively (Fig. 8).

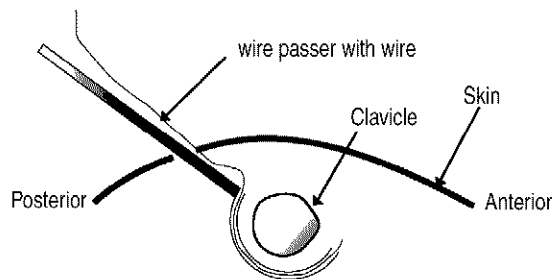


Fig. 2. The wire passer with wire is inserted beneath lower cortex of fracture site from posterior to anterior.

Discussion

Neer and Rockwood subclassified the distal clavicle fracture into 3 types⁹⁾. Type 1 fractures are minimally displaced and occur lateral to an intact coracoclavicular ligament complex. These fractures may be treated nonoperatively and symptomatically. Type 2 fractures occur when the medial fragment is separated from the coracoclavicular ligament complex. The medial fragment is displaced cephalad by the pull of the sternocleidomastoid muscle, and the distal fragment is displaced caudally by the weight of the upper extremity with the intact coracoclavicular ligament complex. The resulting deformity leads to a marked displacement of the fracture ends, predisposes this fracture type to a higher incidence (up to 30%) of nonunion¹⁾. And type 2 fracture can be divided into 2 groups, type 2a in which both conoid and trapezoid ligaments are intact and usually fracture line is oblique, and type 2b in which conoid ligament is torn but trapezoid ligament is intact, consequently the fracture line is more vertical than type 2a. Type 3 fractures are nondisplaced and extend into the acromioclavicular (AC)

joint. As with type 1 fractures, these injuries can be treated symptomatically^{8, 10)}.

Clavicle midshaft fracture can be treated conservatively. However, in the type 2 distal clavicle fracture, because of the rotational movement through the fracture, nonunion rate is upto 20~30%. Furthermore it can cause the chronic pain and functional limitation. So operative treatment is usually recommended⁹⁾. There are many surgical techniques including distal clavicle excision, K-wire fixation, cerclage wiring, tension band wiring, small T-plate, Hook plate fixation, coracoclavicular ligament screw fixation, PDS Suture banding, and the method using Knowles pin or Dacron^{4, 7)}. However it is arguable which method can definitely fix the small distal fragment firmly without damage to acromioclavicular joint.

Through acromioclavicular K-wire fixation is most commonly performed procedure, it is simple and easily performed, but osteoarthritic change and ankylosis can be followed³⁾. So extra-articular technique which spares the acromioclavicular joint was introduced by Kao et al at 2001³⁾. However the migration or disrup-

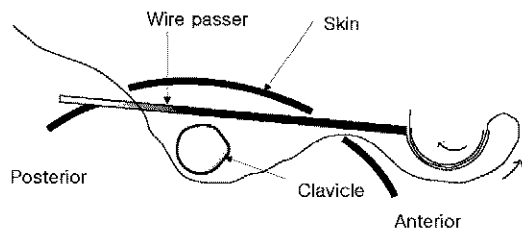


Fig. 3. The wire is guided to above the upper cortex of clavicle by wire passer.

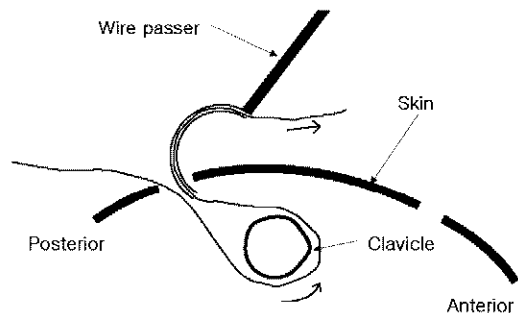


Fig. 4. The wire is guided to above the upper cortex of clavicle by wire passer.

tion of K-wire remains unchanged and it can't withstand the banding force effectively. Furthermore the K-wire fixation is usually technically difficult, if the distal fragment is very small.

Kona et al reported the result of K-wire fixation for distal clavicular fracture before. Non-union and infection were reported in 46% and 32% respectively among 13 patients who were treated with K-wire⁵.

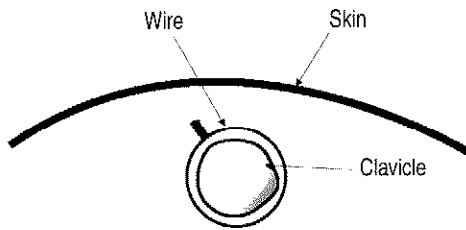


Fig. 5. We fastened the end of wire and entwined with the fracture site.

For firm fixation of the distal fracture fragment, Craig said that the Knowles pin could be used. Because of its compressibility, the fracture site does not widen and no pin migration occurs which can be happened in the K-wire fixation. But it is also the trans-articular technique. The acromioclavicular arthritis

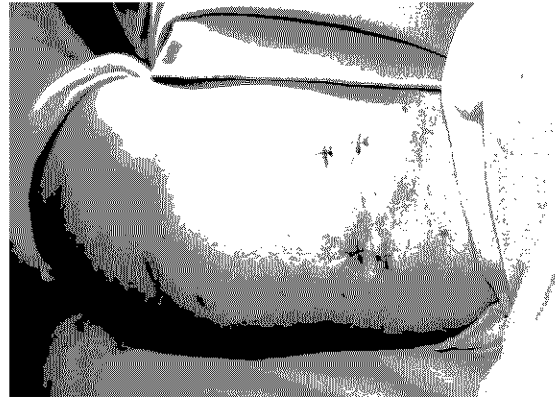


Fig. 7. Gross photo shows the incision after operation.



Fig. 6. Postoperative plain radiography shows the cerclage wiring was performed.



Fig. 8. At 8 weeks postoperatively, radiologic bony union is shown.

can't be prevented²⁾.

Someone uses the plate, but it can't lock up the fracture site firmly compared to the wiring because of small distal fragment, and sometimes the screws can be pulled out. According to Zenni et al, the major possible cause of nonunion is due to extensive soft tissue dissection and periosteum stripping¹²⁾. In that situation, plate fixation can aggravate the nonunion. Furthermore plate sometimes irritates the skin and it needs one more operation.

Coracoclavicular ligament screw fixation is good for minimal incision. However, from time to time it is technically demanding. The reduction is judged only by palpation intraoperatively, and rigid fixations over fracture site were not provided⁹⁾. Tension band wiring is simple and useful, but has some disadvantages that are seen using K-wire fixation.

In the case of oblique fracture like type 2a, cerclage wiring is suitable¹⁰⁾. It can be performed easily and does not injure to the acromioclavicular joint. Nowadays minimal invasive surgery is our concern with many advantages, including minimal periosteal injury, less blood loss, superior cosmetic appearance, diminished post-operative pain, less damage to muscle and skin, faster and easier rehabilitation, quicker return to normal activities. Levy et al introduced the minimally invasive technique with the PDS tension band which was introduced to the fracture fragment via drill hole in the treatment of the Neer type 2 clavicle fracture in 2003⁶⁾. We performed the percutaneous cerclage wiring under minimal incision. Technically it was not complicated and the operation time was not so long. It provided mechanically sound fixation of the

fracture with no extensive dissection near neurovascular structure, and the result was favorable.

In the operative treatment of the distal clavicle fracture 2a, it should be considered the soft tissue condition, fracture line, amount of comminution and surgeon's experience etc. There is no definite treatment in the distal clavicle fracture type 2a. However our technique can be a good choice in type 2a fracture.

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