



ELSEVIER

CASE REPORTS

Early return to play following complete rupture of the medial collateral ligament of the elbow using preparation rich in growth factors: A case report

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Injuries to the medial collateral ligament (MCL) of the elbow and the common flexor origin are common in contact and throwing sports.^{12,20,21} As athletes have previously been considered to be unable to return to the same standard of play following elbow surgery,¹⁸ the gold standard treatment may be considered to be reconstruction or augmentation of a primary repair of the MCL using tendon autograft.⁵ The recovery, rehabilitation, and return to play following these procedures may take up to a year¹⁰; and even then, approximately a third of patients may not return to the same standard of play.⁷

We report the case of an Olympic Judo medalist who, within a year of the forthcoming Olympics, sustained a complete rupture of his right elbow medial collateral ligament and a tear of the common flexor tendon origin (CFT) and pronator teres (PT). We considered that there would be insufficient time available for adequate rehabilitation following reconstruction. He was managed nonoperatively with injections of a preparation rich in growth factors (PRGF) into the MCL and CFT. The PRGF is one of the techniques to obtain platelet rich plasma (PRP).

Case report

A 30-year-old judo athlete injured his right elbow during a training bout. While being thrown, he landed awkwardly on the

mat, sustaining a valgus injury and a probable simple right elbow dislocation. He heard a pop and felt his joint deform before returning to its normal position. The elbow was immediately painful, with tenderness and swelling over the medial structures. The joint opened easily without any discernable end point to valgus stressing. The elbow was subsequently immobilized and protected in a cast brace at 60° of flexion.

Radiographs showed no evidence of fracture and ultrasound (US) (HDI 5000 SonoCT ATL; Philips, Andover, MA) at 48 hours following the injury, revealed increased fluid within the joint, a large medial haematoma, and a full thickness tear of the medial collateral ligament (Figure 1). There was also a near full thickness tear at the insertion of the common flexor origin. Magnetic resonance imaging (MRI) confirmed a full thickness tear of the MCL, rupture of the capsule, and the CFT injury seen by US. A near full thickness tear of the FCU and a large partial thickness tear of pronator teres were identified (Figure 2).

After the initial swelling and bruising had settled, at 6 days post trauma, a localized US guided injection of PRGF was performed. PRGF is a manual technique²⁶ yielding pure PRP with the removal of WBC from the final preparation also known as Leucocyte-poor-PRP (Figure 3).¹¹ The needle was placed just anterior to the medial epicondyle at the avulsed anatomical insertion of the medial collateral ligaments. A second injection was performed into the common flexor tendon origin. The elbow was protected during activities of daily living for the first 3 weeks at 60° of flexion.

An additional PRGF injection was performed at 2 weeks post trauma. At this point, the brace removal was permitted for supervised physical therapy, massage, and range of motion exercises only.

At 5 weeks, the elbow had regained almost full range of motion and felt stable to gentle valgus stressing. Ultrasound showed that the

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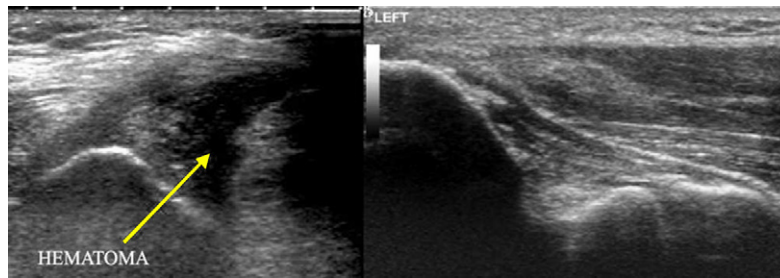


Figure 1 **Right side**, Ultrasound appearance at 48 hours following injury. There is a large medial haematoma (*yellow arrow*) and a full thickness tear of the common flexor tendon origin. No UCL was visualized in the expected anatomic position. **Left side**, For comparison, normal UCL appearance. This figure shows the relatively easy positioning of the needle for accurate PRP injection.

common flexor tendon had healed without major scarring, and the fibres of the medial collateral ligament were continuous with a fine line of scar tissue from the epicondyle to the ulna. MRI examination at 6 weeks post trauma revealed a small amount of joint fluid, soft tissue oedema with a continuous band of tissue forming at the line of the MCL, and a recovery of the CFT (Figure 4) with its anatomical relation to the medial epicondyle.

By 9 weeks, there was no medial opening demonstrated on application of forced valgus stress. An isokinetic dynamometer evaluation (Biodex Medical System, Shirley, NY) demonstrated an elbow extension peak torque bilateral deficit (uninvolved >involved) of 24%, a max. repetition total work deficit of 22%, and an average power deficit of 30% all for 60°/second. Flexion deficits (at 60°/second) were minor at that time (11%, -1%, 4% respectively). Strength training was commenced before returning to judo contact training at 3 months following injury. Biodex values, at this time, demonstrated less than 8% deficit for all extension measurements. For all flexion measurements, the injured elbow was 18% stronger. At 5 months post injury, the athlete returned to competition; at 6 months, he won the gold medal in his weight division at the

Judo World Cup, qualifying for the Olympic Games where he was able to compete at the highest level (Figure 5).

Discussion

Acute injuries of the elbow MCL occur as a result of falls onto the outstretched hand or when forced into valgus. Injuries sustained while competing in Judo most commonly involve the upper limb (16.5 injuries per 1000 exposures). The elbow being injured in 3 per 1000 exposures compared to overall injury rates of 25.2-122.6/1000 athlete exposures. The commonest mechanism of injury was being thrown or attempting to throw.¹⁴ Similarly, during wrestling, 2.3% of injuries are localized to the elbow and 40% of injuries occur during takedowns.²⁹

Elbow injuries in American football occur due to blocking at the line of scrimmage (50%), and when the hand was placed on the playing surface and a valgus or

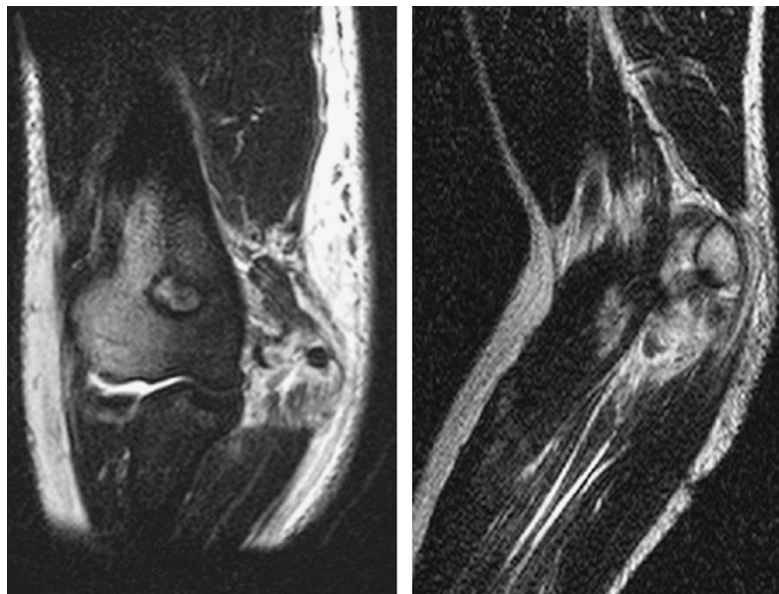


Figure 2 T2 weighted images in coronal and sagittal planes show a complete tear of the elbow MCL, near full thickness tear of CFT, and a partial thickness tear of PT muscle.

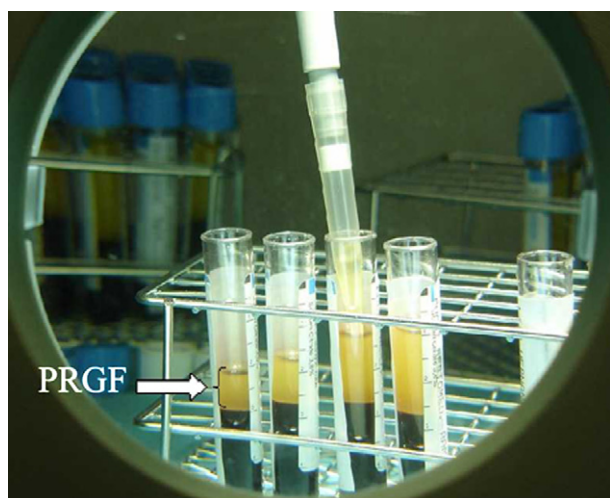


Figure 3 Preparation of the growth factor rich injection. The spun whole blood has separated out into its cellular and plasma layers. The plasma consists of 3 layers. The highest concentration of growth factors is found in the bottom plasma layer, immediately above the white leucocyte layer. The above (intermediate) layer contains much fewer GF concentrations while the top layer is known as the poor platelets and GF layer.

hyperextension force was applied to the elbow (29%). Seventy-seven percent of these injuries were elbow sprains and 17.6% were dislocations; of these, MCL injuries accounted for only 2.9% of injuries.²⁰

The mechanism of injury provides a high degree of suspicion of the structures injured, and MCL laxity should be assessed with the application of a valgus stress force. Twenty five degrees of flexion disengages the olecranon from the fossa on the posterior aspect of the humerus, isolating the soft tissues for testing.^{6,23}

Following injury, the aim of any high level athlete is to return to play in the shortest time possible and at least the same standard of play. The rupture of the medial collateral ligament is a catastrophic injury for a throwing sportsman, and, previously, MCL injured players believed they would never pitch again.¹⁸ The rate of return to sport level is between 50% and 90% for teenage, collegiate, nonprofessional, and professional sportsmen. Reconstruction and augmentation has a higher rate than return following primary repair alone. Return to play typically takes up to 10 months, although sportsmen may not actually attain the same level of competition.^{4,7,10,18,25,27}

In addition to the prolonged recovery period, surgical reconstruction has the disadvantage of the 3-8.8% complication rate compared to nonoperative management.^{4,10} In particular, 21% of patients post MCL reconstruction report ulnar nerve symptoms.⁷ Re-rupture of reconstructions occurs in 2% cases, and only 33% of revisions will return to the same standard of play.⁹

Although the forces applied to the elbow joint during competitive judo bouts have not been determined, they are likely to be considerable. The elbow MCL has been shown



Figure 4 T2 weighted MRI image in the coronal plane at 6 weeks post injury, revealing continuous tissue forming at the line of the MCL and a continuation of the CFT with its anatomical relation to the medial epicondyle.

to have an ultimate tensile strength of 260N,²⁴ far greater than the forces sustained during baseball pitching.¹⁶ This athlete's injury occurred at a crucial time in his pre-competition preparation, where he had to regain almost full muscle strength before returning to contact training and full strength before returning to competition. We were concerned there would not be adequate time for recovery and rehabilitation following reconstruction. We hoped PRGF therapy would promote recovery over the short time period and have the additional advantage of not altering the anatomy for future surgery.



Figure 5 T2 weighted MRI image (coronal plane) at 20 month post injury. The CFT appearance has not significantly changed from the image at 6 weeks post injury, indicating the fast recovery.

The use of PRP allows the insertion of high concentrations of growth factors to an injured area to optimize healing.¹⁻³ PRGF, being a pure PRP technique, has the advantage of providing the beneficial growth factors without the WBCs included in the PRPs produced using commercial kits. The PRGF provides a complex mixture of biological mediators essential of natural repair including: transforming growth factor Beta TGF-B1, platelet derived growth factor (PDGF), epithelial growth factor (EGF), hepatocyte growth factor (HGF), and insulin like growth factor (IGF). These factors are released into the surrounding tissue contributing to the accelerated healing, tissue repair, and vascularization³ by myoblast proliferation and differentiation to promote muscle regeneration and repair.²² Growth factors have been successfully used to promote muscle,¹⁹ tendon,²⁶ and ligament healing¹³ following strain and tear.¹⁵ In vitro studies of tendon repair have shown that PRP accelerates the catabolic demarcation of traumatically injured tendon matrices, increases the

expression of matrix degrading enzymes and endogenous growth factors, and promote angiogenesis and formation of a fibrovascular callus.⁸ Hildebrand et al showed that application of PDGF-BB on sectioned knee MCL in rabbits improved significantly the ultimate load, energy absorbed to failure, and ultimate elongation values, both biomechanically and histologically, in the early phases of ligament repair.¹⁷

The preparation and injection of growth factors does have some small costs and risks. After initial equipment outlay, Sanchez's method²⁶ can be used to produce PRGF for injections at the fraction of the cost compared to commercially available kits.²⁸ The infection risks are similar to any percutaneous injection and may be minimized by the use of a small laminar flow canopy.

We believe that the use of PRGF optimized and speeded recovery, and we are currently studying this technique in many more sports related soft tissue injuries. This case highlights the use of growth factors to promote healing and return to play in cases which previously may only be considered suitable for reconstructive surgery.

Conclusion

An Olympic Judoka medallist who, within 11 months of the forthcoming Olympics, sustained a complete rupture of his elbow medial collateral ligament and a near full thickness tear of the common flexor tendon origin, was managed using injections of a PRGF into the MCL and CFT. He returned to full contact training within 3 months, and won a gold medal in a World Cup competition 6 months following injury, and qualified for the Olympic Games where he was able to compete at the highest level.

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