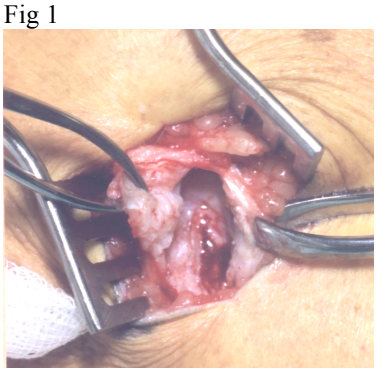
Lateral elbow tendinopathy

Lateral elbow tendinopathy is a common condition with an incidence of 1–2%.

The pathology arises from the origin of extensor carpi radialis brevis where changes, consistent with all tendinopathies, of angiofibroblastic hyperplasia occur secondary to repetitive micro trauma. It is not an inflammatory condition.

Acute presentation is managed through conservative measures including activity modification, topical NSAIDs and physiotherapy. For patients with recalcitrant symptoms, injection therapy with, for example, platelet rich plasma can be used. Alternatively surgical excision of the diseased tissue can be performed.

Fig 1



Tennis elbow is a common cause of pain and disability. It is more frequently seen in non-athletes, with a peak incidence in the early fifth decade on a nearly equal gender basis. Degeneration of the tendon of extensor carpi radialis brevis is believed to be the most common cause. Non-operative treatment is successful in effecting a resolution of symptoms in 90% of the patients. The remaining 10%, who do not respond to conservative treatment are labeled as resistant or refractory cases. Different modalities of treatment are used to treat these chronic cases.

INTRODUCTION

In 1883, Major [7] linked this to lateral elbow pain in lawn tennis players at which time the term Tenni*s* Elbo*w* was first introduced.

Elbow pain can commonly be caused by tendinopathies. The most common tendinopathy around the elbow involves the common extensor origin, frequently known as tennis elbow, which has a prevalence of 1% to 3%.

EPIDEMIOLOGY

The incidence in the general population is 1% to 2%, which increases to 9% in tennis players, with novice tennis players being affected more than professional players. The peak incidence occurs in the fifth decade, with women of that age having a prevalence as high as 10% [*Int Orthop* 1994; 18():263–7]. The incidence is notably higher in those who are manual workers [*Occup Environ Med* 1998; 55:172–9].

ANATOMY AND PATHOGENESIS

The articular side of the origin of ECRB is the most commonly cited region for degeneration to occur with the characteristic histology previously described seen here. Repeated loading of the common extensor origin with eccentric and concentric exercises causes microtrauma. An impaired or incomplete reparative response follows, leading to tendinopathy.

Tendinopathy is a non-inflammatory condition characterized by ‘angiofibroblastic hyperplasia’, a combination of immature fibroblastic accumulation and neovascularization. This causes disorganized collagen matrix and mucoid degeneration, producing the characteristic macroscopic appearance of a grey, amorphous tendon (Fig. 1). Inflammation is not a histological feature and so the term tendinopathy or tendinosis should be the preferred method of describing these conditions.

within the insertion of ECRB in patients with lateral (and medial) elbow tendinopathy. This may explain the pain experienced with this condition and why corticosteroid injections give short term relief. However, it is most likely that the pain is multifactorial and numerous studies have implicated intra-articular pathology in the form of plicae or synovitis as a source of pain.

CLINICAL FEATURES

Activity related lateral elbow pain of insidious onset is the most common history.
The pain can radiate down the forearm, and patients often describe poor grip strength or difficulty carrying objects in the affected hand.

Tennis: Professionals have their wrists in a position of extension with a likelihood of further extension in follow-through compared to novices hitting the ball with their wrist in flexion with a likelihood of further flexion. This may be the reason why novice tennis players are more pre-disposed to tennis elbow.

A history of paraesthesia or other sensory symptoms would suggest a peripheral nerve entrapment such as radial tunnel syndrome. Mechanical symptoms of locking or instability may point towards an intra-articular cause for pain.

Provocation Tests:

1. Maudsley's test : Resisted extension of the middle finger

2. Cozen's test: Resisted wrist extension with the elbow extended and wrist pronated .

3. Grip strength with the wrist in extension has been shown to be as much as 50% less than the non-affected side [19] and so is a useful adjunct in clinical examination.

4. Mill's test The patient makes a fist and the examiner fully flexes the wrist while moving the elbow into full extension causing pain over the extensor carpi radialis brevis origin

5.'Coffee cup' test Lateral epicondylar pain on lifting a full cup of coffee

6.'Chair' test Patient is asked to lift a chair (elbow extended, wrist pronated), which reproduces pain

Differential diagnosis

Radial tunnel syndrome
Posterior interosseus nerve entrapment
Cervical radiculopathy
Posterolateral rotatory instability
Osteochondral lesion to capitellum
Synovitis/plica Osteoarthrosis

MRI

INVESTIGATIONS

1. MRI

A thickened and oedematous common extensor origin in 90%
MRI can also evaluate the lateral collateral ligament complex
The chondral surfaces of the radiocapitellar joint and the synovium

Fig. 2 Magnetic resonance imaging showing high signal intensity at common extensor origin consistent with lateral elbow tendinopathy.

tendon can be seen but is present in less than 10% of cases [27]. However, they have some use in ruling out bony pathology such as osteochondritis dissecans of the capitellum in younger patients or osteoarthritis in the older patient.

TREATMENT

It is important to remember that the natural history of lateral elbow tendinopathy is improvement of symptoms over a period of 12 months in approximately 80% of patients[*Lancet* 2002; 359:657–62].

NON-OPERATIVE MANAGEMENT

1. Corticosteroid injections
2. Physiotherapy,
3. Bracing,
4. NSAID
5. Acupuncture,
6. Ultrasound,
7. Extracorporeal shockwave therapy (ESWT),
8. Autologous blood injection,
9. Botulinum toxin injection,
10. Platelet-rich plasma (PRP) injections
11. Prolotheraphy.

Nonsteroidal anti-inflammatory therapy

Topical NSAIDs (diclofenac, diflam)

The results for oral NSAIDs, however, have been less convincing, with only one study showing reduced pain compared to placebo [36]. This may be explained by lateral elbow tendinopathy being a non-inflammatory condition and so improvement may be a result of the analgesic effects of the NSAIDs and not the anti-inflammatory effect. [*Arch Fam Med* 1997; 6:257–62]

The corticosteroid group showed significant benefit over NSAIDs and placebo at 4 weeks, although this effect did not continue to 6 months or 12 months with a small number of patients in the corticosteroid group relapsing compared to the other groups.

Corticosteroid injections

All tendons can experience tendinopathy, with the Achilles, patellar, rotator cuff and common extensor origin being the most common. These are all characterized by non-inflammatory angiofibroblastic hyperplasia but, despite this, corticosteroid injections remain a common method of treatment.

A systematic review of the use of corticosteroid injection in tendinopathies showed improvement in pain in the short term but the effects were reversed at intermediate and long term. This review included high-quality randomized controlled trials and so, of the 3824 trials that were identified, only 41 were included. There were 12 trials looking specifically at lateral elbow tendinopathy assessing slightly different interventiolns and controls. All studies showed a significant improvement in pain.

Smidt [*Lancet* 2002; 359:657–62] compared three similar groups and found success rates of 92% for corticosteroid injection, 47% for physiotherapy and 32% for wait and see policy at 6 weeks [30]. However, the success rates at 52 weeks were 69%, 91% and 83%, respectively, showing a significant detrimental effect of corticosteroid injections at 1 year.

PRP injections

The use of PRP injections has escalated significantly over recent years for treating many ligament and tendon conditions. Whole blood is centrifuged or filtered forming plasma that has a high concentration of platelets and endogenous growth factors. It is assumed (but not proven) that these growth factors, when infiltrated at sites of tendinous or ligamentous injury, facilitate healing. There is a slowly increasing body of evidence to support their use but studies are still relatively sparse. One of the advantages that PRP has is very few side effects and this factor has probably aided in its increasing use.

Autologous blood was shown to be more effective at 8 weeks than corticosteroid in a randomized controlled trial of 60 patients [*Am J Phys Med Rehabil* 2010; 89:660–7.] [

Peerbooms [*Am J Sports Med* 2010] performed a randomized controlled trial comparing PRP and corticosteroid injections[48]. 49% of the corticosteroid group and 73% of the PRP group were considered a success.

Achilles tendinopathy, in which PRP was found not to affect outcome with regards pain and function compared to an eccentric exercise programme.

Botulinum toxin type A (60 *Dysport* units) injection appears to be beneficial in reducing pain up to 18 weeks compared to placebo injection [54,55]. Weakness of finger extension, particularly the middle finger, was noted in a significant proportion of patients treated with botulinum toxin, as would be expected, although this appeared to resolve by final follow-up. Keizer compared botulinum toxin injection to surgical release in a randomized controlled trial in 40 patients [*Clin Orthop Relat Res* 2002; 401:125–31]. The results at 1 year demonstrated 65% and 75% success rates in the botulinum toxin and surgical release groups, respectively.

Prolotherapy involves an injection of dextrose with an extract of cod liver oil called sodium morrhuate. The mechanism of action is poorly understood, although animal studies have shown that prolotherapy may strengthen ligament and tendon insertions. Scarpone suggested prolotherapy group demonstrated 60% resolution { the natural history of lateral elbow tendinopathy is improvement in 80% of patients at 1 year, the use of prolotherapy as a treatment is not recommended].

Polidocanol is a sclerosing agent that is injected into the part of the common extensor tendon showing increased blood flow. Zeisig assessed the use of polidocanol injection and there was no difference in outcome between the groups at 1 year, with improvement seen in approximately half of patients. Again, the natural history of the condition brings these results into question.

Orthotics, acupuncture and physiotherapy

A number of trials have included counter-force braces as a treatment or as an adjunct to treatment for lateral elbow tendinopathy. A Cochrane review [62] concluded there is no clear evidence for the use of orthotic devices either as a treatment or an adjunct.

Acupuncture has been the subject of another Cochrane review and it is likely to have some short-term benefit in pain relief but no difference at 3 months or 6 months.

A variety of physiotherapy modalities have been used.
These include exercise, stretching, eccentric loading exercises, friction massage, ultrasound and manipulation. Pienimaki; There was a statistical significant reduction in pain, sleep disturbance and improvement in grip strength in the exercise group at 8 weeks. The intermediate or long-term effects were not assessed.
Eccentric loading exercises have been used as the mainstay of physiotherapy management of tendinosis, particularly patellar and Achilles,

A systematic review also failed to demonstrate the efficacy of ultrasound as a treatment modality. In the same review, phonophoresis (ultrasound with hydrocortisone gel) was shown to be of no additional benefit over ultrasound alone.

Electrotherapeutic interventions (laser therapy, extracorporeal shockwave therapy, pulsed electromagnetic field and iontophoresis)

1. Laser therapy: There is no benefit from low-level laser therapy

2. It is not clear how extracorporeal shockwave therapy exerts its effects on soft tissues, although there has been a surge in interest in its use for conditions such as lateral elbow tendinopathy, plantar fasciitis, Achilles tendinopathy and rotator cuff tendinopathy. Following a number of trials and systematic reviews, including a Cochrane review, it has become apparent that its use in lateral elbow tendinopathy is not indicated

3. Iontophoresis is a method of administering transdermal drugs through the use of electrical charges. The use of NSAIDs iontophoresis, on this level of evidence, can therefore not be supported

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Glyceryl trinitrate (GTN)

Disappointing results of the last trial and the notable risk of side effects with GTN patches, it is likely that this treatment will not become more widespread.

Radiofrequency microtenotomy

Radiofrequency is used in many orthopaedic arthroscopic procedures to ablate connective tissues. It can also be used in a non-ablative mode to heat collagen-based connective tissue to promote a healing response. By causing a 'thermal injury', an inflammatory response follows with influx of inflammatory mediators including macrophages. The technique is commonly carried out as an open procedure under appropriate anaesthetic, although there have been reports of percutaneous and even non-invasive administration.

Unfortunately, there is little evidence at present to support its use in lateral elbow tendinopathy,

OPERATIVE MANAGEMENT

Surgical options can be performed through open, arthroscopic or percutaneous techniques and are directed at the insertion of ECRB. Techniques described include debridement, release, repair, denervation and lengthening.

Open surgery

1. Debridement. The most established open technique for surgical treatment [Nirschl].

The operative technique involves a curvilinear incision over the lateral epicondyle. An incision is made between ECRL and the common extensor aponeurosis with ECRL reflected anteriorly to expose ECRB. ECRB is then incised and inspected with abnormal looking tendon being fully excised, including, if necessary, parts of EDC and ECR. In their series, they found it was generally necessary to remove approximately 75% of ECRB. A small arthrotomy is also performed to rule out intra-articular pathology. The anterior aspect of the lateral epicondyle is decorticated using an osteotome or multiple drill holes to improve blood supply. The interface between ECRL and the extensor aponeurosis is then closed.

Sixty-six (75%) patients were reported to have an excellent result, nine were good, 11 were fair and two were considered to have failed.

Dunn et al. reported the long-term results of the Nirschl technique at a minimum of 10 years follow-up in 139 patients [103]. Three patients required revision surgery [*Am J Sports Med* 2008; 36:261–6.].

2.Release with or without repair [Hohmann]

under Local anaesthesia OPD procedure

91% being pain free at 5 years.

3. Bosworth described four different approaches for the surgical treatment of tennis elbow in 27 patients. These included division of the common extensor origin with or without excision of a synovial fringe between the radial head and capitellum or partial excision of the annular ligament with or without division of the common extensor origin.

Leppilahti performed a randomized-controlled trial comparing decompression of the PIN with Z-lengthening of the ECRB in 28 patients. The operation was considered successful in 50% of the PIN group and 43% of the ECRB group with an overall 25% reoperation rate. These results do not compare favorably with many non-operative treatments and other surgical techniques.

4. ***Arthroscopic surgery***
The advantage of arthroscopic surgery in the treatment of lateral elbow tendinopathy is that it allows for intra-articular pathology to be evaluated and addressed. The pathology is present on the undersurface of the ECRB tendon and so this can be directly visualized following partial capsulectomy of the lateral margin of the radiocapitellar joint. Arthroscopic surgery, however, has a steep learning curve and its use in the management of lateral elbow tendinopathy is a relatively recent advance. Interestingly, they reported intra-articular pathology in 69% of patients: synovitis/thickening (55%), bone spurs (12%), valgus.

Intra-articular pathology has been noted in most studies assessing arthroscopic intervention although the incidence varies significantly. Szabo reported 44% of patients had intraarticular pathology [*Orthop Clin NAm* 2009; 40:531–5], Latterman et al. reported 31%.

RECENT ARTICLES

1. CMAJ. May 18, 2010; 182(8): 768–773.

Our trial showed that the use of anatomic measurement to guide injection of botulinum toxin can be effective in the management of chronic lateral epicondylitis. This approach is easily implemented and does not require complex methods. However, because of the high rate of transient extensor lag, it should be reserved for patients whose job does not require finger extension. Further research is needed to determine whether the pain-relieving effects of the treatment remain or diminish after four months.

2. Am J Sports Med. 2013 Jun;41(6):1435-46.

Treatments-glucocorticoid (10 trials) Vs botulinum toxin (4 trials) Vs autologous blood (3 trials), Vs platelet-rich plasma (2 trials), Vs polidocanol, glycosaminoglycan, prolotherapy, and hyaluronic acid (1 trial each)

>8 weeks, glucocorticoid injection was no more effective than placebo.
Botulinum toxin showed marginal benefit, it caused temporary paresis of finger extension, and all trials were at high risk of bias.
Both autologous blood and platelet-rich plasma were also statistically superior to placebo,

Prolotherapy and hyaluronic acid were both more efficacious than placebo, whereas polidocanol and glycosaminoglycan showed no effect compared with placebo.

Conclusion:

This systematic review and network meta-analysis of randomized controlled trials found a paucity of evidence from unbiased trials on which to base treatment recommendations regarding injection therapies for lateral epicondylitis.

3. Skeletal Radiol. 2012 Apr;41(4):369-86. D/D
. Knowledge of the typical clinical presentation and imaging findings of lateral epicondylitis, in addition to other potential causes of lateral elbow pain, is necessary. These include entrapment of the posterior interosseous and lateral antebrachial cutaneous nerves, posterolateral rotatory instability, posterolateral plica syndrome, Panner's disease, osteochondritis dissecans of the capitellum, radiocapitellar overload syndrome, occult fractures and

lateral epicondylitis and their characteristic clinical and imaging features is essential for accurate diagnosis.

4. Am J Sports Med. 1997 ;25(6): 746-50.
Salvage surgery for lateral tennis elbow.

A retrospective analysis of 34 patients (35 elbows) who had prior failed surgical intervention for lateral tennis elbow. Revision surgeries were performed between 1979 and 1994.

At revision surgery, findings included **residual tendinosis** of the extensor carpi radialis brevis tendon in 34 of 35 elbows. In 27 elbows, the pathologic changes in the extensor carpi radialis brevis tendon had not been previously addressed at all, and in 7 elbows the damaged tissue had not been completely excised.

Salvage surgery included excision of pathologic tissue in the extensor carpi radialis brevis tendon origin combined with excision of excessive scar tissue and repair of the extensor aponeurosis when necessary.

83% of the elbows had good or excellent results at an average follow up of 64 months

5. J Hand Surg Am. 2013;38(2):344-9. **Denervation of the lateral humeral epicondyle for treatment of chronic lateral epicondylitis.**

Anatomic studies reveal that the posterior branch or branches of the posterior cutaneous nerve of the forearm consistently innervate the lateral humeral epicondyle.
Prospective study included 30 elbows in 26 patients.

After diagnostic nerve block of the posterior branches of the posterior cutaneous nerve of the forearm proximal to the lateral humeral epicondyle, a denervation surgery involved identification and transection of the posterior cutaneous nerve of the forearm branches with implantation into the triceps.

Denervation of the lateral epicondyle was effective in relieving pain in 80% of patients with chronic lateral epicondylitis who had a positive response to a local anesthetic block of the posterior branches of the posterior cutaneous nerve of the forearm.

REFERENCES

1. *Shoulder & Elbow* 2013 5: 239

2. **Nirschl. ICL 53: 587**