



## **Bilateral clavicle non-unions treated with anteroinferior locking compression plating (LCP) A case report**

Peter KLOEN

*From the Academic Medical Center, Amsterdam, The Netherlands*

**The author reports the case of a 30-year-old female patient with bilateral atrophic non-union of the clavicle ; the latter both healed after internal fixation with a locking compression plate fixed on the antero-inferior aspect of the clavicle, combined with autologous cancellous bone grafting. The advantages of the anteroinferior positioning of the plate on the clavicle are presented.**

### **INTRODUCTION**

The vast majority of clavicle fractures heal with non-operative treatment. However, for those 0.9-4% of patients that develop a painful non-union of the clavicle, numerous treatment options exist. This paper presents an unusual case of bilateral clavicular non-union which necessitated operative treatment. Using an anteroinferiorly placed locking compression plate (LCP) and bone grafting, both non-unions healed without sequelae.

### **CASE REPORT**

A previously healthy 30-year-old female sustained a fall from an elephant while vacationing in Nepal. She sustained multiple injuries including a right-sided hemothorax, a bilateral pneumothorax, a bilateral closed midshaft clavicle fracture and fracture of six ribs. She was initially treated at a local hospital. Non-operative treatment of her clav-

icle fractures was advised. She was transferred back to the Netherlands two weeks after the injury.

Two years later she presented with painful shoulders. She was limited in her activities and complained of pain over both clavicles. On physical examination she was noted to have a painful mobile non-union of both clavicles. There was no evidence of infection or neurovascular compromise in the upper extremities. Radiographs revealed bilateral atrophic nonunions of the clavicles (fig 1).

Both clavicle non-unions were treated similarly in two separate operative procedures. For both procedures, the patient was placed in the beach-chair position with the ipsilateral iliac crest prepped and draped. No antibiotics were given until the results of deep cultures were obtained. The incision was made slightly inferior to the lower border of the clavicle. Dissection was carried down to bone with care being taken not to injure the subclavian vessels or the anterior divisions of the brachial plexus. As

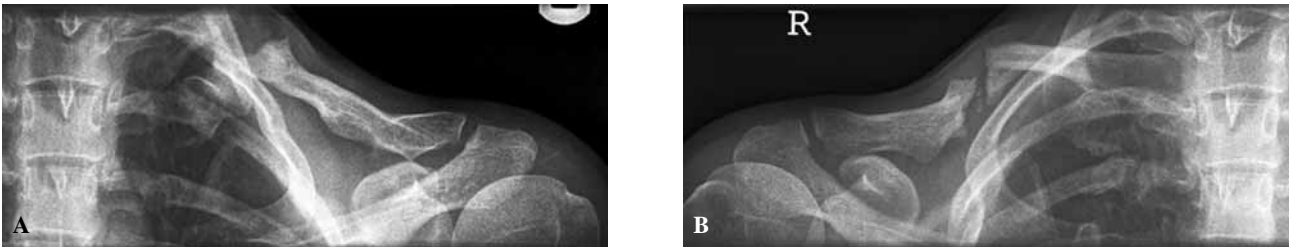
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■ Peter Kloen, MD, Consultant Orthopaedic Surgeon.  
*Department of Orthopaedic Surgery, Academic Medical Center, Amsterdam, The Netherlands.*

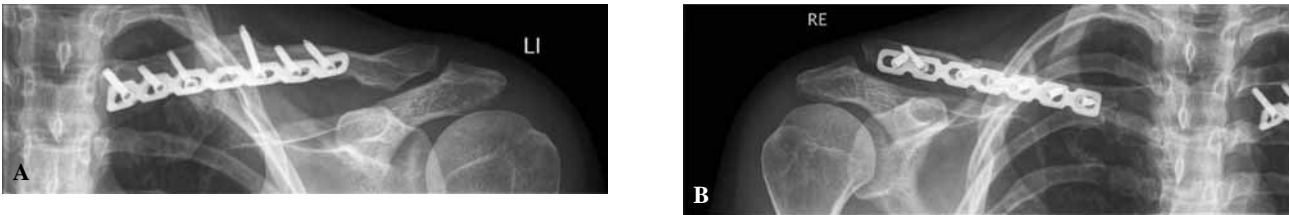
Correspondence : Peter Kloen, Department of Orthopaedic Surgery, Academic Medical Center, Meibergdreef 9, 1100 DD Amsterdam, The Netherlands. E-mail : p.kloen@amc.uva.nl.

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**Fig. 1.** — Anteroposterior radiographs showing the left (A) and right (B) midshaft clavicle non-union



**Fig. 2.** — Anteroposterior radiographs taken at one-year follow-up show healing of the left (A) and right (B) clavicle non-union

the non-union was encased in scar tissue and fibrosis, we started the dissection medial to the non-union, to locate healthy bone. The dissection was also extended laterally. From these “safe zones” the non-union was carefully dissected free, but no dissection was performed on the superior border of the clavicle. The non-union was debrided from intervening scar tissue, grasped at both ends with pointed reduction clamps and the medullary canals on each side of the non-union were opened using a 2.5 mm drill. A 7-hole straight titanium 3.5 mm LCP plate (Mathys, Bettlach, Switzerland, the Netherlands) was then contoured to fit on the anteroinferior aspect of the clavicle. The plate was first fixed laterally, after which the non-union was reduced and bridged with the plate. Finally, cancellous bone graft from the iliac crest was harvested and placed around the non-union site after local decortication with an osteotome.

Postoperatively the patient was placed in a sling for 10 days, after which exercises were begun.

Both non-unions healed within 2 months. At one year follow up, the patient denied any pain or limitations of her shoulders and she had full range of motion of both shoulders. Radiographs showed healing of the non-union (fig 2).

## DISCUSSION

Fractures of the clavicle are common, representing about 44% of all shoulder injuries. Most of these fractures involve the midshaft and heal with nonoperative treatment (1). Indications for operative treatment of acute clavicle fractures are relatively scarce, and the incidence of clavicle non-union is relatively low (ranging from 0.9 to 4%) (1, 2). When it does occur, however it often results in significant deformity and discomfort for the patient. Several factors are known to predispose to the development of a clavicle non-union: open fracture, comminution, displacement, initial shortening greater than two centimetres, insufficient length of immobilisation, operative treatment, and refracture. The pain complaints range from a mild aching during overhead activities to severe and disabling resting pain. Neurovascular symptoms may be present, ranging from mild dysesthesias or paraesthesias to a full-blown thoracic outlet syndrome with a decreased peripheral pulse and/or venous congestion. Bilateral clavicle non-unions are extremely rare given the low incidence of bilateral fractures (less than 0.2% (5)) and their high union rates. Only three cases of bilateral clavicle

non-union (of which one was treated nonoperatively) have been described to the best of our knowledge (2, 5, 6).

Numerous techniques have been described for the treatment of non-unions of the clavicle, including pins and wires, intramedullary fixation, single or double plates and screws, (partial) cleidectomy, and external fixation (1, 3, 7). A recently described modification of the standard clavicle plating technique seems to reliably minimise the complications and to reduce the need for secondary surgeries previously reported (4). The proposed anteroinferior positioning of the plate on the clavicle has several benefits. The lateral fragment is lifted up to the medial fragment and supported like a shelf rather than being suspended from cephalad by screws. Also, screw length aiming from anteroinferior to superoposterior is longer, and therefore provides more holding power. There is also no risk of penetrating the neurovascular structures beneath the clavicle. Lastly, the hardware is not prominent or painful, which essentially obviates the need for hardware removal. In our patient, we used a locking compression plate (LCP) with very good outcome. This plate has proven valuable in difficult scenarios with osteoporosis and revision surgery (8). These scenarios are often seen in clavi-

cle non-unions, and this case demonstrates how using an LCP can lead to a successful result.

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