Title	Little League elbow in a pre-pubertal cricket player
Author(s)	Swarup Mukherjee
Source	*Current Sports Medicine Reports, 14*(6), 455–458. http://dx.doi.org/10.1249/JSR.0000000000000211
Published by	American College of Sports Medicine

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Introduction

Little League elbow has been commonly reported in young baseball pitchers (7,9) but its prevalence in other youth sports is relatively unknown. Repetitive valgus stress across the elbow can lead to injury of the relatively weaker medial epicondyle apophysis in young athletes. Forceful contraction of the forearm flexor-pronator muscles further add to the tensile stress on the growth plate leading to the condition called Little League elbow (3) characterized by medial epicondylar apophysitis, partial separation and/or fragmentation (10). This report presents a rarely documented case of Little League elbow in a male pre-pubertal cricket player.

Cricket is one of the world's popular team sport and arguably the most popular sport in South Asia and parts of South East Asia. Broadly the players have three roles: bowling, fielding and batting. Amongst bowlers, there are fast bowlers and spinners. Spin bowling is slow (60-85 $km.h^{-1}$) and causes the ball to deviate from its path on either side after pitching on the ground thus deceiving the batsman into committing a mistake in judgment. Fast bowling on the other hand involves the use of speed and swing making the ball travel through a curved path in air. While both forms of bowling in cricket are overhead actions, fast bowling requires ball release at speeds between 120-155 $km.h^{-1}$ with extended elbow leading to repetitive high traction strains on the upper limb and trunk. Irrespective of the form of the game, a bowler has to bowl six legal deliveries (one match over) before a break during which he becomes a fielder and another bowler starts bowling. In a test match (5 day game), a fast bowler can be asked to bowl 10-30 overs (60-180 deliveries) in an innings usually lasting 1-2 days while in a one-day game the fast bowler can bowl up to 10 overs (60 deliveries) during a 3-4 hour innings duration.

Briefly, the fast bowling action involves a run-up, a pre-delivery stride, delivery stride and follow-through (Figure 1). The components of delivery stride are back foot strike, front foot strike and ball release (2). The sequence of segmental movements in the kinetic chain from the hip, shoulders and the bowling arm comes into play during the delivery stride (17). While there seem to be biomechanical similarities between fast bowling in cricket and baseball pitching (Figure 1), a detailed comparative biomechanics of overhead action in the two sports is yet to be elucidated.

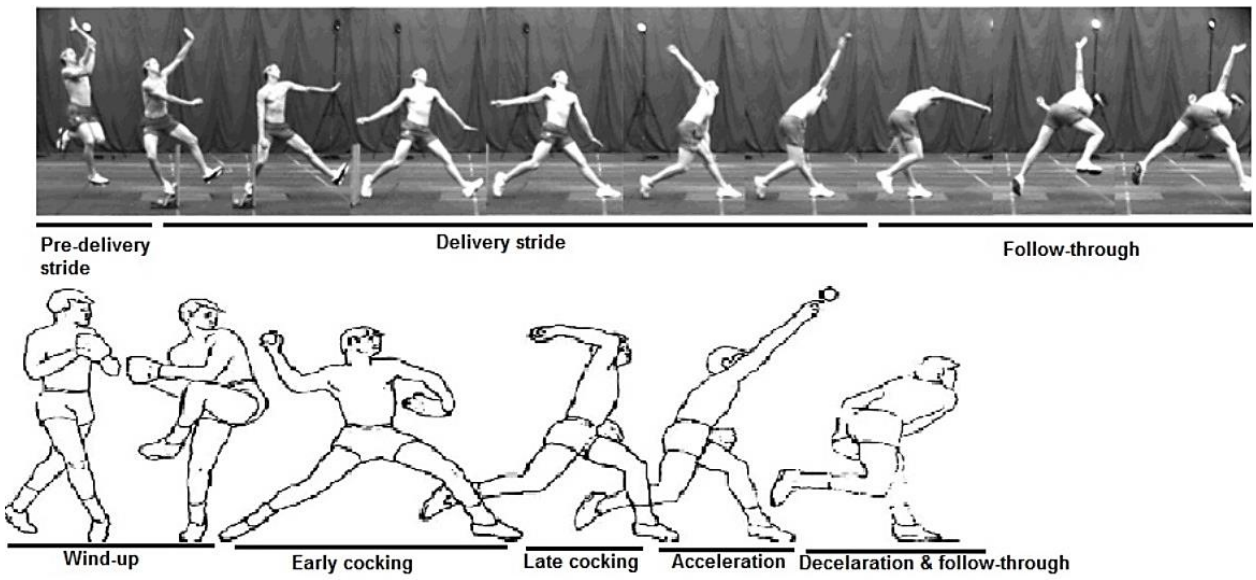

Figure 1. A comparative illustration of action in cricket fast bowling and baseball pitching.
Note: The pictorial sequence of cricket fast bowling is used with permission from the Sports Biomechanics and Motor Control Research Group, School of Sport, Exercise and Health Sciences, Loughborough University, UK.

In addition, all players in the fielding team need to deliver fast and accurate throws throughout the game from a distance up to 80 meters (depending upon the field size) to the stumps to prevent the batting team from scoring runs. The throws most commonly are overarm and sidearm type which closely resemble the baseball pitching actions. While elbow valgus torques of 18 ± 4Nm have been reported during the arm cocking and acceleration phase in youth baseball pitchers (16), seemingly no study has determined the magnitude of medial elbow valgus torques in young cricketers.

Case Report

An 11.3 year old male school team cricket player (height 1.38m, weight 38 kg) presented with a five week history of pain on the medial side of left elbow (dominant arm) and inability to fully flex the elbow. Pain occurred for the first time during fast bowling and throwing practice in a school summer coaching camp. The pain was initially low-grade and activity-related and the young athlete continued to be involved in fast bowling, throwing and batting training. Following the camp he played in an inter-school tournament. While fast bowling in a match the severity of the pain increased and he had to pull out of the tournament.

Elbow examination

Clinical examination revealed prominence over the medial epicondylar area on the left (Figure 2) compared to the right side. Superficial palpation revealed mildly raised skin temperature over the left medial epicondylar area. Deeper palpation elicited moderate-to-severe tenderness over the left medial epicondyle. Gentle medial valgus stress at both 0° and about 20-30° elbow flexion without forearm pronation provoked medial elbow pain but no ulnar collateral ligament (UCL) laxity was felt. There was no UCL laxity even with forearm pronation. The left elbow flexion was restricted (110°) compared to the right side (155°) whereas the elbow extension was within normal range (–10°to 0°) on both sides. No signs of lateral compression were apparent on examination.

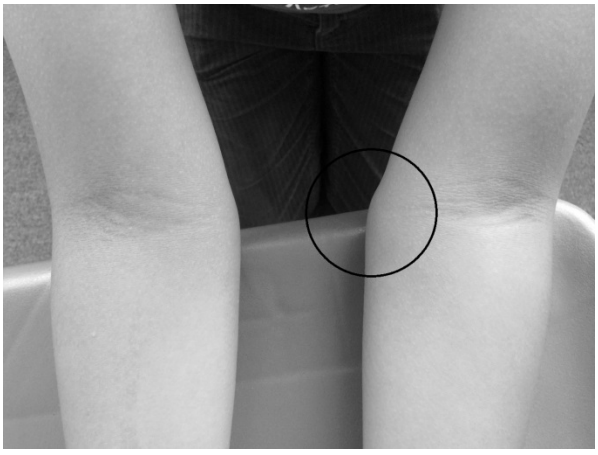

Figure 2. Prominence over medial side of the left elbow.

Shoulder examination

All shoulder movements were within the normal range of motion (ROM, abduction 160°, adduction 55°, forward flexion 160°, backwards extension 65°, internal rotation 85°, lateral rotation 90°), smooth and pain-free on both sides. There was no muscle wasting or asymmetry of the scapular region.

Wrist examination

The movements of the wrist joint were within normal ROM (dorsiflexion and palmar flexion 70-80°, radial deviation 30°, ulnar deviation 40°), smooth and painless on both sides. Pronation and supination

movements at 90° elbow flexion with the arm adducted were also within the normal range (80-90°) on both sides. The hand grip strength was marginally less on the left compared to the right side.

Neurovascular examination

The elbow flexion strength was similar on both sides and examination of the median, ulnar and radial nerves (13) revealed no sensory or motor deficit. The deep tendon reflexes (biceps brachii, brachialis and brachioradialis) were brisk and the brachial, radial and ulnar pulses were palpable with regular rhythm.

Pubertal status

Examination of the pubertal status showed that the young athlete was in Tanner Stage 1 for genitalia and pubic hair (12).

The x-ray image showed hypertrophy, partial separation and slight postero-superior displacement of the left medial epicondyle with overlying soft tissue swelling (Figure 3).

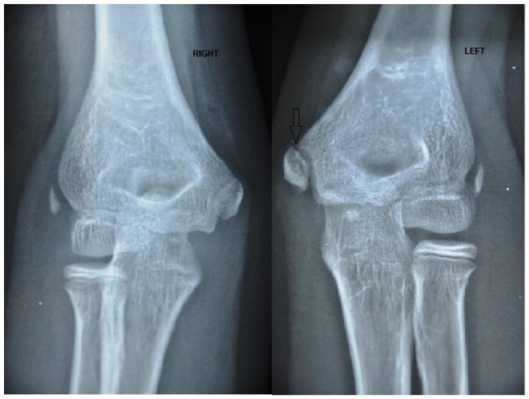

Figure 3. X-ray image showing widening, partial separation and displacement of the left medial epicondyle.

Following discussion of the condition with the parents, the young athlete was advised to totally abstain from cricket training and also avoid other overhead activity sports. Local icing, elastic elbow sleeve brace and active elbow flexion-extension and pronation-supination ROM exercises were advised along with pain medication.

The young athlete was largely asymptomatic when he presented for his 4 week follow-up visit. The skin temperature over the left medial epicondylar area was similar to the right side. Deep palpation elicited only mild tenderness over the medial epicondyle. Medial valgus stress did provoke mild pain but there was no evidence of UCL laxity either without or with forearm pronation. Elbow flexion strength and the hand grip strength were similar on both sides. Testing of the nerve functions revealed no sensory or motor deficit. The range of left elbow flexion had increased to 130°. The young athlete was advised to continue abstaining from cricket and avoid overhead actions. Stretching exercises of the flexor and extensor muscles of the forearm and progressive strengthening exercises for the elbow, forearm and wrist were instituted.

A repeat x-ray after 2 weeks from 1st review (week 6) revealed signs of healing with reduction in the extent of hypertrophy of the medial epicondyle and the marginal approximation of the epicondyle with the humerus (Figure 4).

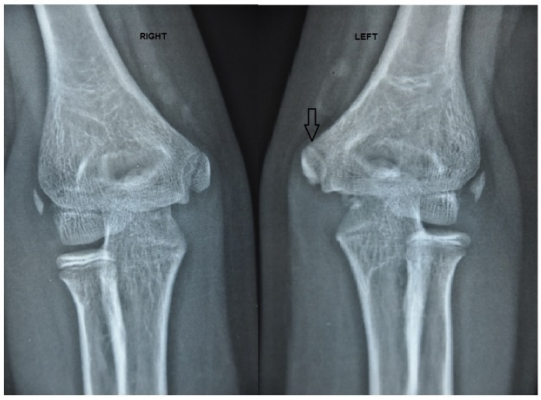

Figure 4. Follow-up x-ray image after 6 weeks showing approximation of the left medial epicondyle.

Following 10 weeks of abstaining from the game, the young athlete was allowed to make a gradual but cautious return to the sport. The coach was advised to avoid overhead activities like bowling and throwing and limiting the athlete's involvement to batting and fielding within 10-15 yards from the pitch as a closer fielding position mostly involves underhand throws.

The case was reviewed after 4 weeks (week 14). The young athlete was completely asymptomatic with no tenderness over the medial epicondyle and no pain or laxity on applying a valgus stress. The elbow flexion strength and hand grip strength were similar on both sides. The left elbow flexion ROM was 145°. His coach was advised to gradually and progressively induct the young athlete back into the sport. The final follow-up after 10 weeks (week 24) revealed that the young athlete had been asymptomatic and was able to train for fast bowling and throwing without any pain or discomfort.

Discussion

This is a rarely documented case report of Little League elbow in a pre-pubertal cricket player. This condition has traditionally been of greatest concern in youth baseball players. While a study has reported this condition in a young cricketer, no information on the pubertal status was provided (14). Both cricket and baseball belong to the category of 'Striking-fielding games' and involve similar movement mechanics and stresses of overhead actions. Similar to pitching in baseball, fast bowling in cricket requires an overhead whip-like activity of the arm causing repetitive traction strain on the shoulder and elbow joints (18). Moreover, cricket involves both fast bowling and overarm throwing during fielding; requiring the ball to be thrown to the wicket-keeper at high velocities over distances up to 80 metres depending upon the field size. Players are required to train for both these overhead activities specifically and repeatedly in almost all training sessions thus increasing the extent of loading on the shoulder and elbow.

Injury prevalence amongst fast bowlers in cricket have been reported to be higher (14%) than spinners (4%) and batsmen (2%) (15). Moreover, a popular practice in the sport is to position the fast bowlers close to the boundary as they are expected to deliver high-velocity throws to the wicket-keeper to prevent the batting team from scoring. Therefore, the fast bowlers also need to regularly train on the speed and accuracy of long-distance throws. This further increases the likelihood of repetitive valgus loading of the elbow and forearm flexor strain in fast bowlers.

It is frequently observed that youth cricket training follows adult-like models that can increase the risk of overuse as well as acute injuries in young cricketers. Youth athletes are as such at a higher injury risk owing to insufficient strength and fitness, poor or inappropriate technique, vulnerability of the immature musculoskeletal system, underdeveloped physical and cognitive skills (11) and low risk perception (5). In

addition, excessive training intensity and competition can further contribute to the risk of injuries in youth athletes (11). It has been reported that bowling more than 20 match overs in the week preceding a match has been associated with a higher injury prevalence in adult first class cricketers (15). Therefore, similar magnitude of loading is likely to significantly increase the injury risk in young athletes. Moreover, pre-tournament coaching camps can lead to abrupt increase the magnitude and intensity of training further adding to the risk of injuries in young athletes. Attempts to increase the bowling speed especially with added swing can lead to manifold increase in valgus stress on the elbow and inability to absorb or dissipate the forces. This was classically encountered in our subject when the pain aggravated during the tournament forcing him to withdraw.

Abstinence from the sport, periodic follow-ups, upper extremity ROM and strength training and gradual and a cautious return to the sport was sufficient to manage this case. Similar results have also been previously reported in youth athletes with overuse shoulder and elbow injuries (1,4,14). While the present and the previous case reports suggest that abstinence from the sports and basic conservative care can lead to full recovery from Little League elbow, complains of elbow pain in youth sports other than baseball need to be taken seriously. Continuing to train through discomfort and pain can lead to accumulation of forces. Other diagnoses to consider include: valgus overload syndrome, medial epicondyle growth plate avulsion, Panner's disease, osteochondritis of the capitellum and radial head, olecranon apophysitis, ulnar stress fracture, posterior interosseous nerve entrapment and ulnar nerve neuritis (6,8). This can lead to long-term adverse effect like growth deformities, movement restrictions and prolonged activity-associated pain.

Increased participation of youth in sport is likely to increase the risk and incidence of injuries. It is important for the parents, coaches and school sports organizations to be aware and informed on the higher risk of repetitive overloading leading to growth plate-related injuries in young athletes. Cricket is an immensely popular sport in the Indian subcontinent, Pacific countries like Australia and New Zealand, parts of Africa, United Kingdom and is also rising in popularity in Europe and Canada. Young aspiring cricketers training too hard too early to be successful is a frequent observation. Moreover, cricket requiring overhead actions of both fast bowling and throwing increases the risk of overuse elbow injuries.

While the seriousness of the condition has been recognized in baseball and limitations on pitch count has been imposed (19), no such measures have been instituted in cricket. This case report serves to provide the basis for large scale studies in young cricketers to determine the magnitude of this problem and evaluate the need for regulations limiting number of bowls and throws in the sport.

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