

General

MIMINALLY INVASIVE OSTEOSYNTHESIS FOR BILATERAL CLAVICLE MIDSHAFT FRACTURES: A CASE REPORT

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Bilateral clavicle fractures are rare, with an overall incidence of 0.43%. Various treatment methods exist, but no consensus has been reached. We report a case of a 51-year-old male patient with bilateral midshaft clavicle fractures treated with minimally invasive Osteosynthesis. After 14 months of follow-up, bone healing and functional recovery were excellent. In conclusion, minimally invasive fixation is a viable alternative treatment for this fracture type, complementing established methods. The selection of a suitable minimally invasive fixation device should be individualized for each fracture type.

INTRODUCTION

Bilateral clavicle fractures are rare. Dongxu Feng¹ reported that bilateral clavicle fractures comprise 1% of all clavicle fractures. Based on published literature, Bout² reported an incidence of 0.43% among all clavicle fractures. High-energy trauma is the typical cause and may be associated with multiple injuries. Treatment options for these fractures include conservative management, open reduction and internal fixation with plates, intramedullary nails, or lag screws. However, no standardized approach has been established. This article aims to present a case where minimally invasive techniques were used for bilateral clavicle fracture.

CASE REPORT

A 51-year-old male fell off a motorcycle, striking his chest and shoulder against a roadside pole. He presented to the emergency department alert and responsive but severe pain, swelling, and deformity in both clavicle regions. Clinical examination revealed sharp pain and angulated deformities at the midshaft of both clavicles, positive bonny crepitus. No vascular, neurological, or associated injuries were noted. X-ray images showed a wedge fracture in the right clavicle's midshaft and a transverse midshaft fracture in the left clavicle ([Figure 1](#)).

TREATMENT AND OUTCOME

Two days post-trauma, the patient underwent surgical fixation under general anesthesia, positioned in the beach chair setup with a small pillow support under both shoulders. A combination of minimally invasive techniques was

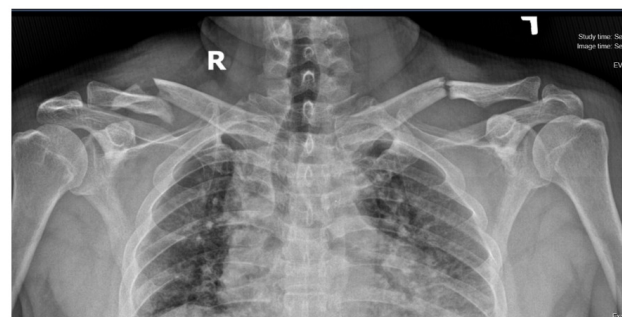


Figure 1. Right clavicle fracture with a wedge fragment and left clavicle fracture with a transverse fracture line.

employed for each clavicle, tailored to the specific fracture patterns ([Figure 2](#)).

Right Clavicle – Minimally Invasive Plate Osteosynthesis (MIPO): Two 2.5 cm incisions were made with one at the lateral end and one at the medial end of the clavicle, exposing the respective segments. A 10-hole locking plate was carefully tunneled subperiosteally across the fracture site to preserve the periosteal blood supply. A drill was used to create a hole at the lateral locking point of the clavicle, followed by using the drill to adjust the clavicle length under C-arm fluoroscopic guidance. Another hole was drilled at the medial locking point of the clavicle to secure the clavicle's length. Additionally, Kelly forceps could be used to subcutaneously manipulate the fracture site if needed. Guided by C-arm fluoroscopy, the plate was secured with cortical screws at both ends to restore clavicle length and alignment. Locking screws were then placed to ensure stable fixation.

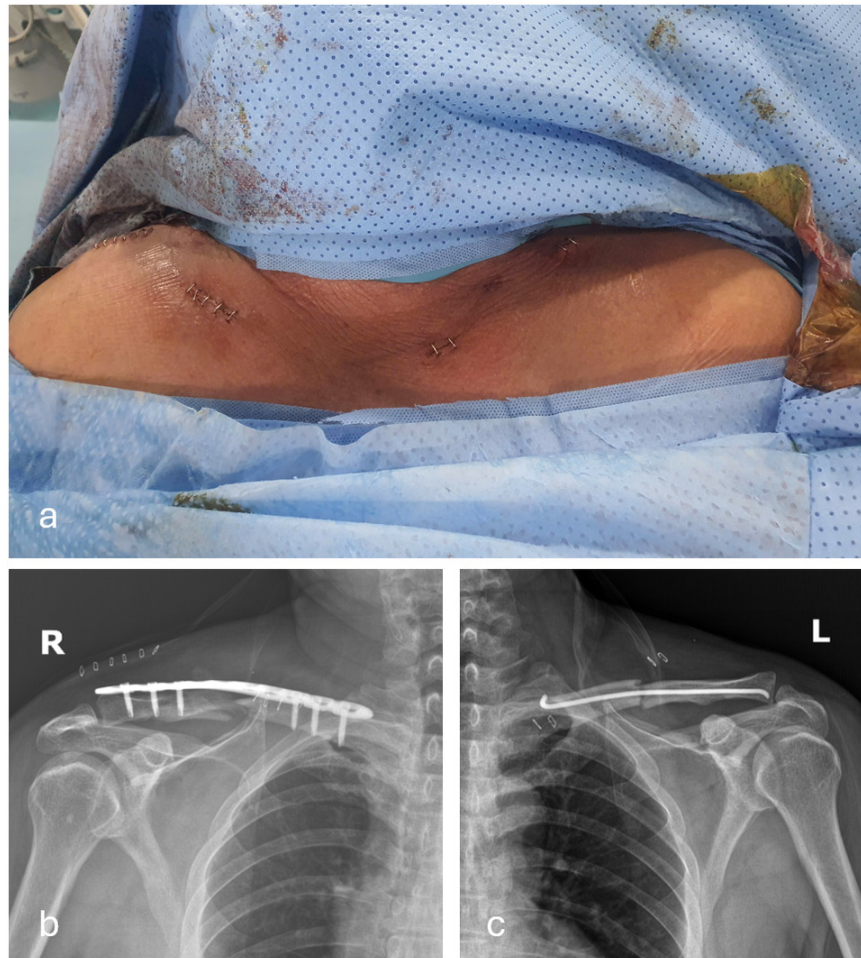


Figure 2. a: Surgical incisions for bilateral clavicle fractures; b: Postoperative X-ray of the right clavicle; c: Postoperative X-ray of the left clavicle.

Left Clavicle – Intramedullary Fixation Using Metaizeau Nail: A 1 cm incision was made medially to access the clavicular canal, where a 2.5 mm Metaizeau nail was inserted into the medullary cavity under C-arm guidance. A 0.5 cm incision was created over the fracture site to allow reduction using a Kirschner wire as a lever. Once alignment was achieved, the nail was advanced across the fracture site to provide internal stabilization.

At the first postoperative day, The patient experienced little pain and mobilized both shoulders gently without support. Radiographs confirmed progressive healing, with the right clavicle achieving union in 8 weeks and the left clavicle in 10 weeks. No complications, such as infection, implant failure, or neurovascular injury, were observed.

At the 14-month follow-up, complete bone healing was evident on X-rays. Functional assessments showed excellent recovery, with a Constant Score of 88 for the right shoulder and 90 for the left ([Figure 3](#)). The patient reported full return to daily activities without limitations.

DISCUSSION

Bilateral clavicle fractures are uncommon. Van den Bout² reviewed literature from 1887 to 2010, noting an overall incidence of bilateral clavicle fractures at 0.43% among all

clavicle fractures. Recent data by Dongxu Feng¹ reported a higher rate of 1% (15 cases in 1,542 fractures). The common cause of bilateral clavicle fractures is high-energy trauma. Frequently observed mechanisms of injury include compressive forces on both shoulder girdles, direct impact on both clavicles, or direct impact on one clavicle with indirect transmission of force to the opposite shoulder.²

Treatment options range from conservative methods to surgical interventions. Conservative management often leads to bilateral shoulder pain due to instability at the fracture site, a higher risk of nonunion, and prolonged immobilization.^{3,4} Surgical fixation reduces pain, promotes early mobilization, and particularly improves respiratory function in chest trauma patients.

Bonnevialle⁵ suggested external fixation for cases involving soft tissue compromise over the clavicles. While minimally invasive, this method can hinder daily activities and carries risks like pin site infection and malalignment. Open reduction and internal fixation (ORIF) using Kirschner wires^{6,7} or plates and screws^{1,8} provide stable fixation and restore anatomical alignment. However, these surgical techniques are invasive. In case of direct trauma, the skin overlying the fracture site is frequently compromised, posing challenges to soft tissue preservation during surgery. Furthermore, ORIF seems to not be suitable for



Figure 3. a: Anteroposterior chest X-ray after 14 months showing complete bone healing of the left and right clavicles. b: ROM in flexion and abduction of the injured shoulders after 14 months. c: ROM in internal rotation after 14 months. d: ROM in extension after 14 months."

comminuted fractures due to complicated reduction and disrupt the biomechanical environment necessary for optimal bone healing.

In this case, minimally invasive Osteosynthesis offered a viable alternative. For the wedge fracture in the right clavicle, plate fixation with MIPO was indicated. For the left transverse fracture with minimal displacement, intramedullary fixation using a Metaizeau nail was suitable. These techniques not only minimized soft tissue damage, preserved periosteal blood supply, maintained uncontaminated hematoma in fracture site but also provided relative stability for secondary bone healing. Moreover, minimally invasive techniques reduced surgical time, blood loss, and postoperative pain, enhancing functional recovery of shoulder and respiratory improvement.⁹⁻¹¹ The small surgical scars also improved cosmetic outcomes.

CONCLUSION

Bilateral clavicle fractures are rare, and no single treatment modality has been established. While open surgical techniques remain common, this case highlights the potential of minimally invasive fixation for treating these fractures

effectively. However, the choice of technique should consider fracture stability and device appropriateness.

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AUTHOR CONTRIBUTION

Nhat Pham Van: Conceptualising the plan for surgery, performing the surgery, follow up patient's recovery, writing the literature review for case report, reviewing the manuscript.

Hieu Nguyen Chi: Completing the manuscript, submission of the article, writing the literature review.

Xuan Tran Chanh, Giang Ho Hai Truong: Assisting in planning and in the surgery, writing the draft for case report.

Tuan Nguyen Anh: Assisting in planning and in the surgery, writing the literature review, taking note of post-operative functions.

Lam Tran Dinh: Assisting the surgery, analyzing the radiology.

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CONFLICT OF INTERESTS

We declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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