Scaphoid Fractures- Anatomy And Diagnosis: A Systemic Review Of Literature

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Scaphoid Fractures- Anatomy And Diagnosis: A Systemic Review Of Literature

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Abstract

Scaphoid fractures are commonly seen in orthopedic practice. An organized and thoughtful approach to diagnosis and treatment can facilitate good outcomes. Anatomical knowledge of the scaphoid is important both for the treatment and prognosis. The blood supply to scaphoid is from distal to proximal pole. Clinical suspicion is of paramount importance. X ray is most important to confirm the diagnosis with aids of MRI and bone scan.

Review

Related anatomy and blood supply
Scaphoid fractures constitute 60-70 % of all carpal bone fracture1. Due to the importance of scaphoid in wrist mechanics and because of the frequency of the fracture in young adult male, it has an economic as well as physical significance. Scaphoid fractures are uncommon in children because the physis of distal radius fails first. It is also known as carpal Navicular. It is irregular shaped bone, more resembling a twisted peanut than the boat for which it is named. Scaphoid represents floor of the anatomic snuff box. Its articular cartilage covers 80 % of the scaphoid surface therefore only narrow area of its neck and smaller distal portion are accessible to blood vessels. Distally, it articulates with the trapezium and trapezoid in a gliding motion, the articulation with the trapezium forms a base for independent movement of the thumb. On the ulnar side, it articulates distally with the capitate, and proximally with the lunate in a rotary motion. Proximally, its large, biconvex surface allows articulation with the radius.

Its major blood supply comes from the scaphoid branches of the radial artery entering the dorsal ridge at or just distal to waist area and supplying 70-80 % of the bone including the entire proximal pole in a retrograde fashion. Second group of vessels that arise from palmar and superficial palmar branches of radial artery and enter the distal tubercle, it perfuses distal 20-30 % of bone, including tuberosity. The blood supply to the scaphoid can be divided into extrasosseous and intraosseous sources1, 2. The extrasosseous blood supply is primarily derived from a branch of the radial artery, the artery to the distal ridge of the scaphoid. The branches of this vessel enter the scaphoid through a foramen at the dorsal ridge at the level of the waist. These vessels then run proximally and palmarly within the medullary chamber, forming the intraosseous supply to the proximal pole. Since vascularity of the proximal pole is limited and dependent on intraosseous flow, acute proximal pole fractures have a potentially prolonged healing period, averaging 3 to 6 months and there is higher incidence of non-union. There are no anastomoses between the dorsal and palmar vessels. Vessels enter through dorsal ridge in 79 %, distal to waist in 14 % and proximal to waist in 7 % population. Fractures across scaphoid may destroy blood supply to its proximal part.

Biomechanics
Mechanically scaphoid acts as a link between the proximal and distal carpal rows. Scaphoid spans both carpal rows and therefore has less mobility than other carpal bones. Scaphoid carries the compressive loads from the hand across the wrist to the distal forearm. Scaphoid flexes with wrist flexion and extends with wrist extension. It also flexes during radial deviation and extends during ulnar deviation. These factors make immobilization of scaphoid fractures difficult especially when there is displacement. Scaphoid is a principal bony block to dorsiflexion of hand and wrist, and is susceptible to fracture during fall on outstretched hand.

Scaphoid fracture and mechanism of injury
Incidence of scaphoid fractures estimated to be around 15% of all wrist injuries3. It is more common in males. Highest incidence occurs between 20-30 year age group. Out of total fractures, 70-80% occurs at waist. Relative Incidence of Carpal Bone Fractures4 is Scaphoid 68.2%, Triquetrum 18.3%, Trapezium 4.3%, Lunate 3.9%, Capitate 1.9%, Hamate 1.7%, Pisiform 1.3%, Trapezoid 0.4%.

There are two different mechanisms involved in the fracture:
1. Compression injury : usually results in non displaced fracture
2. Hyperextension bending injury :usually results in displaced fracture

Diagnosis
A strong index of suspicion is the key to early diagnosis. The diagnosis should be based on:
1. History
2. Clinical examination
3. Radiographic evaluation
1. History
It usually occurs after a fall on an outstretched hand, athletic injury, or MVA. It usually happens in young adult men. Patient will give history of pain at the radial side of the wrist. Associated injuries may or may not be present.
2. Clinical examination
Clinically one should demonstrate tenderness in the anatomic snuff box. There is also tenderness to palpation over scaphoid tuberosity and proximal pole just distal to Lister's tubercle. Tenderness with axial compression of thumb toward the snuff box is also considered diagnostic test. Tenderness in the anatomical snuffbox is often described as a classical sign of scaphoid fracture with a reported sensitivity of 90% but a low specificity of 40%-5. The diagnosis of a scaphoid fracture can sometimes be difficult to establish, as patients may have normal radiographs early in their clinical course. Most patients have limited range of motion and pain at the end arc of motion, especially with flexion and radial deviation. Reduced grip strength may be noted6. However, it is important to note that not all patients have pain over the scaphoid even with a well-defined fracture seen on radiographs. Overall, sensitivity is quite high for the clinical examination, although specificity approaches only 74%-80%

3. Radiographic evaluation
This is considered as the best method for determining the presence of a fracture. Acute scaphoid fractures can often be missed on initial plain radiographs, with reported sensitivities ranging from 84% to 98%8. Many different views have been recommended. The useful initial views are: PA, lateral, scaphoid view (PA with ulnar deviation), Motion views of the wrist (flexion-extension-radial & ulnar deviation) may demonstrate fracture displacement. If a diagnosis still can't be confirmed with confidence on routine films, further oblique views can be taken. If certainty still exists after all these maneuvers, the patient should be placed in a cast for 2 to 4 weeks and the clinical & radiographic evaluation repeated. If the second radiographic examination is still equivocal, a technetium bone scan, polytomography, CT or MRI of the wrist is recommended. The bone scan is the most sensitive but the least specific of these modalities, thus if the bone scan is negative, a scaphoid fracture is ruled out. Although this remains an accepted treatment option, it may result in unnecessary immobilization, with adverse effects upon return to work and the need for repeat radiographs, clinical examinations, and splint or cast changes. Alternative imaging techniques may be useful for diagnosing a fracture, and magnetic resonance imaging (MRI) is superior to repeat radiographs for detecting an occult scaphoid fracture9.
Differential diagnosis
• It is the same as of radial sided wrist pain
• Sapholunate instability
• Radial styloid fracture
• Trapezium fracture
• Lunate dislocation or fx• Rupture of FCR tendon
Treatment
Most of the acute scaphoid fractures were treated by a below elbow cast, which included immobilisation of the thumb (scaphoid cast). But recent work demonstrated that immobilisation of the thumb did not influence union rates and a “Colles” type cast can be used safely10. We still use a traditional scaphoid cast, leaving the IP joint of the thumb free. If there is a clinical suspicion of a fracture, the plaster should be removed after 2-3 weeks and new radiographs should be ordered11. Other authors believe that a bone scan is more sensitive for the diagnosis of the occult scaphoid fracture and it can be performed earlier to exclude a fracture and remove the unnecessary cast11. We routinely do bone scans a week after injury in unclear cases to prevent complications of prolonged unnecessary casting. The length of the cast is controversial. In European countries a below elbow cast is used to treat a stable or a more distal fracture. An above elbow cast is used for an unstable or a more proximal fracture. We almost always use a below elbow cast and an above elbow cast occasionally. The position of the hand in plaster is also controversial. Some authors propose some ulnar deviation and no wrist flexion or extension as the most logical position. In a recent paper no difference in union rates was found between wrists immobilised in 20° flexion or 20° extension, but the wrists immobilised in flexion had greater restriction of extension after six months12. The position probably doesn’t matter as long the wrist is immobilised. There also is no agreement in the literature on the period of casting. Barton recommends putting a cast for eight weeks and a clinical and radiographic examination afterwards10. If there is tenderness in the snuffbox or the radiographs is dubious the patient goes back into plaster for another four weeks. After that the plaster is always removed, and clinical follow up is continued. Non union of the scaphoid is another important subject which is beyond the discussion of this brief review.

References
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