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Case Report

Successful management of a distal clavicular fracture using Titanium elastic nail (TEN) fixation [☆]

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ABSTRACT

This case report presents a unique instance of a 25-year-old male patient successfully treated with Titanium elastic nail (TEN) for a distal clavicle fracture, a method typically reserved for midshaft clavicle fractures. Distal clavicular fractures, constituting 12%-15% of all clavicle fractures, often necessitate surgical intervention to avoid complications such as malunion and persistent pain. While standard surgical therapies include Kirschner wire and hook plate fixation, this case explores the benefits of TEN, known for minimal tissue disruption and faster recovery. The patient, who suffered a severe left shoulder injury after falling, underwent a minimally invasive TEN procedure. Post-surgery, he showed a significant reduction in pain and improvement in shoulder mobility, with radiographic evaluations confirming successful fracture reduction and stable fixation. The case underscores the potential of TEN as a viable alternative for distal clavicular fractures, though further research is needed to establish comprehensive guidelines for its application.

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Introduction

Distal clavicular fractures are relatively common injuries, accounting for approximately 12%-15% of all clavicle fractures [1]. Surgical intervention is often required to achieve optimal functional outcomes and prevent complications such as malunion, nonunion, and persistent pain [2]. The standard surgical therapy for distal clavicle fractures involves inter-

nal fixation using techniques like Kirschner wire and hook plate [1].

However, alternative surgical approaches have been explored to enhance outcomes in these challenging fractures. One such alternative approach is the use of Titanium elastic nail (TEN), which is primarily employed in clavicle midshaft fractures. The TEN techniques offer several advantages, including minimal soft tissue disruption, shorter operative time, and early functional rehabilitation [3]. Nonetheless, the

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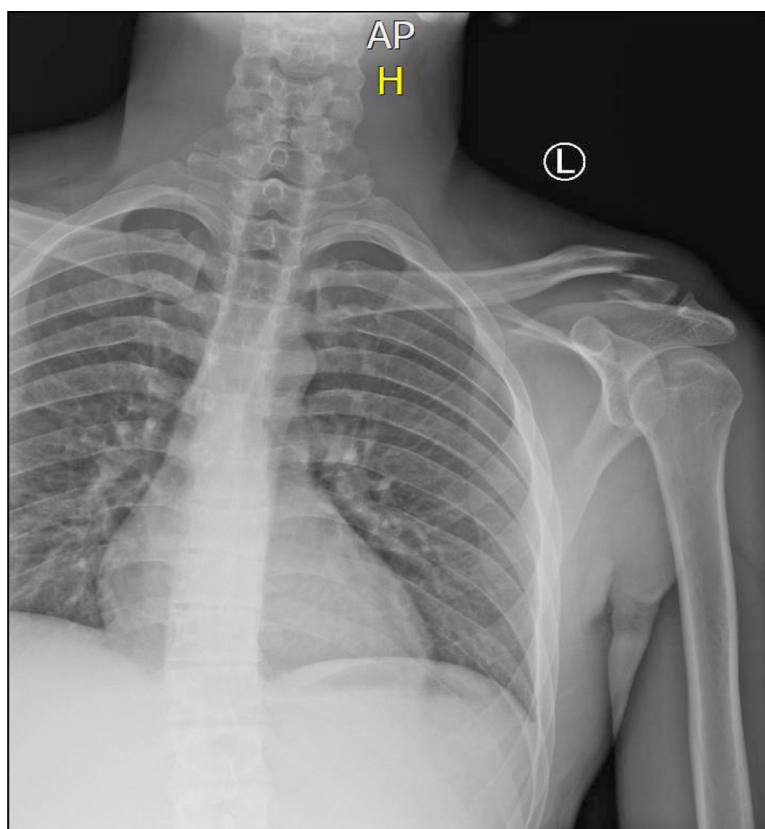


Fig. 1 – Preoperative anteroposterior radiograph of the left clavicle showing the distal fracture of left clavicle.

application of TEN in distal clavicle fractures remains limited, with only one known case reported in the literature [4].

This case report presents a unique case of a 25-year-old male patient with a distal clavicle fracture who was successfully treated with TEN, shedding light on the potential of this unconventional surgical approach.

Case presentation

Our case revolves around a 25-year-old male patient following a falling down on the floor in which his shoulder hit the ground. He was presented to An-Najah National University Hospital with severe left shoulder pain. Moaning in agony, the patient's pain intensified with any movement of his left shoulder. Upon visual inspection, mild bruising and swelling were evident over his left shoulder, indicating a possible underlying fracture.

An initial assessment, including a comprehensive history and physical examination, was conducted. The patient's medical history was unremarkable, with no significant comorbidities or previous shoulder injuries. To evaluate the extent of the damage, an X-ray examination was performed, revealing a fracture in the distal third of the clavicle, confirming the initial suspicion (Fig. 1). Arm sling was then used to be returned in 3 days.

Three days later, the patient returned to An-Najah National University Hospital to begin his recovery journey. The patient

was prepared for surgery, which was performed by qualified orthopedic surgeons. He was positioned in a beach chair position. A precise closed reduction was done with the use of C-arm, an imaging technology, a tiny medial incision was made above the clavicle to ensure the accurate insertion of the elastic nail into the fractured location. To reduce the danger of abnormalities, the nail alignment and fracture reduction were diligently evaluated using C-arm (Fig. 2).

The patient's vital signs were steady when he awoke from anesthesia. The arm was then placed in an arm sling and gently immobilized, acting as a therapeutic wrap during the healing process. The patient was sent home with explicit instructions and a follow-up visit arranged for 1 week later.

The patient's journey towards recovery following the surgery was met with success. At the 1-week follow-up appointment, the patient reported a significant reduction in pain and improvement in shoulder mobility. Clinical examination revealed a stable and well-aligned clavicle with no signs of instability or complications. Radiographic evaluation confirmed the satisfactory position and integration of the TEN, demonstrating successful fracture reduction and stable fixation (Figs. 3 and 4). There were no major complaints or adverse events.

Discussion

The management of distal clavicular fractures poses a unique challenge for orthopedic surgeons due to the complex



Fig. 2 – Postoperative anteroposterior radiograph of the left clavicle. The distal fracture of left clavicle was fixed with a TEN.



Fig. 3 – After 2 months postoperative axial radiographs of the left clavicle.

anatomy and inherent instability of the distal clavicle [5]. Traditional treatment methods, such as Kirschner wire and hook plate fixation, have been widely utilized as the gold standard [6]. However, the emergence of innovative techniques, such as TEN fixation, has shown promising results in optimizing outcomes and minimizing complications [4].

The biomechanical principle underlying TEN involves the symmetrical bracing effect achieved by inserting these nails into the metaphysis [7]. Here, they exert pressure against the internal bone structure at 3 distinct points. This technique provides immediate stability to the affected bone segment, enabling patients to mobilize early and resume their normal activities with a minimal risk of complications [7]. While TENs may not provide substantial axial and rotational stability, they offer relative stability conducive to secondary bone healing [7].

In our case report, we successfully managed a distal clavicular fracture in a young patient using TEN fixation. The TEN technique offers several advantages that make it an appealing alternative to traditional fixation methods. First and foremost,

TEN fixation is a minimally invasive procedure that preserves the surrounding soft tissues. This leads to reduced postoperative pain, faster recovery, and improved patient satisfaction compared to more invasive techniques. Furthermore, TEN fixation allows for early initiation of active range of motion exercises, promoting early functional rehabilitation and minimizing the risk of stiffness [8].

The successful outcome observed in our case aligns with previous case report by Jeon et al. [4] that has reported positive results with the use of TEN fixation in clavicle fractures and reported excellent clinical outcomes and high patient satisfaction rates with TEN fixation. They also emphasized the advantages of minimal soft tissue disruption, early return to function, and lower rates of hardware removal compared to traditional techniques.

It is worth noting that the use of TEN fixation in distal clavicular fractures is relatively new and there are still a limited number of studies specifically focusing on this fracture pattern. However, the success achieved in our case, along with



Fig. 4 – After 6 months postoperative axial radiographs of the left clavicle.

the favorable outcomes reported in the literature, highlights the potential of TEN fixation as a viable treatment option for distal clavicular fractures [9].

While TEN fixation offers several advantages, it is essential to consider its limitations and potential complications. Malpositioning of the elastic nail can lead to suboptimal reduction and fixation, resulting in impaired healing or hardware-related complications. Therefore, meticulous pre-operative planning and intraoperative fluoroscopic guidance are crucial to ensure accurate nail placement and alignment [10]. Additionally, as with any surgical intervention, there is a risk of infection, nerve or vessel injury, and implant failure, although these risks are generally low when proper surgical techniques are followed [11].

Conclusion

Our case report highlights the successful management of a distal clavicular fracture using TEN fixation. The positive outcome observed in this case, along with the existing literature, suggests that TEN fixation is a promising alternative to traditional treatment methods for distal clavicular fractures. However, further research is needed to establish guidelines and evaluate the long-term outcomes and effectiveness of this technique in comparison to traditional fixation methods. Additionally, standardized guidelines regarding patient selection, implant size, and surgical technique are needed to optimize outcomes and minimize complications.

Patient consent

Although no identifiable patient information was provided, a consent form was obtained from the patient.

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