Closed Central Slip Injuries – A Missed Diagnosis?

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Abstract

The extensor apparatus of the finger is a complex structure and injury can lead to significant digital dysfunction. Closed injuries of the central slip may be missed or diagnosis delayed because of lack of an open wound and often no radiographic abnormality, and can result in boutonniere deformities if untreated. This study aimed to quantify the number of patients presenting with closed central slip injuries and to ascertain if the initial diagnosis was correct. The number of patients presenting to us over a 6 month period was recorded. The original diagnosis, time to diagnosis of central slip injury and the presence/absence of a boutonniere deformity were recorded. Ten patients were included in the study. Seven (70%) injuries were due to sport. Eight (80%) had a delayed diagnosis of central slip injury. Six (60%) had previously presented to general practitioners or emergency departments. Seven (70%) had boutonniere deformities. Closed central slip injuries can be missed. Simple clinical tests can diagnose central slip disruption.

Introduction

Patients with closed tendon injuries of the hand commonly present to the emergency department. They generally exhibit tenderness with or without swelling and ecchymosis over the affected area. There is a deficit in the specific function of the tendon. As there is no wound and often no radiographic abnormality, the diagnosis can be missed or delayed. When rupture of the central slip of the digital extensor tendon occurs, extension of the digit due to the lateral bands is initially preserved. Consequently, it is a diagnosis that can easily be missed in the acute presentation if not specifically looked for.

Methods

The number of patients presenting to the hand surgery service with closed central slip injuries over a 6 month period was prospectively recorded. Data collected included patient demographics (age, sex, occupation and hand dominance), the mechanism of injury, whether or not the PIPJ had been dislocated, and radiographic findings. The time to initial medical presentation and time to referral to the hand surgery trauma service was noted. The original diagnosis made and the time to diagnose a central slip injury, along with the presence or absence of a boutonniere deformity was recorded. If the injury was not yet present, it was then checked to ascertain if it was passively correctable and if there were any associated joint changes. All patients were then commenced on PIPJ extension splintage and a DIPJ flexion exercise regime in an attempt to heal the central slip injury under the supervision of our hand therapists. Descriptive statistics were then performed on the data obtained.

Results

Ten patients (nine male, one female) presented to our service with closed rupture of the central slip of an extensor tendon during the study period. Ages ranged from 15 years to 40 years (mean 29 years). Seven of the ten patients had injury to a digit on their dominant hand. Seven injuries were sporting injuries, while the remainder occurred after a fall, a road traffic accident and while catching a child. None of the patients had a history of previous injury to the involved digit or gave a history of dislocation of the PIPJ at the time of injury. Seven of the ten had radiographs of the finger taken, which did not show any bone injuries. Boutonniere deformities had developed in seven patients. However, these were all fully correctable passively.

Discussion

Distal to the metacarpophalangeal joint (MCPJ), the extensor tendon divides into three slips – one central and two lateral. The central slip inserts at the base of the middle phalanx and the two lateral bands converge at the distal third of the middle phalanx to form the terminal tendon. The central slip extends the middle phalanx and the two lateral bands extend the DIPJ. In the proximal phalanx, the individual components of the extensor apparatus can lead to significant dysfunction of the digit. Rupture of the central slip may ultimately result in a boutonniere deformity due to volar migration of the lateral bands, which then exert a flexor rather than an extensor force on the PIPJ. Boutonniere deformities are commonly treated by PIPJ extension exercises and DIPJ flexion exercise exercises, which guide the lateral bands back to their normal position. Seven of our ten cases had begun to develop this deformity. If allowed to remain in this position, the volar plate of the PIPJ becomes stuck proximally and the collateral ligaments shorten resulting in a fixed flexion contracture.

Conclusion

Correction of this contracture and reconstruction of the central slip at this stage can be very difficult. Closed ruptures of the central slip can potentially be missed in the acute setting. The lack of a wound and a normal radiograph can lead to these injuries being dismissed as soft tissue injury or strain. Six of our ten cases fell into this category on their initial presentation. The presence of active extension of the PIPJ can be misleading, as the lateral bands will also extend the PIPJ initially, before they start to migrate to the volar aspect of the PIPJ. On physical examination, the injured finger is usually held in a semi-flexed position, the PIPJ is usually swollen, painful and tender, and active extension of the PIPJ is usually decreased. There will often be a point of maximum tenderness near the central slip insertion (dorsally, over the PIPJ). Ecchymosis may be present.

Elson's test is a simple clinical manoeuvre that can establish the integrity of the central slip. The patient flexes the injured finger to 90 degrees e.g. over the edge of a table. It is held in this position by the examiner's finger over the middle phalanx and the patient is asked to extend their finger. If the central slip is intact, the examiner will feel pressure through the middle phalanx and the PIPJ will be held in a full position as the lateral bands cannot extend the PIPJ. If rupture of the central slip is present, the lateral bands are able to lift the DIPJ into extension in this position and any extension effort will be accompanied by DIPJ extension. Correction of this is crucial, as the loss of active extension of the PIPJ when the wrist is supinated and the metacarpophalangeal joint (MCPJ) are fully flexed is a useful diagnostic test for the early recognition of the injury. Boysen noted that early diagnosis may be facilitated by checking the amount of DIPJ flexion possible with the PIPJ in full extension; if there has been disruption of the central slip and the lateral bands have migrated to a volar position, flexion of the DIPJ is significantly reduced. Radiographs should also be checked to ensure there is no dislocation of the PIPJ or any associated avulsion of a bony fragment.

When diagnosed acutely, closed central slip injuries can be treated with extension splinting of the PIPJ - combined with active exercises of the PIPJ in order to restore normal tendon balance and precision length relationship of the central slip and lateral bands. Another option is immediate surgical repair of central slip injuries. We have used a combination of these techniques using a commercially available bone anchor and reconstruction of the damaged central slip with adjacent lateral band tissues. However, once fixed flexion deformities of the PIPJ set in, the complexity of treatment greatly increases. Fortunately, none of our patients had developed flexion deformities at the time of diagnosis. All were amenable to treatment by extension splinting/DIPJ flexion exercises.
We hope to raise awareness of this injury so that patients can be diagnosed and appropriately treated acutely. As with all hand injuries, timely appropriate intervention significantly reduces the associated morbidity. It allows the patient to proceed along a less complicated treatment route. In our unit, we favour a trial of non-surgical therapy in preference to immediate surgical reconstruction of the central slip. Awareness of the presence of these injuries and the anatomy of the extensor tendon mechanism in the finger can reduce the incidence of delayed or missed diagnosis. Early recognition of the condition and referral to a hand surgeon can ensure prompt institution of appropriate splinting and correct hand therapy. Closed tendon injuries such as those of the central slip can result in chronic deformities in the hand if untreated. While signs initially may be subtle, awareness of the injury and careful clinical examination of the digit will reduce the incidence of missed and delayed diagnoses. Timely recognition and early treatment can reduce the impact of a central slip rupture on hand function.

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References