



Original Article

A retrospective study of titanium elastic stable intramedullary nailing in displaced mid-shaft clavicle fractures[☆]

Rajesh Govindasamy*, Saravanan Kasirajan,
Jimmy Joseph Meleppuram, Fawas Thonikadavath

Vinayaka Missions Medical College and Hospital, Department of Orthopaedics, Pondy, India

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ABSTRACT

Objective: The aim of this study is to analyze the functional outcome following titanium elastic stable intra-medullary nailing (ESIN) for displaced mid-shaft clavicular fractures (DMCF).

Methods: A retrospective study of 60 patients between March 2009 and March 2015 was conducted. Patients were selected based on the inclusion criteria. Six patients were lost during follow up. Out of the remaining 54 patients, there were 39 males and 15 females. The mean age was 30.6 years. The functional outcome was analyzed using the Constant score, rate of bone union, complication, and earliest time of return to work.

Results: All fractures united well, with an average time of 7.5 weeks. Follow-up period ranged between 12 months and 18 months (average, 14 months). 24 out of 54 patients had closed nailing, while 30 had minimal open reduction. The average size of ESIN was 2 mm (range, 1.5–3 mm). The average Constant score was 97.8 (range, 95–99). There were no major complications, but minor complications occurred, viz. skin irritation in 15 patients, temporary paresthesia in five patients, and three patients who developed superficial infections. One case had implant migration and perforation at the lateral cortex, and one case had delayed union. There were few implant-related problems, as the authors used a standard protocol to remove it after radiological union. All patients returned to work within 10 weeks of the post-operative period.

Conclusion: ESIN is a safe, minimally invasive, engenders rapid healing with good cosmesis, and provides an excellent functional outcome in terms of patient satisfaction, with fewer complications.

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[☆] Work performed in the Vinayaka Missions Medical College and Hospital, Department of Orthopaedics, Pondy, India.

* Corresponding author.

E-mail: drgrortho@yahoo.com (R. Govindasamy).

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Estudo retrospectivo de haste intramedular estável elástica de titânio em fraturas deslocadas do terço médio da clavícula

R E S U M O

Palavras-chave:

Clavícula
Fixação de fratura
Intramedular
Hastes ósseas
Titânio

Objetivo: O objetivo deste estudo é analisar o desfecho funcional após o uso de haste intramedular estável elástica de titânio (HIEET) em fraturas deslocadas do terço médio da clavícula (FDMC).

Métodos: Realizou-se um estudo retrospectivo de 60 pacientes entre março de 2009 e março de 2015. Os pacientes foram selecionados com base nos critérios de inclusão. Houve perda de seguimento de seis pacientes. Dos 54 pacientes restantes, 39 eram homens e 15 mulheres. A média de idade foi de 30,6 anos. O desfecho funcional foi analisado pela escala de Constant, taxa de união óssea, taxa de complicação e tempo de retorno ao trabalho.

Resultados: Todas as fraturas apresentaram boa união, em uma média de 7,5 semanas. O período de acompanhamento variou entre 12 e 18 meses (média: 14 meses). Em 24 dos 54 pacientes usou-se redução fechada com hastes intramedulares; nos outros 30, foi utilizada a redução aberta com fixação mínima. O tamanho médio da HIEET foi de 2 mm (variação: 1,5-3 mm). A média da escala de Constant foi 97,8 (variação: 95-99). Nenhum paciente apresentou complicações de grande porte, mas algumas complicações de pequeno porte foram observadas, a saber: irritação da pele em 15 pacientes, parestesia temporária em cinco pacientes e infecções superficiais em três pacientes. Observou-se um caso de migração do implante e perfuração no córtex lateral; um caso teve união atrasada. A taxa de problemas relacionados ao implante foi baixa, uma vez que os autores usaram um protocolo padrão para removê-lo após a união radiológica. Todos os pacientes retornaram ao trabalho em até dez semanas após a cirurgia.

Conclusão: A HIEET é um método seguro, minimamente invasivo, que gera cicatrização rápida com boa cosmesis e proporciona um excelente resultado funcional em termos de satisfação do paciente, com menos complicações.

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Introduction

The shoulder joint functions as a closed chain mechanism and constitutes four joints. Two among the four joints articulates with the clavicle. Therefore any clavicle fracture affects the whole shoulder girdle. The clavicle is the first bone to ossify and it is one of the commonest bones to be fractured (2.6-5% of all fractures).¹ Approximately 80% of fractures occur in the mid-shaft, as it is a transition zone between the flattened lateral part and tubulo-triangular medial part as well as it is also the thinnest segment which is relatively unprotected as it is not stabilized by any ligaments.²

A fall or direct blow to the shoulder is the most common mechanism of injury for any clavicle fracture. The mid-shaft fractures, tend to shorten when displaced. It is due to the combined working of the sternocleidomastoid pulling the medial fragment superiorly and posteriorly, and the pectoralis major, the deltoid and gravity pulling the lateral fragment inferiorly and anteriorly. This results in net displacement and shortening of the fracture (Fig. 1). More than 50% of clavicle fractures are displaced.² The overall frequency of non-union in undisplaced fractures is about 5% and it is higher in displaced fractures approximately 15.1%.³

As nature has endowed clavicle with excellent reparative powers, these fractures are treated conservatively in general,

but two-third of DMCF will end up in some degree of malunion with shortening and symptoms.⁴

The clavicle length plays an important role to maintain anatomical relationship and function of the shoulder girdle.⁴ So early surgical treatment in DMCF improves the functional outcome by decreasing the rates of nonunion and symptomatic malunion. So surgery has been indicated for fractures which are completely displaced, which has skin perforation, having shortening of more than 20 mm, neurovascular injury, bilateral fractures and floating shoulder.⁵

The standard treatment of DMCF is plate osteosynthesis as it restores length and anatomical alignment, also the implant is mechanically stronger but has its own complications.⁵ Intramedullary fixation has emerged as an excellent alternative since it behaves as an internal splint by sharing load and maintains alignment without rigid fixation.⁵

Intramedullary fixation for clavicular fractures was first described by Peroni⁶ in 1950. The devices include, Kirschner wire, Rush pins, Knowles pin, Steinman pin, Haige pin, Rockwood pins and Titanium elastic nails.^{5,7-9} Titanium ESIN can block itself in the bone and provide a three point fixation within the S shaped clavicle. Some studies have shown, there is a spectrum of complications and technical difficulties associated with this procedure.¹⁰

Our study is to evaluate this DMCF treated by titanium ESIN. We analyzed (1) union rate, (2) functional outcome using

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