

Scaphoid Fracture

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Overview

- Pediatric scaphoid fractures have excellent outcomes [1].
- Some well-established and widely used principles of scaphoid fracture management are supported by an insufficient amount of evidence, with many decisions based on small case series [2].
- The clinical outcomes of malunited scaphoids after reconstruction for scaphoid fractures nonunion did not differ significantly from well-united scaphoids at a minimum 5-year follow-up [4].
- Internal fixation of scaphoid fractures is indicated in certain acute situations and in chronic nonunion cases [15].
- Appropriately performed acute percutaneous internal fixation is now a standard treatment option for a selected group of patients with acute scaphoid fracture [17].
- The definition of instability of scaphoid fractures and the indications for conservative treatment must be considered carefully [14].
- Nondisplaced scaphoid fractures can be effectively treated nonoperatively with union rates approaching or exceeding those of operative intervention, while operative intervention is recommended for displaced fractures [24].
- This study did not demonstrate a true long-term benefit of internal fixation, compared with nonoperative treatment, for acute nondisplaced or minimally displaced scaphoid fractures [5].
- For all indications, the scaphoid staple has a high union rate and a low complication rate [6].
- Patients with recent scaphoid fractures that failed treatment may also be treated with distal scaphoid resection [25].
- Despite improvements in diagnosis and surgical techniques, nonunion rates remain high and early internal fixation is increasingly favored even for nondisplaced fractures [28].

Anatomy & Pathophysiology

- The scaphoid is critical to the coordination of normal carpal kinematics [34].
- Scaphoid fracture has significant biomechanical consequences to the wrist [34].
- Scaphoid nonunions have a dramatic impact on carpal kinematics, partially uncoupling the proximal and distal carpal rows [35].
- Problem fractures and non-unions of the scaphoid are associated with major alterations in wrist kinematics [46].
- Problem fractures and non-unions of the scaphoid are associated with a higher incidence of premature carpal collapse and degenerative arthritis than previously appreciated [46].
- A foreshortened healed scaphoid will disrupt carpal kinematics [37].
- A foreshortened healed scaphoid negatively impacts results, including decreased wrist range of motion and diminished grip strength [37].
- Malunion or nonunion of an acute scaphoid fracture can lead to abnormal carpal kinematics and wrist arthrosis [61].
- Radiocarpal-based lunate morphology was not associated with scaphoid fracture [74].
- Anomalous carpal kinematics caused by lunotriquetral coalition may have predisposed both scaphoid bones to fracture, although causality cannot be proven [78].

Classification

- Pediatric scaphoid fractures have excellent outcomes [1].
- Even some well-established and widely used principles of scaphoid fracture management are supported by an insufficient amount of evidence, with many decisions based on small case series [2].
- The combination of conventional radiographs and two clinical examinations does not provide adequate diagnostic certainty for scaphoid fractures, as a true fracture was identified in only about 40% of patients [3].
- If there is a strong clinical suspicion of a scaphoid fracture which cannot be confirmed by conventional radiology, bone scintigraphy is a valuable diagnostic tool [8].
- The combination of conventional radiographs and clinical reassessment does not increase the accuracy of these diagnostic tests compared with the accuracy of conventional radiographs alone and is therefore also limited in diagnosing scaphoid fractures [9].
- There is no consensus regarding the imaging modality and measurements to use to define a scaphoid fracture as 'nondisplaced' [10].
- Due to low agreement between observers for the recognition of scaphoid fractures and poor diagnostic performance, 6-week radiographs are not adequate for evaluating suspected scaphoid fractures [12].
- Scaphoid fractures account for 2% of all fractures and are the most commonly injured carpal bone [13].

- The definition of instability of scaphoid fractures and the indications for conservative treatment must be considered carefully [14].
- Internal fixation of scaphoid fractures is indicated in certain acute situations and in chronic nonunion cases [15].
- Despite improvements in diagnosis and surgical techniques, nonunion rates remain high and early internal fixation is increasingly favored even for nondisplaced fractures [28].
- There is a need for a validated prognostic classification system for scaphoid nonunions that can allow comparisons between outcome studies [41].
- The authors hypothesise higher union rates in scaphoid fractures using more stable fixation systems [79].
- Scaphoid fracture and nonunion management continues to be an area of expanding evidence with opportunities to improve knowledge and familiarization with current evidence-based data [80].

Clinical Presentation

- Scaphoid fractures account for 2% of all fractures and are the most commonly injured carpal bone [13].
- Most scaphoid fractures are missed due to failure to consider the possibility of the injury and search for clinical signs [19].
- The combination of conventional radiographs and two clinical examinations does not provide adequate diagnostic certainty for scaphoid fractures, as a true fracture was identified in only about 40% of patients [3].
- The combination of conventional radiographs and clinical reassessment does not increase the accuracy of these diagnostic tests compared with the accuracy of conventional radiographs alone and is therefore also limited in diagnosing scaphoid fractures [9].
- 6-week radiographs are not adequate for evaluating suspected scaphoid fractures due to low agreement between observers for the recognition of scaphoid fractures and poor diagnostic performance [12].
- Ultrasonic assessment is not recommended for the early diagnosis of acute scaphoid fractures, with a sensitivity of only 50% and five missed scaphoid fractures in a small series [39].
- If there is a strong clinical suspicion of a scaphoid fracture which cannot be confirmed by conventional radiology, bone scintigraphy is a valuable diagnostic tool [8].
- Clinical examination along with early MRI scan should form the basis of diagnosing a suspected scaphoid fracture [20].
- The use of early MRI in patients with clinically suspected scaphoid fracture results in the accurate and reliable identification of a significant number of radiological occult injuries and early identification of patients without acute injuries [23].
- MRI-detected scaphoid fractures are not universally benign, with delayed or nonunion seen in over 6% despite appropriate initial immobilization, with most of these patients with nonunion requiring surgery to achieve union [22].

- The diagnosis of scaphoid and other fractures is reliable when using HRpQCT in patients with a clinically-suspected fracture [40].
- There is no consensus regarding the imaging modality and measurements to use to define a scaphoid fracture as ‘nondisplaced’ [10].
- Oblique scaphoid fractures are potentially unstable and may result in detrimental sequelae if overlooked in the acute stage [16].

Investigations

- Conventional radiographs combined with two clinical examinations provide inadequate diagnostic certainty for scaphoid fractures, identifying a true fracture in only about 40% of patients [3].
- The combination of conventional radiographs and clinical reassessment does not increase diagnostic accuracy compared to conventional radiographs alone [9].
- There is no consensus on the imaging modality or measurements used to define a scaphoid fracture as nondisplaced [10].
- Six-week radiographs are not adequate for evaluating suspected scaphoid fractures due to low inter-observer agreement and poor diagnostic performance [12].
- Most missed scaphoid fractures result from a failure to consider the injury possibility and search for clinical signs [19].
- Clinical examination combined with early MRI scan should form the basis for diagnosing suspected scaphoid fractures [20].
- MRI-detected scaphoid fractures are not universally benign, with delayed or nonunion occurring in over 6% of cases despite appropriate initial immobilization [22].
- Most patients with nonunion of MRI-detected scaphoid fractures require surgery to achieve union [22].
- Early MRI in patients with clinically suspected scaphoid fractures accurately and reliably identifies a significant number of radiological occult injuries [23].
- Early MRI in patients with clinically suspected scaphoid fractures allows for the early identification of patients without acute injuries [23].
- Early MRI provides an immediate diagnosis for suspected scaphoid fractures when initial radiographs are inconclusive [56].
- Early MRI for suspected scaphoid fractures when initial radiographs are inconclusive is cost-effective and minimizes complications [56].
- CT is a good way to screen for occult fractures but may not be superior to MRI or bone scanning in detecting scaphoid fractures without causing overtreatment [58].
- Multidetector computed tomography (MDCT) has a sensitivity of 86% and specificity of 100% for detecting occult scaphoid fractures in patients with negative radiographic examinations [59].
- MRI is the optimal second test for assessing a possible scaphoid fracture after a negative radiograph [60].

- CT is preferred over MRI when the fracture is visible for further assessment and surgical planning [60].
- There is variation in definitions of scaphoid fractures on MRI scans, highlighting a need for consensus to assess reliability and diagnostic performance [63].
- Bone scintigraphy is inappropriate for evaluating specificity and sensitivity against clinical examination [64].
- MRI is the recommended examination of choice for diagnosing occult scaphoid fractures over bone scintigraphy [64].
- MRI is considered the best diagnostic radiological test for triage of suspected scaphoid fractures according to existing literature [67].
- Bone scanning, CT, and ultrasound may be useful for suspected scaphoid fractures when MRI is not readily available [67].
- Routine MRI of suspected scaphoid fractures carries a notable risk of overdiagnosis and potential overtreatment [72].
- Nearly 70% of MRI findings in suspected scaphoid fractures are categorized as distracting and potentially misleading [72].
- Stopping the pursuit of occult fractures may prevent unnecessary treatment due to the risk of overdiagnosis with routine MRI [72].
- Better standardization of MRI definitions for scaphoid fractures is required to address diagnostic uncertainty [76].
- A definitive definition may not exist to solve the potentially unsolvable issue of diagnostic uncertainty in scaphoid fractures [76].
- Patients should participate in decisions regarding diagnostic and treatment strategies for scaphoid fractures due to diagnostic uncertainty [76].
- MRI is not 100% specific for diagnosing occult scaphoid fractures, with a specificity of 96% in healthy volunteers [77].

Treatment

NONOPERATIVE MANAGEMENT

- Pediatric scaphoid fractures have excellent outcomes [1].
- Internal fixation of scaphoid fractures is indicated in certain acute situations and in chronic nonunion cases [15].
- Early treatment of acute scaphoid fractures is important, with union rates significantly greater when treatment is instituted prior to 4 weeks from injury [26].
- Nondisplaced scaphoid fractures can be effectively treated nonoperatively with union rates approaching or exceeding those of operative intervention, while operative intervention is recommended for displaced fractures [24].

- Surgical treatment for non-displaced and minimally displaced acute scaphoid fractures may be slightly favourable compared to conservative treatment for standardised functional outcome on the short term (within 2 years), with a significantly faster return to work (SMD of 7 weeks) [21].
- This study did not demonstrate a true long-term benefit of internal fixation, compared with nonoperative treatment, for acute nondisplaced or minimally displaced scaphoid fractures [5].
- We found no difference in functional outcome at 12 months for fractures of the waist of the scaphoid with ≤ 2 mm displacement treated operatively or nonoperatively [18].
- Non- and minimally displaced scaphoid waist fractures are best treated conservatively [36].
- Non-operative treatment of non-displaced scaphoid fractures may be preferred [53].
- A restricted period of cast immobilisation is usually adequate for the treatment of non-displaced scaphoid fractures [53].
- Nondisplaced fractures of the scaphoid heal with cast immobilization in most cases, but operative treatment is being offered with greater frequency to active patients to reduce the period of cast immobilization [57].
- The definition of instability of scaphoid fractures and the indications for conservative treatment must be considered carefully [14].
- Currently, there is insufficient evidence to support the most effective treatment for acute scaphoid fractures [51].
- Even some well-established and widely used principles of scaphoid fracture management are supported by an insufficient amount of evidence, with many decisions based on small case series [2].
- Among patients with nonoperatively managed scaphoid fractures, those prescribed NSAIDs within 1 month of diagnosis demonstrated an increased risk of nonunion and subsequent salvage procedures [54].

OPERATIVE MANAGEMENT

- Appropriately performed acute percutaneous internal fixation is now a standard treatment option for a selected group of patients with acute scaphoid fracture [17].
- The frequency of non-union after surgical management for closed scaphoid fractures exceeds 10% and remained consistent during the study period [11].
- For all indications, the scaphoid staple has a high union rate and a low complication rate [6].
- The use of 2 headless compression screws for the treatment of scaphoid nonunions is safe and effective [44].
- Patients with recent scaphoid fractures that failed treatment may also be treated with distal scaphoid resection [25].
- The optimal protocol for postoperative immobilization following operative treatment of scaphoid fractures remains controversial [62].

SPECIAL POPULATIONS AND CONSIDERATIONS

- The authors prefer to treat nondisplaced acute scaphoid fractures in the athlete on an individualized basis [55].
- The clinical outcomes of malunited scaphoids after reconstruction for scaphoid fracture nonunion did not differ significantly from well-united scaphoids at a minimum 5-year follow-up [4].
- This case is interesting as the child is one of the youngest patients described in the literature with a scaphoid fracture, and the fracture went on to non-union despite immediate medical attention and rigorous treatment [49].
- The authors argue that comfort with uncertainty is key in suspected scaphoid fracture scenarios, as there is no best strategy; instead, clinicians should help patients choose a diagnostic and therapeutic course based on their individual values and risk tolerance [66].

Complications

- Pediatric scaphoid fractures have excellent outcomes [1].
- Many decisions regarding scaphoid fracture management are based on small case series due to insufficient evidence for well-established principles [2].
- The combination of conventional radiographs and two clinical examinations does not provide adequate diagnostic certainty for scaphoid fractures, as a true fracture was identified in only about 40% of patients [3].
- Clinical outcomes of malunited scaphoids after reconstruction for scaphoid fracture nonunion did not differ significantly from well-united scaphoids at a minimum 5-year follow-up [4].
- There is no true long-term benefit of internal fixation compared with nonoperative treatment for acute nondisplaced or minimally displaced scaphoid fractures [5].
- The scaphoid staple has a high union rate and a low complication rate for all indications [6].
- Subacute scaphoid fractures presenting within 6 months from injury can be expected to successfully heal with casting alone, even if the initial diagnosis is delayed [7].
- The frequency of nonunion after surgical management for closed scaphoid fractures exceeds 10% and remained consistent during the study period [11].
- Oblique scaphoid fractures are potentially unstable and may result in detrimental sequelae if overlooked in the acute stage [16].
- Appropriately performed acute percutaneous internal fixation is a standard treatment option for a selected group of patients with acute scaphoid fracture [17].
- There is no difference in functional outcome at 12 months for fractures of the waist of the scaphoid with ≤ 2 mm displacement treated operatively or nonoperatively [18].
- Persistent nonunion is common after surgery for scaphoid nonunion, and surgeries for persistent nonunion are even less successful [27].

- Delayed presentation of scaphoid fractures 21 days or more after injury predicts a greater risk of casting failure, although the union rate remains high with comparable time in cast [29].
- Nearly half of all patients with malunited acute scaphoid fractures demonstrated radiographic findings of early arthritis on CT imaging but had overall good clinical results on midterm follow-up [30].
- Increased likelihood for nonunion was found when the fracture was treated greater than 31 days from injury and when fracture volume was less than 38% of the entire scaphoid [32].

Recovery

- Pediatric scaphoid fractures have excellent outcomes [1].
- Clinical outcomes of malunited scaphoids after reconstruction for nonunion did not differ significantly from well-united scaphoids at a minimum 5-year follow-up [4].
- There is no true long-term benefit of internal fixation compared with nonoperative treatment for acute nondisplaced or minimally displaced scaphoid fractures [5].
- The scaphoid staple has a high union rate and a low complication rate for all indications [6].
- Subacute scaphoid fractures presenting within 6 months from injury can be expected to successfully heal with casting alone, even if the initial diagnosis is delayed [7].
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- Oblique scaphoid fractures are potentially unstable and may result in detrimental sequelae if overlooked in the acute stage [16].
- There is no difference in functional outcome at 12 months for fractures of the waist of the scaphoid with \leq 2 mm displacement treated operatively or nonoperatively [18].
- Surgical treatment for non-displaced and minimally displaced acute scaphoid fractures may be slightly favourable compared to conservative treatment for standardised functional outcome on the short term (within 2 years) [21].
- Surgical treatment for non-displaced and minimally displaced acute scaphoid fractures results in a significantly faster return to work (SMD of 7 weeks) [21].
- Union rates are significantly greater when treatment is instituted prior to 4 weeks from injury [26].
- Persistent nonunion is common after surgery for scaphoid non-union, and surgeries for persistent nonunion are even less successful [27].
- Delayed presentation of scaphoid fractures 21 days or more after injury predicts a greater risk of casting failure [29].
- The union rate remains high with comparable time in cast despite delayed presentation of scaphoid fractures 21 days or more after injury [29].
- Nearly half of all patients with malunited acute scaphoid fractures demonstrated radiographic findings of early arthritis on CT imaging [30].

- Patients with malunited acute scaphoid fractures demonstrated overall good clinical results on midterm follow-up despite radiographic findings of early arthritis [30].
- From an 8- to 11-year perspective, patients with distal scaphoid fractures report normal self-assessed hand function [31].
- From an 8- to 11-year perspective, patients with distal scaphoid fractures report good wrist motion and strength [31].
- Increased likelihood for nonunion was found when the fracture was treated greater than 31 days from injury [32].
- Increased likelihood for nonunion was found when fracture volume was less than 38% of the entire scaphoid [32].
- Patients treated nonoperatively or with salvage procedures had similar long-term outcomes as those treated with a corrective scaphoid osteotomy [65].
- Patients with comorbid psychiatric conditions experienced increased rates of delayed scaphoid union [83].
- Dynamic imaging with time-intensity curve analysis does not provide additional predictive value over standard delayed enhanced imaging for acute scaphoid fracture viability assessment using contrast-enhanced MRI [84].
- Scaphoid nonunions demonstrate findings indicative of progression to union on CT at a mean of 6 weeks [86].
- Scaphoid nonunions demonstrate findings indicative of progression to union on CT as early as 3 weeks postoperatively [86].

Key Evidence

- [L1] Pediatric scaphoid fractures have excellent outcomes. ([10.1177/1558944717735948](https://doi.org/10.1177/1558944717735948))
- [L5] Even some well-established and widely used principles of scaphoid fracture management are supported by an insufficient amount of evidence, with many decisions based on small case series. ([10.1177/1753193420977241](https://doi.org/10.1177/1753193420977241))
- [L5] The combination of conventional radiographs and two clinical examinations does not provide adequate diagnostic certainty for scaphoid fractures, as a true fracture was identified in only about 40% of patients. ([10.1097/corr.0000000000002413](https://doi.org/10.1097/corr.0000000000002413))
- [L4] The clinical outcomes of malunited scaphoids after reconstruction for scaphoid fractures nonunion did not differ significantly from well-united scaphoids at a minimum 5-year follow-up. ([10.1016/j.otsr.2014.09.026](https://doi.org/10.1016/j.otsr.2014.09.026))
- [L1] This study did not demonstrate a true long-term benefit of internal fixation, compared with nonoperative treatment, for acute nondisplaced or minimally displaced scaphoid fractures. ([10.2106/jbjs.g.00673](https://doi.org/10.2106/jbjs.g.00673))
- [L4] For all indications, the scaphoid staple has a high union rate and a low complication rate. ([10.1177/1558944716658747](https://doi.org/10.1177/1558944716658747))

- [Paper] If there is a strong clinical suspicion of a scaphoid fracture which cannot be confirmed by conventional radiology, bone scintigraphy is a valuable diagnostic tool. ([10.1016/j.injury.2005.02.009](#))
- [L2] The combination of conventional radiographs and clinical reassessment does not increase the accuracy of these diagnostic tests compared with the accuracy of conventional radiographs alone and is therefore also limited in diagnosing scaphoid fractures. ([10.1097/corr.0000000000002310](#))
- [L5] There is no consensus regarding the imaging modality and measurements to use to define a scaphoid fracture as ‘nondisplaced.’ ([10.1016/j.jhsa.2012.10.025](#))
- [L3] The frequency of non-union after surgical management for closed scaphoid fractures exceeds 10% and remained consistent during the study period. ([10.1016/j.jhsa.2015.06.019](#))
- [L2] Due to low agreement between observers for the recognition of scaphoid fractures and poor diagnostic performance, 6-week radiographs are not adequate for evaluating suspected scaphoid fractures. ([10.1007/s00402-016-2438-4](#))
- [L5] Scaphoid fractures account for 2% of all fractures and are the most commonly injured carpal bone. ([10.1016/j.hcl.2017.04.003](#))
- [L5] The definition of instability of scaphoid fractures and the indications for conservative treatment must be considered carefully. ([10.1142/s0218810415400018](#))
- [L5] Internal fixation of scaphoid fractures is indicated in certain acute situations and in chronic nonunion cases. ([10.1016/s0749-0712\(21\)00118-9](#))
- [L4] Oblique scaphoid fractures are potentially unstable and may result in detrimental sequelae if overlooked in the acute stage. ([10.1016/j.injury.2009.07.078](#))
- [L4] Appropriately performed acute percutaneous internal fixation is now a standard treatment option for a selected group of patients with acute scaphoid fracture. ([10.5435/00124635-200708000-00004](#))
- [L1] We found no difference in functional outcome at 12 months for fractures of the waist of the scaphoid with ≤ 2 mm displacement treated operatively or nonoperatively. ([10.1302/0301-620x.104b8.bjj-2022-0085.r2](#))
- [L4] Most scaphoid fractures were missed due to failure to consider the possibility of the injury and search for clinical signs. ([10.1016/j.injury.2019.05.009](#))
- [L3] Clinical examination along with early MRI scan should form the basis of diagnosing a suspected scaphoid fracture. ([10.1177/1753193420979465](#))
- [L1] Surgical treatment for non-displaced and minimally displaced acute scaphoid fractures may be slightly favourable compared to conservative treatment for standardised functional outcome on the short term (within 2 years), with a significantly faster return to work (SMD of 7 weeks). ([10.1136/jisakos-2015-000024](#))
- [L3] MRI-detected scaphoid fractures are not universally benign, with delayed or nonunion seen in over 6% despite appropriate initial immobilization, with most of these patients with nonunion requiring surgery to achieve union. ([10.1302/0301-620x.106b4.bjj-2023-1171.r1](#))
- [L2] The use of early MRI in patients with clinically suspected scaphoid fracture results in the accurate and reliable identification of a significant number of radiological occult injuries and early identification of patients without acute injuries. ([10.1177/1753193412471008](#))

- [L1] Nondisplaced scaphoid fractures can be effectively treated nonoperatively with union rates approaching or exceeding those of operative intervention, while operative intervention is recommended for displaced fractures. ([10.2106/jbjs.rvw.15.00073](#))
- [L4] Patients with recent scaphoid fractures that failed treatment may also be treated with distal scaphoid resection. ([10.1016/j.jhsg.2024.03.013](#))
- [L5] Early treatment of acute scaphoid fractures is important, with union rates significantly greater when treatment is instituted prior to 4 weeks from injury. ([10.1016/s0749-0712\(21\)00580-1](#))
- [L4] Persistent nonunion is common after surgery for scaphoid non-union, and surgeries for persistent nonunion are even less successful. ([10.1016/j.jhsa.2015.06.022](#))
- [L5] This article reviews current concepts regarding the treatment of scaphoid fractures and nonunions, highlighting that despite improvements in diagnosis and surgical techniques, nonunion rates remain high and early internal fixation is increasingly favored even for nondisplaced fractures. ([10.1016/j.jhsa.2008.04.026](#))
- [L4] Delayed presentation of scaphoid fractures 21 days or more after injury predicts a greater risk of casting failure; however, the union rate remains high with comparable time in cast. ([10.1016/j.jhsa.2023.10.020](#))
- [L4] Nearly half of all patients with malunited acute scaphoid fractures demonstrated radiographic findings of early arthritis on CT imaging but overall good clinical results on midterm follow-up. ([10.1016/j.jhsa.2020.04.002](#))
- [L2] From an 8- to 11-year perspective, patients with distal scaphoid fractures report normal self-assessed hand function as well as good wrist motion and strength. ([10.1016/j.jhsa.2017.06.016](#))
- [L5] The scaphoid is critical to the coordination of normal carpal kinematics, and its fracture has significant biomechanical consequences to the wrist. ([10.1016/s0749-0712\(21\)01439-6](#))
- [L4] Scaphoid nonunions have a dramatic impact on carpal kinematics, partially uncoupling the proximal and distal carpal rows. ([10.1016/j.jhsa.2008.03.008](#))
- [L2] Non- and minimally displaced scaphoid waist fractures are best treated conservatively. ([10.1016/j.jhsa.2015.03.007](#))
- [L5] All scaphoid fractures that heal do not yield acceptable results, as a foreshortened healed scaphoid will disrupt carpal kinematics and negatively impact results, including decreased wrist range of motion and diminished grip strength. ([10.1016/s0749-0712\(21\)01437-2](#))
- [L4] With a sensitivity of only 50% and five missed scaphoid fractures in this small series, we can not recommend ultrasonic assessment for the early diagnosis of acute scaphoid fractures. ([10.1054/jhsb.2000.0432](#))
- [L4] The diagnosis of scaphoid and other fractures is reliable when using HRpQCT in patients with a clinically-suspected fracture. ([10.1302/0301-620x.102b4.bjj-2019-0632.r3](#))
- [L4] There is a need for a validated prognostic classification system for scaphoid nonunions that can allow comparisons between outcome studies. ([10.1177/1753193417739510](#))
- [L4] The use of 2 headless compression screws for the treatment of scaphoid nonunions is safe and effective. ([10.1016/j.jhsa.2014.02.030](#))

- [L5] Problem fractures and non-unions of the scaphoid are associated with major alterations in wrist kinematics and a higher incidence of premature carpal collapse and degenerative arthritis than previously appreciated. ([10.2106/00004623-199274030-00014](#))
- [L4] This case is interesting as the child is one of the youngest patients described in the literature with a scaphoid fracture, and the fracture went on to non-union despite immediate medical attention and rigorous treatment. ([10.2106/00004623-198365080-00026](#))
- [L1] Currently, there is insufficient evidence to support the most effective treatment for acute scaphoid fractures. ([10.1007/s11552-010-9276-6](#))
- [L4] A restricted period of cast immobilisation is usually adequate for the treatment of non-displaced scaphoid fractures. ([10.1016/j.injury.2008.10.028](#))
- [L2] Among patients with nonoperatively managed scaphoid fractures, those prescribed NSAIDs within 1 month of diagnosis demonstrated an increased risk of nonunion and subsequent salvage procedures. ([10.1016/j.jhsg.2026.100958](#))
- [L4] The authors prefer to treat nondisplaced acute scaphoid fractures in the athlete on an individualized basis. ([10.1016/s0749-0712\(21\)00181-5](#))
- [L5] Early magnetic resonance imaging (MRI) provides an immediate diagnosis for suspected scaphoid fractures when initial radiographs are inconclusive, which is cost-effective and minimizes complications. ([10.1016/j.jhsa.2013.03.055](#))
- [L5] Nondisplaced fractures of the scaphoid heal with cast immobilization in most cases, but operative treatment is being offered with greater frequency to active patients to reduce the period of cast immobilization. ([10.5435/00124635-200007000-00003](#))
- [Commentary] CT is a good way to screen occult fractures but may not be any better than MRI or bone scanning in detecting scaphoid fractures without some over treatment. ([10.1177/1753193412446273](#))
- [L2] Although MRI remains the best diagnostic tool after radiography for detecting occult scaphoid fractures, MDCT sensitivity was 86% and specificity was 100% in this study. ([10.1007/s11604-010-0520-3](#))
- [Paper] MRI is the optimal second test for assessing a possible scaphoid fracture after a negative radiograph, while CT is preferred when the fracture is visible for further assessment and surgical planning. ([10.1016/j.hcl.2019.03.001](#))
- [L5] Early diagnosis and vigilant care of an acute scaphoid fracture are warranted to prevent malunion or nonunion, which can lead to abnormal carpal kinematics and wrist arthrosis. ([10.2106/00004623-200612000-00026](#))
- [L4] The optimal protocol for postoperative immobilization following operative treatment of scaphoid fractures remains controversial. ([10.1177/15589447221093675](#))
- [L3] This review highlights the need for a consensus definition of scaphoid fractures on MRI scans to assess the reliability and diagnostic performance of MRI scans for diagnosing true scaphoid fractures, as well as their potential harms and benefits. ([10.1177/17531934251367541](#))

- [L5] The authors argue that bone scintigraphy is inappropriate for evaluating specificity and sensitivity against clinical examination, and that MRI is the recommended examination of choice for diagnosing occult scaphoid fractures. ([10.1016/j.injury.2007.12.013](#))
- [L4] Patients treated nonoperatively or with salvage procedures had similar long-term outcomes as those treated with a corrective scaphoid osteotomy. ([10.1177/1558944716643295](#))
- [L5] The authors argue that comfort with uncertainty is key in suspected scaphoid fracture scenarios, as there is no best strategy; instead, clinicians should help patients choose a diagnostic and therapeutic course based on their individual values and risk tolerance. ([10.1097/corr.0000000000003141](#))
- [L5] According to the existing literature, MRI is the best diagnostic radiological test for triage of suspected scaphoid fractures, but bone scanning, CT, and ultrasound may also be useful, particularly when MRI is not readily available. ([10.1016/j.jhsa.2008.04.016](#))
- [L5] Routine MRI of suspected scaphoid fractures carries a notable risk of overdiagnosis and potential overtreatment, with nearly 70% of MRI findings categorized as distracting and potentially misleading, suggesting that stopping the pursuit of occult fractures may prevent unnecessary treatment. ([10.1097/corr.0000000000002914](#))
- [L3] By contrast, radiocarpal-based lunate morphology was not associated with scaphoid fracture. ([10.1016/j.jhsa.2025.10.018](#))
- [L5] The authors argue that better standardization of MRI definitions for scaphoid fractures is required, but acknowledge that a definition may not exist to solve the potentially unsolvable issue of diagnostic uncertainty, suggesting patients should participate in decisions regarding diagnostic and treatment strategies. ([10.1177/17531934251394819](#))
- [Paper] MRI is not 100% specific for diagnosing an occult scaphoid fracture, with a specificity of 96% in healthy volunteers. ([10.1016/s0363-5023\(10\)60085-8](#))
- [L4] The patient may represent two isolated coexisting conditions, or the anomalous carpal kinematics caused by the lunotriquetral coalition may have predisposed both scaphoid bones to fracture, although causality cannot be proven. ([10.1016/j.jhsa.2015.07.003](#))
- [Paper] The authors hypothesise higher union rates in scaphoid fractures using more stable fixation systems. ([10.1007/s00402-016-2556-z](#))
- [L5] Scaphoid fracture and nonunion management continues to be an area of expanding evidence with opportunities to improve knowledge and familiarization with current evidence-based data. ([10.1016/j.jhsg.2024.06.013](#))
- [L3] Patients with comorbid psychiatric conditions experienced increased rates of delayed scaphoid union. ([10.1177/15589447221142894](#))
- [L4] Our data are consistent with previously reported data supporting contrast-enhanced MRI for assessment of viability, and showing that dynamic imaging with time-intensity curve analysis does not provide additional predictive value over standard delayed enhanced imaging for acute scaphoid fracture. ([10.1007/s00256-014-1981-8](#))
- [L4] Scaphoid nonunions demonstrate findings indicative of progression to union on CT at a mean of 6 weeks and as early as 3 weeks postoperatively. ([10.1016/j.jhsa.2016.07.051](#))

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