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Recommended Citation
Lin, Yi-Chen and Wei, Ta-Sen (2021) "Extracorporeal Shock Wave Therapy for Delayed Diagnosis of Proximal Radial Head Fracture with Nonunion: A casereport," Rehabilitation Practice and Science: Vol. 49: Iss. 1, Article 10.
DOI: 10.6315/TJPMR.202106_49(1).0010
Available at: https://rps.researchcommons.org/journal/vol49/iss1/10

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Extracorporeal Shock Wave Therapy for Delayed Diagnosis of Proximal Radial Head Fracture with Nonunion: A Case Report

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Fracture of the proximal radial head is the most common elbow fracture. However, a non-displaced proximal radial head fracture may be overlooked on plain radiographs. This case report describes a 52-year-old female patient who sustained a right elbow injury after a traffic accident, with delayed diagnosis of radial head fractures and subsequent nonunion. After 10 sessions of focal extracorporeal shock wave therapy (ESWT), the pain and range of motion improved and a sequential x-ray revealed smooth cortical bone and increased density of the proximal radial head.

This report reveals that (1) non-displaced proximal radial head fractures can be overlooked on plain radiographs, (2) musculoskeletal ultrasound should be performed if symptoms persist, and (3) ESWT appeared to result in excellent bone healing in a nonunion fracture. (Tw J Phys Med Rehabil 2021; 49(1): 113 - 117)

Key Words: non-union, radial head fracture, non-displaced fracture, extracorporeal shock wave therapy, ESWT

INTRODUCTION

Fractures of the proximal radial head are common. The incidence of proximal radial head fracture ranges from 2.5 to 2.8 per 100,00 inhabitants annually. Furthermore, it is the most common fracture occurring around the elbow, representing nearly one-third of all elbow fractures.[1] However, a non-displaced proximal radial head fracture can be overlooked on plain radiographs.[2] Nonunion refers to the failure of bone fractures to achieve cortical continuity on radiographic studies. The incidence of nonunion of proximal radial fracture was 1.7%.[3] This report presents a case of delayed diagnosis of a proximal radial head fracture with nonunion which achieved a favorable outcome after extracorporeal shock wave therapy (ESWT).

CASE REPORT

A 52-year-old female presented to the emergency department with complaints of local tenderness over the right lateral epicondyle, visual analog scale (VAS) of 6, and partial loss of the range of motion (ROM) over the
right elbow. The symptoms began immediately after a traffic accident.

The past medical history included a laparoscopic appendectomy for acute appendicitis and a spontaneous seizure ten years prior. Physical examination in the emergency department revealed severe right elbow tenderness and ROM limitation without numbness. There was no sensory, motor, or vascular deficit distal to the elbow. Plain elbow radiography revealed no obvious fracture (Figure 1A); nevertheless, the right lateral elbow pain persisted. An x-ray taken three months later at a clinic revealed a fracture of the proximal radial head with bony resorption (Figure 1B), and musculoskeletal ultrasound (MSUS) indicated discontinued bone margin over the right radial head and increased effusion over the right olecranon fossa (Figure 2). We used focused ESWT (PIEZOWAVE² PLUS 60), applied in 10 sessions, with approximately 0.35 mJ/mm² (2500 shots per session).

Four weeks after ESWT, the lateral elbow tenderness was alleviated, the VAS decreased from 6 to 3, bone union was identified on subsequent plain radiographs (Figure 1C), and the ROM was improved. Plain radiographs after completion of the course of ESWT (Figure 1D) revealed smooth cortical bone and increased density of the proximal radial head were found. Her local tenderness, pain, and ROM limitation subsided.

Figure 1. Sequential X-ray finding of the fracture (white arrow) (A): Initial x-ray revealed no obvious fracture. (B): Three months after injury showed fracture of the proximal radial head (white arrow) with bony resorption. (C): Bone union of the proximal radial head after ESWT. (D): After whole course of ESWT showed smooth cortical bone and increased density of the proximal radial head.
DISCUSSION

Minimally displaced fractures can be treated with a sling or splint for a few days followed by early ROM exercises. If the fracture is unstable, open reduction and internal fixation should be performed.[4] ESWT is an efficient, non-invasive alternative to surgery,[5] with equivalent results to surgical intervention regardless of the underlying pathophysiology or location.[6] Forty studies have indicated an overall success rate of approximately 76% 6 months after focused ESWT treatment for nonunion fractures, without major complications.[7]

ESWT is available as focused or radial ESWT. We used focused ESWT because this can achieve deeper penetration and the highest pressure at the targeted pathological tissue. Many researchers have reported improved biomechanical properties, enhanced callus quality and quantity, and an increase in the expression of bone-specific transcription factors following ESWT. [8] The direct effect is due to the kinetic energy of the shock wave and the indirect effect to cavitation. ESWT may also alter the conduction ability of sensitive nerves through gate control mechanisms and influence osteoblasts’ metabolic activity. An in vivo animal study using histology and fluorescence microscopy revealed that ESWT has a dose-dependent effect on osteogenesis and transformation of callus to mature bone.[9] ESWT can promote bone marrow stromal cell growth and make it differentiate toward osteo-progenitors which associate with transforming growth factor beta 1 and vascular endothelial growth factor induction.[10]

CONCLUSION

Non-displaced proximal radial head fracture can be overlooked on plain radiographs, and MSUS should be performed if symptoms persist. ESWT appears to be a successful non-invasive therapy for nonunion fracture and allows patients an alternative to immobilization and surgical intervention.

ACKNOWLEDGMENTS

We are grateful to the members of the department of Physical Medicine and Rehabilitation, Changhua Christian Hospital, Changhua.
REFERENCES


體外震波使用於延誤診斷之未癒合近端橈骨頭骨折：
個案研究報告

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橈骨頭骨折是手肘骨折裡面最常見的，占了所有手肘骨折的三分之一。然而，位於此處未移位的骨折在X光下很容易被遺漏。早期的超音波檢查可以更精確的診斷出骨折。本次案例是一位52歲的女性，因車禍傷到右手肘，於急診照的X光並未看出骨折。三個月後因疼痛及活動角度受限，患者來到復健科門診，超音波及X光檢查診斷出橈骨頭骨折合併骨折處不癒合。後續患者於門診接受十次的聚焦式震波治療，並於後續的X光可看到皮質骨癒合及骨密度增加。本個案研究結論：(1)未移位的骨折在X光之下容易被遺漏，早期的超音波检查可協助早期診斷。(2)震波治療對於骨折未癒合的病人治療效果是非常好的。（台灣復健醫誌 2021; 49(1): 113 - 117）

關鍵詞：不癒合(non-union)，橈骨頭骨折(radial head fracture)，不移位的骨折(non-displaced fracture)，震波治療(extracorporeal shock wave therapy, ESWT)