

Gamekeeper's Thumb—A Treatment-Oriented Magnetic Resonance Imaging Classification

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Purpose To investigate by magnetic resonance imaging the degree of ulnar collateral ligament (UCL) displacement in order to create a simple classification to aid in determining which UCL injuries require surgery.

Methods We evaluated 43 cases of UCL injury with a dedicated extremity magnetic resonance imaging and measured the degree of ligament displacement. This was correlated to clinical outcome with planned surgical intervention reserved for patients with a Stener lesion. By collating results we could generate 4 types of injury based on the appearances of the UCL.

Results Partial and minimally displaced UCL tears (type 1) and tears displaced less than 3 mm (type 2) typically healed by immobilization alone, whereas 90% of tears displaced more than 3 mm (type 3) failed immobilization and required surgery as did all of those with a Stener lesion (type 4).

Conclusions Our 4-stage, treatment-oriented classification of thumb UCL injury is based on the degree of UCL displacement in, with correlation with the likelihood of success with either immobilization or operative intervention. Tears of the UCL with more than 3 mm of displacement are likely to require operative repair even in the absence of a true Stener lesion. (*J Hand Surg Am. 2015;40(1):90–95. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.*)

Type of study/level of evidence Diagnostic IV.

Key words Classification, magnetic resonance imaging, ulnar collateral ligament.

FOLLOWING CAMPBELL'S¹ DESCRIPTION of ulnar collateral ligament (UCL) injury in 1955, there have been ongoing efforts to establish a reliable means to discriminate between injuries that require surgical intervention and those that can be managed conservatively.^{2–5} Most notably, this refers to cases complicated by the presence of a Stener lesion in which the adductor aponeurosis is interposed between the distally avulsed UCL and its attachment on the base of the proximal phalanx, which prevents healing.⁶ Despite

their recognized limitations, clinical examination and plain/stress radiographs remain the baseline tools used to evaluate UCL injury and guide management. However, neither can provide definitive prognostically relevant information on the degree of ligament displacement or the presence of a Stener lesion.⁷ As a result, many patients with UCL laxity are assumed to have either a widely displaced complete tear or a Stener lesion and subsequently undergo surgical exploration and repair regardless of the actual pathology present. In other situations, diagnostic uncertainty persists after clinical and radiographic assessment and a period of trial immobilization is instigated that can delay intervention in cases that are ultimately destined to fail conservative treatment, as defined by persistent UCL laxity with no discernible end point.

To improve diagnostic accuracy in thumb UCL injury, the value of adjunctive imaging using ultrasound or magnetic resonance imaging (MRI) has been

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extensively studied.^{8–11} Magnetic resonance imaging sensitivity and specificity for UCL injury detection approaches 100%; with the latest generation of dedicated extremity coils, it offers a level of detail that can show the precise location of the torn ligament within the accuracy of a millimeter. Romano et al¹² used high-resolution MRI to characterize the detailed appearance of the thumb UCL after injury and suggested 5 distinct subclasses of ligament tear, ranging between partial tears and Stener lesions with undisplaced, minimally displaced (up to 3 mm), and moderately displaced (3 mm or more) lesions in between. This MRI classification of UCL injury offers an opportunity to study the natural history of UCL tears and identify the extent of trauma that can be tolerated and still heal without surgical intervention. Thus, this could lead the way to avoiding both unnecessary surgery and delay to surgery when there is limited chance of healing without intervention.

MATERIALS AND METHODS

Our institutional review board approved the study and we adhered to all requirements including obtaining informed consent from each patient. The study was based on the retrospective association between final outcome after UCL injury and the initial appearances of the ligament on MRI scans at presentation. The final outcome was defined as the successful establishment of stability at the ulnar side of the thumb metacarpophalangeal (MCP) joint, regardless of whether it was treated by immobilization alone or through surgical reconstruction or repair of the UCL. A total of 43 patients were included; 25 were male and 18 were female. Average age at injury was 39 years (range, 16–69 y). Duration of time from injury to presentation ranged from 1 day to 3 years. Patients with an injury to the thumb with tenderness over the UCL associated with pain or instability on clinical stress testing were included in the study. All patients underwent clinical evaluation at all stages by the senior author (S.M.T.), who also performed UCL repair when necessary. Ulnar collateral ligament laxity was assessed by stressing the thumb MCP joint in 30° flexion to isolate support from the UCL from that provided by the volar plate when held in extension.³ Specifically, where there was an absence of a solid end point and no associated discomfort or when there was pronounced laxity compared with the contralateral thumb under the same examination, UCL integrity was deemed to be lost, requiring further treatment.

After clinical examination and standard plain radiography, all included subjects were evaluated in a

TABLE 1. Classification of UCL Injury Based on Ligament Appearance on MRI

Group	UCL Appearance on MRI	Recommended Treatment Modality
1	Partial/undisplaced tear	Immobilization
2	Complete tear up to 3 mm	Immobilization
3	Complete tear \geq 3 mm Buckled/quasi-Stener lesion	Surgical repair
4	Stener lesion	Surgical repair

Recommended treatment for each UCL injury group is based on the intervention necessary to achieve a successful outcome in the 42 patients studied.

1.0-T dedicated extremity MRI machine. Our musculoskeletal radiology group evaluated all MRI scans and documented the degree of UCL injury and extent of displacement in complete tears to millimeter accuracy. The configuration of the ligament in complete tears was also noted including the typical appearance of the Stener lesion. In simplifying the classification described by Romano et al,¹² UCL injury severity was assigned 4 types, retaining their distinction of complete tears into those of up to 3 mm separation and those with separation of 3 mm or more (Table 1). Type 1 included sprains or partial tears of the UCL (Romano type 1 and 2 combined) (Fig. 1). Type 2 lesions had a complete UCL tear in which the separation between the ends of the ligament (for intra-substance tears) or the separation of the ligament from its bony point of insertion was reported to lie within 3 mm of each other beneath the adductor aponeurosis (Fig. 2). Type 3 included complete UCL injuries with 3 mm or more of separation but without interposition of the adductor aponeurosis (Fig. 3). Type 4 represented cases with a Stener lesion (Fig. 4).

All patients, including those with instability on the first examination, were initially treated conservatively by full-time immobilization in a forearm-based thumb spica orthosis unless there was MRI evidence of a Stener lesion, because this was the standard practice of the senior author at the time of data acquisition. There were no compliance problems with any conservatively managed patients included in the study. Because of the large geographical area for included study subjects, the duration of immobilization ranged from 6 to 8 weeks for logistical reasons. After immobilization was completed, we reassessed UCL stability immediately after cast removal and treated patients surgically if UCL instability persisted, defined as the lack of a discernable end point

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