Injury to the Scapholunate Ligament in Sport “A Case Report”

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Abstract: Although wrist injuries are not so common such as ankle or knee joints in sports, it is more common in athletes using their wrists aggressive such as baseball, volleyball and goalkeepers in football. All soft tissues including tendons and ligaments (sprains and strains) and bones may be injured in sports. Trauma sometimes causes minor or major ligamentous injury, of which is the scapholunate ligament with a rate of 5% injury in sport. The injury occurs from a fall onto the out-stretched hyper-extended hand. The study reviewed a scapholunate ligament injury in a young amateur football player. The diagnosis, treatment and prognosis of this injury were discussed in this study and may be helpful for such injuries in other sports.

Key words: Scapholunate ligament %Out-stretched hand %Wrist injuries

INTRODUCTION

Wrist injuries occur commonly amongst athletes. They can be divided into two categories - acute and chronic. Acute injuries are mostly caused by traumatic events such as falls or direct trauma to the wrist, while chronic injuries are either due to overuse or excessive force to the wrist [1]. There is accumulating evidence suggesting that wrist injuries constitute 3 to 9% of all injuries in the athletic population [2]. The injury may cause damage to bony structures in relation to it such as carpal bones and digits, while it could also affect soft tissues such as tendons and ligaments [1]. Inter-carpal ligamentous injuries, often described as “wrist sprains”, are common among athletes [3]. These injuries range from minor sprains or partial ligamentous tears, with no instability, to complete rupture with large instabilities [4]. The scapholunate ligament is one of the most commonly affected structures in traumatic wrist injuries [5]. It is suggested that 5% of patients with wrist trauma have scapholunate ligament complex involvement [4]. Only half (51.4%) of the cases however, have been found to suffer complete disruption [6]. As appropriate and early diagnosis of these injuries requires a thorough knowledge of the anatomy of the wrist and hand, this injury could sometimes be missed by physicians, leading to chronic wrist issues [1].

The wrist is composed of eight bones which are placed in two rows - proximal and distal [3]. From lateral to medial, the proximal row consists of the scaphoid, lunate, triquetrum and pisiform bones. The distal row is composed of the trapezium, trapezoid, capitate and hamate bones. The stability of the carpal rows is provided by extrinsic capsular and intrinsic interosseous ligaments [7]. As most of the flexion/extension and ulnar/radial deviation movements occur in the proximal row, problems in this region could impair the kinematics between the bones, leading to weakness and hand dysfunction [3].

The scapholunate ligament has a key role in maintaining carpal stability [8]. It is well established that the ligament has 3 (dorsal, proximal and volar) components [9]. The dorsal and volar (palmar) components are described as true ligaments with the same histological structures, although the dorsal component is thicker, shorter and stronger than the volar region [10]. The proximal region is however comprised of fibrocartilage and is the weakest part of the ligament. Incomplete tears occurring at the proximal component, although common, are frequently asymptomatic. Nevertheless tears at the dorsal and/or volar parts of the ligament are symptomatic which can cause more serious and complicated problems [10].
The injury occurs from a fall onto the outstretched hyper-extended hand. The individual may complain of pain in the dorsal, radial side of the hand which increases during extension activities and gripping [7]. Although clinical examination might reveal swelling and tenderness in the acute stage, most chronic cases could be asymptomatic. The main clinical diagnostic test is Watson’s test (Fig. 1) [3] demonstrating pain, clicking and movement of the scaphoid [11]. However, it has been found that in people who have general ligamentous laxity this test might often be falsely positive [12].

The AP radiographic views, especially with the clenched fist, might reveal a gap between the scaphoid and lunate. If injury is suspected due to positive clinical tests while radiographic findings are negative, an MRI arthrogram is required for confirmation due to its high sensitivity and specificity [13].

Depending on the type of the sport and the severity of the condition, different treatments could be considered. In patients with positive clinical findings but negative stress radiographic views, conservative treatment options such as casting, splinting and NSAIDs should be considered. Furthermore, for those with dynamic instability and scapholunate dissociation, surgical intervention is needed which could be in the form of open reduction, closed reduction or ligamentous repair arthroscopy [7, 13, 14]. Rehabilitation is also very important and should be followed by strengthening exercises after achieving a full and painless range of motion in these cases [11].

**Case Study**

**History:** A 29-year-old female amateur football player was referred to the sport injury clinic by her general practitioner (GP). She complained of pain and discomfort in her right wrist following a fall on her hand 3 months earlier whilst jogging. After the fall, she had pain which did not prevent her from performing daily living activities. She did not visit her GP at the time and managed the pain using pain killers, ice and a wrist splint. The pain decreased gradually in the first 24 hours but did not disappear completely even after a week. She then visited her GP as she felt some discomfort and “clunking” during various movements. After clinical examination, her GP ordered an AP radiograph of her right hand. No significant bony abnormality was detected in the radiograph. She was thus referred to physiotherapy for 20 sessions and advised to use a “Muller wrist support” which had already been prescribed by her GP. The physiotherapy treatment aimed to decrease the pain and increase the strength of the wrist with different modalities such as electrotherapy and exercise. She was also advised to exercise with a “power ball” device at home.

After two months of conservative treatment, she still felt pain and discomfort during various activities. However, she could not remember the exact activities which could aggravate her symptoms. Therefore, her GP decided to send her to the sports injury clinic for further examination.

On further investigation and history taking, she mentioned that she felt no pain at night and during the day but would sometimes experience sudden pain on carrying out certain activities such as turning a door knob or a tap, chopping meat with knife and washing the dishes. No weakness, numbness or tingling signs were reported.

**Clinical Examination:** On clinical examination the skin was normal and no swelling was presented. Active and passive ranges of motion through flexion/extension, supination/pronation and ulnar/radial deviation were normal. Manual muscle test was carried out and no significant weakness was noticed in her right hand when compared to her left hand. During palpation, a mild degree of tenderness was noticed in the pre-scaphopid space; hence no hyper-mobility of that bone was noticed. Special tests were carried out, with the patient sitting on a chair, in front of the clinician; Watson’s Test was performed to rule out scapholunate ligament injury. To perform the test,
the clinician placed his thumb on the scaphoid tuberosity with the wrist held in ulnar deviation. When the wrist was then deviated radially some degree of discomfort and a clunk was noticed. No dorsal displacement of the scaphoid was noticed by the clinician but the test was considered positive. She was then asked to stand up by pushing her hand on to the chair to raise the body weight from the chair (Sitting hands-press Test). She felt some pain and discomfort during this test as well. Other suspected injuries such as de Quervain’s syndrome, triangular fibrocartilage complex injury and dorsal wrist ganglions were excluded. Other ligamentous injuries such as lunotriquetral ligament were also excluded, as their respective special tests were negative. There was no pain or other signs of injury in proximal joints such as the elbow, shoulder and sternoclavicular joint. As the result of the previous PA radiograph was reported as normal by her GP, a lateral view and stress view radiograph was ordered to confirm the suspected injury.

**Imaging:** The AP stress view did not reveal the “Terry Thomas” sign and no fracture was observed in the carpal and forearm bones. In the lateral view, although the scapholunate angle had increased slightly, it was not more than 70 degree and hence not great enough to consider scapholunate dissociation [13]. An MR arthrogram was carried out to confirm a partial tear of the ligament.

MRI revealed a partial tear in the scapholunate ligament in addition to a disruption in the proximal portion of the scapholunate ligament. The MRI was also able to exclude any other associated injury to bony and soft tissues.

**Diagnosis:** Based on the history of fall on an outstretched hand and positive clinical and imaging findings, a clinical diagnosis of Grade 1 scapholunate ligament tear was made.

Clinical examination and MRI excluded associated injuries since involvement of other structures would require different management strategies overall.

**Treatment:** As the patient presented to the clinic 3 months after the injury, it was difficult to consider the best treatment for her. Grade 1 injuries are mostly managed with conservative treatment consisting of casting, splinting, NSAIDs and physiotherapy. However some arthroscopic intervention studies had good short term results in managing Grade 1 scapholunate ligament injuries [14, 15]. Although it had been 3 months since her injury, the clinician decided to manage her injury conservatively. Her hand was therefore immobilized with a short forearm fibreglass cast with thumb support for 6 weeks.

After removal of her cast, she was referred to a rehabilitation centre and 15 sessions of physiotherapy was prescribed, aiming towards obtaining the level of full painless range of motion and strength, much of which was lost after immobilization.

**Prognosis:** The aforementioned case has a good prognosis as it involved disruption only of the proximal portion of the scapholunate ligament. However, the delay in treatment could decrease the chance of healing of her damaged ligament. As no degeneration was seen in her carpal joints and there was no associated injury to other ligamentous and bony structures, her conservative treatment was beneficial. Furthermore, because her symptoms were reduced after the treatment period, the treatment can be considered successful. However, if she had presented with symptoms after this line of treatment, surgical intervention would be required to repair the ligament. This again, would be followed by a rehabilitation program to obtain full range of motion and maximal strength [7].

As no MRI was obtained after her rehabilitation to confirm the effectiveness of her treatment, she was asked to return to the clinic if she noticed any symptoms in her wrist in the future.

**DISCUSSION**

Acute wrist pain might be caused by a fall on the outstretched ulnar-deviated hand. The injury could be associated with carpal fractures and complete ligamentous disruptions. It is reported that 71% of scaphoid fracture injuries are associated with scapholunate ligament injury. However, in that study they found that, of those ligamentous injuries, only 24% had a complete rupture [5]. Hence, incomplete scapholunate ligament tears are known as one of the most common causes of wrist pain amongst athletes [16]. The scapholunate ligament has a key role in maintaining the carpal stability. The wrist injuries affecting this ligament can therefore lead to chronic problems such as perilunate instability and scaphoid dissociation [17]. With regard to the scaphoid and lunate
Fig. 2: PA X-ray of wrist, Stress view with a Positive Terry Thomas Sign

geometry and intercarpal lines forces across the joints, the scaphoid has a tendency to flex and the lunate to extend, although this is usually countered by the scapholunate ligament. It is suggested that, as the three distinct parts of the ligament have different histological and anatomical structures they can behave differently in response to various loading conditions such as rotational or tensile forces between the bones [10]. The fibres of the volar subunit of the ligament are obliquely oriented which are more resistive to rotational forces. However, the dorsal part is comprised of transversely oriented fibres [18]. Therefore, in the volar ruptures of the ligament, rotation of the scaphoid is more likely to occur which can be demonstrated in lateral radiographic views. Thus, the radiographic view will demonstrate an increased scapholunate angle, which is normally between 30-60 degrees [4]. In the posterior subunit tears, the space between the scaphoid and lunate will increase (known as Terry Thomas sign). This could be noticed in the stress PA radiographic views, (Fig. 2) [13] while the instability might not be noticed in a normal PA view. Therefore, this radiographic technique, also known as dynamic view, is useful to detect hypermobility between the carpal joints in the saggital plane. It is widely suggested that any enhanced space more than 2 mm should be considered as an abnormal radiographic finding. However, this should be compared with the radiographic image of the contralateral hand to confirm the scapholunate instability [4].

The dynamic instabilities are known as primary forms of wrist problems. In this situation the instability could just be noticed by applying extra force to the wrist, which is achieved in the clenched fist radiographic views [4]. The occult instability, also known as peri-dynamic instability is the mildest form of such injuries. As patients may not seek any treatment with these injuries, consequently they have the potential to progress into static instabilities. Incomplete ligamentous injuries are often found in the proximal and volar parts of the ligament, while higher-energy trauma can damage the posterior portion and cause complete or subtotal ligamentous rupture. The enhanced displacement of the carpal bones in this stage, if noticed in the PA radiographs, is known as static instability [13].

Although the treatment of scapholunate ligament injury is still controversial and depends on various factors, Garcia-Elias and his co-workers [22] developed a 5-step question algorithm to define the most appropriate treatment for this injury: Is the dorsal portion intact? does the ligament have sufficient tissue to be repair?, is the scaphoid posture normal?, is any carpal malalignment reducible? and is the cartilage on the radiocarpal and midcarpal surface normal?

However, the aforementioned had no of the indicated symptoms to be nominated for surgical treatment. As this algorithm does not take into account time passed since injury and/or associated injuries, both of which can affect treatment protocol.

Most of the traumatic wrist injuries are not associated with severe fractures and significant capsuloligamentous structural injuries therefore they can often be treated conservatively [3]. The prognosis with such injuries is very dependent on the type of the injury sustained. Other traumatic problems, such as displaced or non displaced scaphoid and/or distal radius fractures are often associated with wrist injuries and these will require surgical management in the earliest stages of injury [3, 5].

The presentation of the fractures and/or complete wrist sprains might be worse than incomplete ligamentous tears. However, since the latter are difficult to diagnose, failure to recognize the injury in the acute onset could lead to chronic wrist pain, arthritis and/or significant structural failure in the future [3, 7].

Partial ligamentous disruptions which are diagnosed and managed in the acute stage can have excellent outcomes and it is therefore possible to manage such injuries conservatively [6, 19]. It is widely suggested that the best outcome in such cases is achieved through early
management and delay in treatment (more than 6 weeks) might result in less successful outcomes [20]. Therefore, carpal instabilities, which are noticed in dynamic radiographic views, could be treated in a scaphoid type cast within 6 to 8 weeks [4]. Conversely, poor outcomes have been noted after conservative treatment in patients with static wrist instabilities and chronic scapholunate dissociation [13]. Some authors have suggested that surgical intervention such as temporary pinning might be beneficial in these patients, while other studies mentioned that no improvement achieved after arthroscopic debridement in similar cases [21]. Thus, closed reduction following by holding the position in a scaphoid type cast might have a better outcome, though this should be followed up by interval radiography to ensure the continued reduction [4]. As the 3-month delay in the patients management demanded a surgical management, but regarding to the result of her MRI, the clinician preferred the conservative management. This decision was made as the volar and dorsal portions of the ligament were intact. The management of such injuries might be different in the professional athletic population and patients might return to sport rapidly after surgical treatment. In long-term follow up however superiority of the surgical intervention had been proofed in comparison with conservative management [10, 13].

Scapholunate dissociation, which is the advanced stage of static carpal instability, is a condition with altered kinematics in both frontal and sagittal planes. In this condition the complete ligamentous tear is noticed by widening and rotation of the scaphoid in both planes [13]. It is shown that as the biomechanics and motion of the wrist are damaged; it can develop osteoarthritis and chronic pain in the mid-carpal joints, which could lead to advanced wrist collapse [15]. Therefore surgical intervention is required to repair the ligament or to fix the bones [7]. Some authors suggest that three months of conservative treatment before arthroscopy intervention might have better results in such patients. The results of these treatments could be beneficial in the long run but they are very time consuming and difficult for the patient to tolerate [20].

In conclusion, as scapholunate ligament is a key structure in maintaining carpal instability and alignment, the disruption of this important organ could lead to dysfunction and degeneration of the wrist joints. It is therefore crucial to be considered in the orthopaedic assessment, especially in those patients who have reported a fall on their out-stretched hand. Furthermore, mildest grades of instability should not be missed to treat, as they have the potential to progress into static instabilities and scaphoid dissociation. Therefore, in the presence of positive clinical examination, obtaining the MRI arthrogram is useful if the stress view radiographic images are unable to demonstrate carpal instability.

REFERENCES