

The Lacertus Syndrome of the Elbow in Throwing Athletes



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KEYWORDS

- Medial elbow pain • Differential diagnosis • Lacertus syndrome

KEY POINTS

- It is important to take a complete history and perform a careful examination in order to avoid confirmation bias when evaluating throwers with medial elbow pain. Lacertus syndrome is a postexertional compartment syndrome, and the history can help elucidate this.
- The Lacertus syndrome is more common than pronator syndrome, which involves the median nerve, and can be distinguished with a careful workup. Other more common pathologies should be ruled out with a routine workup.
- Include inspection of the flexor pronator muscle group and consider evaluating after throwing when examining a thrower with postexertional elbow pain.

HISTORY OF THE TECHNIQUE

In 1959, George Bennett summarized his experiences caring for throwing athletes. The following paragraph is excerpted in its entirety from that article.¹

“There is a lesion which produces a different syndrome. A pitcher in throwing a curveball is compelled to supinate his wrist with a snap at the end of his delivery. On examination, one will note distinct fullness over the pronator radii teres. These are covered by a strong fascial band, a portion of which is the attachment of the biceps, which runs obliquely across the pronator muscle. A pitcher may be able to pitch for two or three innings but then the pain and swelling become so great that he has to retire. A simple linear and transverse division of the fascia covering the muscles has relieved tension on many occasions and rehabilitated these men so that they were able to return to the game.”

This is the first known reference to a condition that has undoubtedly disabled many players and possibly ended careers of an untold number of throwing athletes. Although Bennett did not fully understand the causes or even the mechanics involved (ie, he thought the pitcher supinates instead of pronates on release of the baseball), he did describe a simple operative treatment that has allowed us to

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prolong the careers of throwing athletes. To help distinguish this condition from pronator teres syndrome that involves compression of the median nerve, we have named it the lacertus syndrome.

HISTORY AND PHYSICAL EXAMINATION

Athletes with the lacertus syndrome usually present with a vague history of slowly increasing discomfort in the flexor-pronator muscles after throwing. The discomfort is described as an achy painful tightness of the medial elbow, which develops in the first few hours after activity. Specifically there are not any distal neurologic symptoms or findings, and a Tinel's sign over the anteromedial elbow is not present. This would suggest pronator teres syndrome and involvement of the median nerve.

Pronator teres syndrome is an uncommon but distinct condition in which the median nerve is compressed and irritated as it courses across the elbow region.² Possible areas of compression classically include between the 2 heads of the pronator muscle, beneath the lacertus fibrosus, proximal to the elbow at the ligament of Struthers, beneath the fibrous arch of the flexor digitorum superficialis, and more rarely as it crosses under the flexor palmaris longus or Gantzer muscle (Fig. 1). Pertinent findings and complaints include symptoms similar to carpal tunnel syndrome and the presence of a Tinel sign at the area of the lacertus fascia and convergence of the 2 heads of the pronator teres muscle anterior and 3 to 5 cm distal to the medial epicondyle. Symptoms of pronator syndrome can also be elicited with resisted pronation and extension in symptomatic patients. One should be thorough and open minded when evaluating any athlete with elbow discomfort in an effort to avoid confirmation bias and perhaps miss the diagnosis of an uncommon condition.

In players with lacertus syndrome the symptoms early on may be minor and are often ignored. A few hours rest leads to complete relief. As the condition progresses, the symptoms may develop earlier during throwing and become more severe. Symptoms may also require longer periods of rest to resolve—days instead of hours. Just as Dr Bennett described, these symptoms may progress to the point that the player

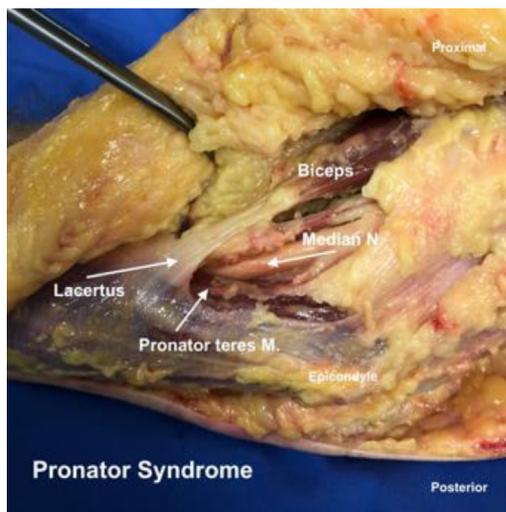


Fig. 1. Dissection of right medial elbow—distal is to left. Note median nerve entering the forearm between the 2 heads of the pronator teres muscle and below the lacertus fascia.

cannot continue throwing. For position players in baseball, this problem is often not debilitating; however, for pitchers it may be. Football quarterbacks complain most often during the repetition of practice but rarely after or during games. It is at the point when the symptoms have progressed to a degree that they interfere with competition that a player usually presents to the athletic trainer or doctor.

The duration of symptoms may vary markedly. In the authors' experience with 60 patients, the duration of acute symptoms ranged from 8 hours to 4 days before resolving, only to begin again when the athlete returned to throwing. Duration of recurrent symptoms ranged from 6 months to 3 years. In all patients the symptoms were disabling if the throwing activity resumed before the acute symptoms had resolved.

The key feature of the history in patients with the lacertus syndrome is the delayed onset of symptoms, which is like that seen in exertional compartment syndromes of the leg in runners. This, together with the history of no neurologic impairment and that a period of rest allows the athlete to resume throwing without discomfort, is diagnostic. Trauma to the elbow is usually not a factor in the etiology of the lacertus syndrome. The physician should take a careful history and perform a thorough physical examination of the elbow to help rule out more common abnormalities such as medial epicondylitis, ulnar collateral ligament injuries, and cubital tunnel syndrome or ulnar neuritis. Other conditions that can cause medial elbow pain and discomfort in throwers are bicipital tendinitis and stress fractures and rarely musculocutaneous nerve entrapment. Pronator teres syndrome or intraarticular pathologies should also be considered and ruled out.

In patients who have a history of postexertional medial elbow pain and tightness and who have the lacertus syndrome as part of their differential diagnosis, it is essential to examine the player after a workout. The examination should begin with a careful inspection of the arm, looking for exaggerated contours of the medial musculature just distal to the medial epicondyle. In players with severe or advanced cases, the proximal portions of the flexor pronator muscles seem grossly swollen, and the distinct oblique band of the lacertus fibrosus is readily visible (Fig. 2). The patient should be asked to flex and pronate the wrist, which may demonstrate more clearly



Fig. 2. Right elbow. Note prominent lacertus indentation after throwing.

any abnormality in the area of the lacertus fascia. Palpation of this area will likely reveal tenderness in the muscle directly beneath and just distal to the crossing fascial band. Any tenderness should be distinguished from a Tinel's sign over the median nerve.

Radiographs and MRI examinations are performed to help exclude other more common diagnoses. There are no findings on these studies to confirm the diagnosis of lacertus syndrome, but the tests are obviously helpful in ruling out other conditions. The diagnosis of lacertus syndrome can usually be made with a careful history and physical examination alone. Ancillary studies are done to rule out associated pathologies.

High-speed video of the pitching motion of course has revealed that pitches are released with a terminal pronation of the hand and forearm.³ Although Bennett was incorrect in his assertion that curveball pitchers supinate on release, he was correct in his belief that curveball pitchers are more prone to develop the lacertus syndrome. Seventy percent of the pitchers in our series listed the breaking ball as their prominent pitch. The curveball is held during the acceleration phase of pitching with greater supination of the hand, putting more stretch on the pronator teres than seen in a fastball or change-up, both of which are normally held in a forearm neutral position during acceleration.⁴ This may lead to more work for the pronator muscles in the release of a breaking ball and thus account for the greater propensity of breaking ball pitchers to develop the condition. Repetitive pronation of the forearm is the mechanism that leads to the symptoms.

The pathophysiology of the lacertus syndrome is somewhat similar to that of exertional compartment syndrome in the legs of runners in that the symptoms develop after a period of exertion.⁵ The success of a fasciotomy in cases of lacertus syndrome supports this observation. The 2 syndromes are similar in their presentation. Both are conditions brought on by exertion and relieved by rest. The symptoms in both conditions usually peak 1 to 2 hours after exertion.

However, the lacertus syndrome does differ from compartment syndromes of the leg due to the peculiar anatomy of the lacertus fascia. The lacertus fibrosus fascia is not the primary muscle fascia for the flexor pronator group of muscles. It is a fascial continuation of the distal biceps muscle that separates from the distal tendon and courses medially to blend into the fascia of the medial flexor pronator muscles (Fig. 3). It does not define an entire compartment; it merely invests and covers a portion of the muscle compartment and may thus act as an extrinsic constrictor preventing normal tissue expansion during and after exercise. Postexercise compartmental pressure measurements taken in symptomatic patients revealed pressures 15 to 22 mm Hg greater under the area of the lacertus fascia than in the same muscles proximal to the crossing lacertus fascia. Therefore, the pathophysiology of the lacertus syndrome is that of a partial compartment syndrome. Only the tissue below the crossing fascia has elevated pressures, and it is here that the symptoms are generated. It is also here that surgical attention should be directed.

NONOPERATIVE TREATMENT

The first priority of nonoperative treatment again is to rule out more common causes of elbow pain in throwers and to make a definitive diagnosis. Once the diagnosis is made, patient education, activity modification, and treatment can be implemented. For example, players may be able to manage the condition after gaining a better understanding of the cause. Some players may elect to avoid surgery when nearing the end of their competitive careers, choosing to finish up without taking time off to recover from an "elective" procedure. Others may simply learn to manage the symptoms by avoiding overuse when possible. With the support of the coaching staff,

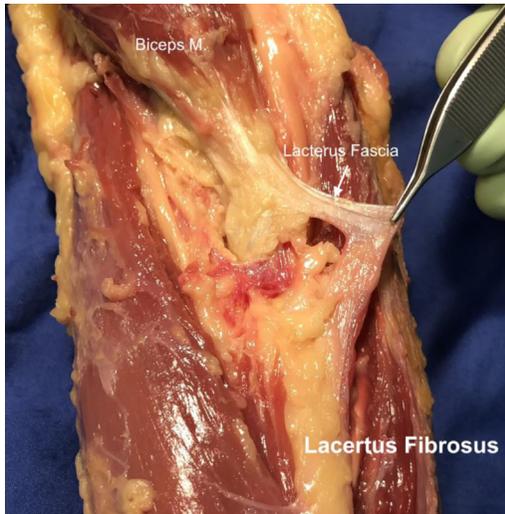


Fig. 3. Cadaver dissection of right elbow. Note lacertus fascia extending medially from biceps tendon.

position players and situational relief pitchers can avoid surgery by limiting any unnecessary throwing and pronator muscle overuse. Resting the arm and avoiding repetitive pronation are the essentials of nonoperative treatment in the lacertus syndrome.

SURGICAL INDICATIONS AND TECHNIQUE

The lacertus fibrosus fascia has been known by several names through the years. These include the more formal aponeurosis *musculus bicipitis brachii* and the simpler bicipital fascia or aponeurosis.⁶ Henry described it as a "sort of retinaculum" arising from the biceps muscle and tendon and extending over the median nerve and the distal end of the brachial artery, attaching or investing into the fascia of the medial muscles of the forearm.⁷ In the days of the barber surgeons this aponeurosis was called the "grace a Dieu" fascia (praise to God fascia), because it protected the artery and nerve during phlebotomy.⁸ The fascia arises from the medial border of the bicipital tendon and the lower medial portion of the muscle; it has a thickened proximal edge, which, in some patients can be seen and palpated. It passes distally and medially to fuse with the deep fascia of the flexor pronator muscles in the upper forearm until it ultimately reaches the ulna posteromedially.⁹ During surgery the fibers of the lacertus fibrosus can be distinguished from the investing muscle fascia by the oblique orientation of its fibers wrapping down and around the musculature (**Fig. 4**).

The basilic vein and the anterior and ulnar branches of the medial antebrachial cutaneous nerve are the only structures of immediate significance when exposing the lacertus fibrosus (see **Fig. 4**). Each usually crosses the elbow anterior to the medial epicondyle. Typically, the dissection is well anterior to the cubital tunnel, and the ulnar nerve is not at risk when releasing the fascia. However, one must be aware of the branches of the ulnar nerve, especially the first motor branch, which supplies the humeral head of the flexor carpi ulnaris. This branch can have a higher than normal origin within the cubital tunnel and it may encroach on the field of surgery at the most medial aspect.¹⁰

The indication for surgery is failure of nonoperative treatment to allow the athlete to participate in sports. After ruling out other possible causes for the patient's pathology

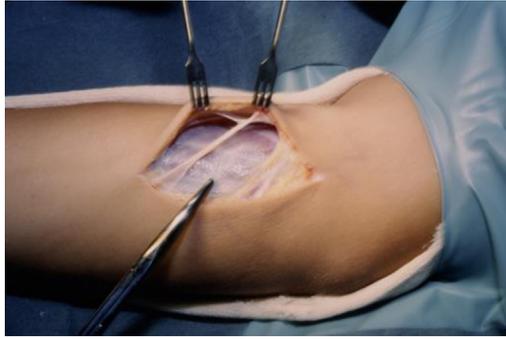


Fig. 4. Surgical dissection of medial elbow. Note fascial band of lacertus (scissors) and medial antebrachial cutaneous nerve branches crossing the field.

and exhausting conservative treatments measures, the patient is prepared for surgery. Patients are asked to throw 30 to 50 times the day before or the morning of surgery when possible. This makes the area of compression under the lacertus fascia more distinct.

The patient is positioned supine with the arm extended on a hand table. A tourniquet is used about the upper arm to control bleeding and improve visualization. A 4- to 6-cm longitudinal incision is made centered over the lacertus indentation in the flexor-pronator muscle group. The skin and subcutaneous tissue are carefully dissected away from the underlying muscle and fascial layers. Care is taken to protect the branches of the medial antebrachial cutaneous nerve.

Once the muscles are visualized, the lacertus fibers are identified. The proximal edge is usually the easiest to see, and it is typically the area of the most prominent indentation of the muscles. One or two simple fasciotomies are made from proximal to distal, always under direct visualization.

These releases should restore the contour to the muscles and eliminate the indentation caused by the crossing lacertus fibrosus (**Fig. 5**). The distinctness and width (proximal to distal) of the lacertus fibrosus varies from patient to patient. In some patients the proximal fibers are thick and the area of compression is narrow. In others the fibers are less distinct and the fibers extend 3 to 4 cm from proximal to distal. The surgeon should feel that a releasing fasciotomy has been done over the proximal flexor

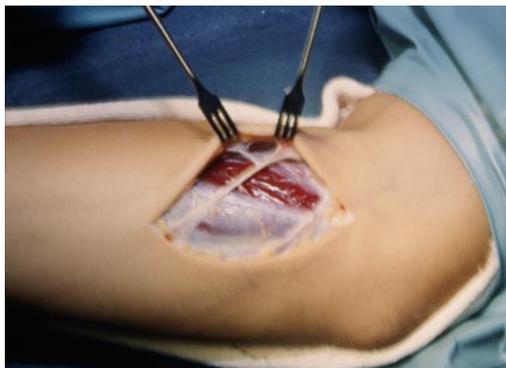


Fig. 5. Surgical dissection of right elbow after lacertus fascial release.

pronator muscle group, restoring the normal muscle contour, before closing. There have been no complications due to overreleasing the fascia, whereas there may be recurrence if it is underreleased. Irrigation and a simple wound closure complete the case.

POSTOPERATIVE CARE

The patients are placed in a soft dressing and given a sling to wear for 2 weeks. Routine postoperative wound checks are performed. Gentle range of motion is begun as tolerated or needed for daily personal care. Players are encouraged to refrain from vigorous exercise with the affected arm for the first month and then they are released to progress as tolerated. Return to throwing is individualized, and the decision is based on the patient's examination. If the player is pain free and the wounds are completely healed, there is no contraindication to begin tossing with advancement to throwing as tolerated. Players are told this usually begins at 4 weeks, and return to full-effort throwing is normally expected at about 6 weeks. Postoperative complications are rare. Persistence of symptoms indicates either inadequate fascial release or the presence of unrecognized pathology such as median nerve involvement.

SUMMARY

The lacertus syndrome is a postexertional or overuse syndrome affecting the medial elbow of throwing athletes. The pathology and presentation are identical to that of a compartment syndrome caused by the constriction of active muscles by an overlying fascia. The lacertus fibrosus fascia constricts the flexor pronator muscles in predisposed athletes, causing pain and discomfort that can lead to an inability to throw regularly. The diagnosis can be made with a careful history and physical examination. The treatment is a simple release of the tight lacertus fibrosus.

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DISCLOSURE

The author has nothing to disclose.

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