World Journal of Pharmaceutical and Life Sciences

www.wjpls.org

Impact Factor: 8.21 Coden USA: WJPLA7

ACCELERATED HEALING OF OCCULT SCAPHOID FRACTURE USING MAGNETIC RESONANCE THERAPY: A CASE REPORT

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DOI: https://doi.org/10.5281/zenodo.22159991

How to cite this Article: Dr. Vasanth Raj Lakshman[1*], Dr. Tejas V.[2]. (2026). Accelerated Healing of Occult Scaphoid Fracture Using Magnetic Resonance Therapy: A Case Report. World Journal of Pharmaceutical and Life Sciences, 12(9), 111–114.

Article Received on 05/08/2026 **Article Revised on 24/08/2026** **Article Published on 01/09/2026**

ABSTRACT

The scaphoid is the most commonly fractured carpal bone, accounting for approximately 60% of all carpal fractures.[1] The injury is commonly seen in active young adults after a fall on an outstretched hand. These fractures sometimes are missed or misdiagnosed as simple wrist sprains. Left untreated or poorly reduced, a scaphoid fracture may develop a malunion or nonunion. Malunions and nonunions may lead to altered carpal kinematics (with resultant pain), diminished ROM, grip strength, and carpal arthrosis and chances of AVN (Avascular Necrosis).[2] Accordingly, displaced, nonunited, and sometimes malunited fractures are treated surgically. Furthermore, because cast immobilization may be prolonged and associated with stiffness, some surgeons and patients prefer early surgery even for nondisplaced fractures.[3] The scaphoid has a palmar and dorsal blood supply. The superficial branch of the radial artery gives off a palmar scaphoid branch that only supplies the distal pole. The dorsal carpal branch of the radial artery gives off a dorsal scaphoid branch, which is the major blood supply to the scaphoid, supplying the distal and proximal poles. The proximal pole relies on retrograde interosseous flow. In the present study the application of MAGNETIC RESONANCE THERAPY in the case of delayed union of scaphoid fracture accelerated the healing process.

KEYWORDS: MAGNETIC RESONANCE THERAPY, Scaphoid fracture.

INTRODUCTION

The scaphoid is the most commonly fractured carpal bone, accounting for approximately 60% of all carpal fractures.[1] The injury is commonly seen in active young adults after a fall on an outstretched hand. These fractures sometimes are missed or misdiagnosed as simple wrist sprains. Left untreated or poorly reduced, a scaphoid fracture may develop a malunion or non-union. Malunion and non-union may lead to altered carpal kinematics (with resultant pain), diminished ROM, grip strength, and carpal arthrosis and chances of AVN (Avascular Necrosis).[2] Accordingly, displaced, nonunited, and sometimes malunited fractures are treated surgically. Furthermore, because cast immobilization may be prolonged and associated with stiffness, some surgeons and patients prefer early surgery even for nondisplaced fractures.[3] The word "scaphoid" is derived from the Greek *skaphē* meaning skiff or boat because of the elongated shape of the bone. The scaphoid has multiple ligamentous attachments. Ulnarly, it is attached to the lunate via the scapholunate interosseous ligament, which has three distinct structures: the palmar ligament, the dorsal ligament, and the proximal fibrocartilaginous membrane. The dorsal attachment is the strongest and is most important to carpal stability. Volarly, bridging from the radial styloid to the capitate, the radioscaphocapitate ligament crosses the scaphoid at its waist, causing the bone to flex with radial deviation. This ligament, in concert with the scapholunate ligament tethering the proximal pole, may lead to fracture displacement or the characteristic "humpback deformity" with palmar flexion

of the distal pole and dorsal extension of the proximal pole.[4]

The blood supply to the scaphoid comes from two branches of the radial artery. The palmar scaphoid branch arises from the superficial palmar branch of the radial artery supplying the distal pole of the scaphoid. The dorsal scaphoid branch arises from the dorsal carpal branch of the radial artery and enters the scaphoid distally. This branch is the only blood supply to the proximal pole of the scaphoid via retrograde intraosseous flow. Accordingly, the blood supply to the proximal pole is tenuous and fractures compromising the vessels place the bone at risk for nonunion if neglected there is chances of AVN (Avascular Necrosis).

All patients who fall on an outstretched hand should be evaluated for a scaphoid fracture. This includes a physical examination of the wrist and plain radiographs, including a dedicated scaphoid view. To perform a dedicated scaphoid view, simply take a posteroanterior radiograph of the wrist with the hand in ulnar deviation; this extends the scaphoid and makes the waist more easily seen. If unable to discern a fracture on plain films, but there is clinical suspicion, other imaging modalities such as MRI or CT are useful. Thin-cut CT is superior in determining displacement but is not as sensitive as MRI for evaluating nondisplaced fractures.[5] Clinical suspicion should be guided by tenderness in the anatomic snuff box and/or pain with an axial load applied to the thumb held in abduction. Sensitivity of the clinical examination is high, but specificity for acute scaphoid fracture is low.[6]

CASE REPORT

A 40-year-old male patient presented with complaints of persistent pain and restricted movement in the right wrist following a Fall on an Outstretched Hand (FOOSH injury). Immediately after the trauma, the patient developed severe wrist pain associated with functional limitation of wrist movements. He initially visited a nearby General Practitioner, where conservative treatment with analgesics and anti-inflammatory medications was prescribed for one week. Conventional wrist radiographs consisting of Antero-Posterior (AP) and Lateral views were obtained and interpreted as normal without evidence of fracture.

Based on these findings, the patient was advised rest for 3 weeks. However, despite compliance with treatment, the patient continued to experience persistent pain and difficulty in performing routine activities involving the affected hand.

The patient subsequently presented to SVASTHI ORTHOPAEDIC AND RESPIRATORY HEALTH CARE CENTRE, BANGALORE, for further evaluation.

CLINICAL EXAMINATION

General Examination

Systemic examination revealed all parameters to be within normal limits.

Local Examination

- Localized pain over the right wrist
- Tenderness over the anatomical snuffbox
- Painful restriction of wrist movements
- Baseline pain severity using the Visual Analog Scale (VAS): **7/10**
- Grip weakness due to pain

Considering the classical symptoms and persistent pain despite negative initial imaging, suspicion of occult scaphoid fracture was raised.

Radiological Evaluation

Dedicated scaphoid imaging including AP and oblique scaphoid views demonstrated a fracture at the waist of the scaphoid. CT scan of the wrist further confirmed the diagnosis and ruled out major displacement.

Scaphoid waist fractures are particularly significant due to their susceptibility to delayed union and non-union because of the bone's retrograde vascular supply.

Intervention

The patient was treated conservatively with:

- Scaphoid cast immobilization
- **MAGNETIC RESONANCE THERAPY using (Bone card protocol)**

Daily treatment duration

- **1 hour/day**
- **9 consecutive days**
- Analgesics
- Calcium supplementation

The patient continued immobilization for an additional **four weeks** after completion of **MAGNETIC RESONANCE**

THERAPY

Follow-up Findings

At 4 weeks:

- Marked reduction in pain
- VAS score reduced from **7 to 1**
- X-ray demonstrated early callus formation and progression toward fracture healing

At 6 weeks

- Radiographic evidence of **complete fracture union**
- **No tenderness** over anatomical snuffbox
- Minimal wrist stiffness
- Cast removed
- **Physiotherapy** initiated

At 8 weeks

- Complete functional recovery
- Return to normal daily activities without pain

DISCUSSION

Scaphoid fractures account for approximately 60–70% of all carpal bone fractures and are among the most commonly overlooked injuries of the wrist. The mechanism frequently involves a fall on an outstretched hand resulting in hyperextension and radial deviation of the wrist.

Diagnosis remains challenging because early radiographs frequently fail to identify nondisplaced or minimally displaced fractures. Literature suggests that up to 20–30% of acute scaphoid fractures may not be visible on initial radiographs. Consequently, patients are often misdiagnosed as having simple wrist sprains, which can delay definitive treatment.

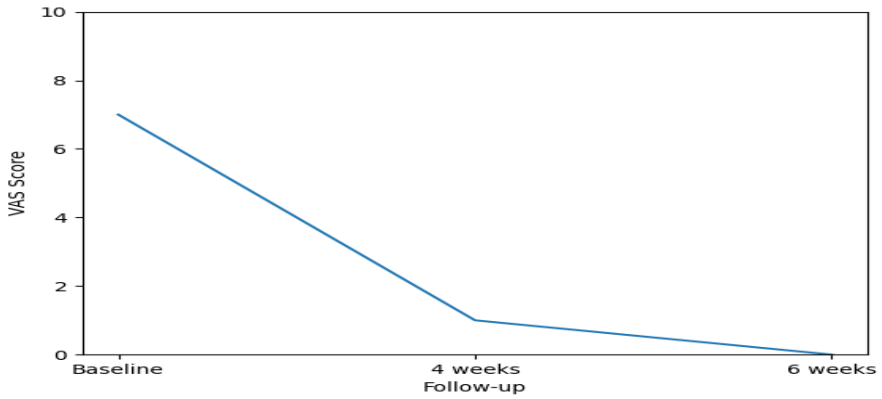
Delayed diagnosis is clinically important because of the unique vascular anatomy of the scaphoid. Blood supply enters primarily from distal branches of the radial artery and progresses in a retrograde fashion toward the proximal pole.

Therefore, interruption of vascular flow may predispose patients to

- Delayed union
- Non-union
- Avascular necrosis (AVN)
- Degenerative wrist arthritis
- Reduced grip strength
- Chronic pain and disability

VAS Outcome Summary

Follow-up	VAS Score
Baseline	7
4 weeks	1
6 weeks	0



GRAPH: VAS SCALE

Early recognition and appropriate imaging of suspected scaphoid fractures remain essential to prevent long-term complications.

In the present case, initial AP and Lateral radiographs failed to reveal the fracture, resulting in approximately **three weeks of delayed treatment**. Dedicated scaphoid imaging and CT scanning eventually established the diagnosis.

The current case demonstrated accelerated fracture healing following combined treatment with immobilization and **MAGNETIC RESONANCE THERAPY**. Although cast immobilization remains the standard treatment for nondisplaced scaphoid fractures, adjunctive modalities aiming to stimulate **osteogenesis** and **tissue repair** may enhance outcomes.

MAGNETIC RESONANCE THERAPY is believed to exert biological effects through:

1. Enhancement of cellular metabolism
2. Stimulation of osteoblastic activity
3. Improved microcirculation
4. Promotion of extracellular matrix synthesis
5. Facilitation of callus formation

The reduction in pain from VAS 7 to VAS 1 within four weeks, along with radiographic evidence of progressive union, suggests a positive therapeutic effect.

CONCLUSION

This case demonstrates the importance of maintaining a high index of suspicion for scaphoid fractures in patients presenting with persistent wrist pain following a fall on an outstretched hand, even when initial radiographs appear normal.

Dedicated scaphoid views and CT imaging play a crucial role in early diagnosis and prevention of delayed treatment. The adjunctive use of MAGNETIC RESONANCE THERAPY with cast immobilization in this patient appeared to contribute to accelerated pain reduction and fracture healing.

The findings suggest that MAGNETIC RESONANCE THERAPY may serve as a promising non-invasive adjunctive treatment modality for delayed union or occult scaphoid fractures.

The VAS graph and X-ray progression figure above can be inserted directly into the manuscript under “Results” or “Follow-up Assessment”.

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