LATERAL ANKLE INJURY
Literature Review and Report of Two Cases

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Abstract:
Background: Injury to the ankle joint is the most common peripheral joint injury. The sports that most commonly produce high ankle injury rates in their participating athletes include: basketball, netball, and the various codes of football. A discussion of the types of ligament injury and common complicating factors that present with lateral ankle pain is presented along with a review of relevant anatomy, assessment and treatment. Also included is a discussion of the efficacy of manual therapy in the treatment of ankle sprain.

Discussion: A detailed knowledge of the anatomy of the ankle as well as the early recognition of factors that may delay the rate of healing are important considerations when developing a management plan for inversion sprains of the ankle. This area appears to be under-researched however it was found that movement therapy and its various forms appear to be the most efficient and most effective method of treating uncomplicated ankle injury. Future investigations should involve a study to determine the effect chiropractic treatment (manipulation) may have on the injured ankle.

Key Words: Ankle, sport, injury, treatment, chiropractic.

INTRODUCTION

It is stated that the ankle is the most injured peripheral joint1-3. Percentages of ankle injury range from 15%4,1-10 to as high as 45% and 59% of all injuries in some sports2,4,6-7,11. The sports that most commonly produce high ankle injury rates in their participating athletes include: basketball, netball, and the various codes of football2,4,6-7,12,13. Thus, those sports and other activities that involve running, balance and quick stop-start movements appear to be of higher risk. Table 1 presents acute injuries associated with the lateral ankle.

| Common | Less common | Not to be missed |
|--------|-------------|------------------|
| Ligament Sprain | Lateral ligaments | Medial ligament | AITFL |
| Personal dislocation | Greenstick or growth plate fractures (children) | Ruptured syndesmosis. |
| Fractures | Lateral/medial posterior malleolus (Pott’s) | Talar dome | Tibial plafond |
| | Base of the fifth metatarsal | Anterior process of the calcaneus | Lateral process of the talus |
| | Posterior processes of the talus | Os trigonum | |
| | | Deltoid Ankle (tfracture/dislodgment) | |
| | | Tendon Rupture | |
| | | Achilles tendon | |
| | | Peroneal tendons | |

Table 1: Some causes of acute lateral ankle injury (adapted from Brukner P, Khan K: Clinical Sports Medicine, Sydney: McGraw-Hill Book Company Pty Ltd 1993: 447-8.)

CASE REPORT 1

A twenty six year old male presented for treatment of left ankle pain and swelling of three days duration. The pain came on after being tackled during an amateur league soccer game. The patient was about to gently kick the soccer ball with the outside of his left foot when the opposing player challenged for the ball, kicking both the ball and the patient’s foot. The foot was in a plantar flexed position at the time of impact, which was on the lateral aspect of the foot and forced the ankle into extreme inversion. The patient had the foot in a relaxed position prior to this incident. His history was otherwise unremarkable.

On inspection of the ankle, the area was very red, hot and swollen. Pitting oedema was present. There was limited active ROM due to the presence of swelling. Plantar flexion gave a stretch anteriorly. Passive ROM gave slight pain on inversion. Palpation to the area elicited pain inferior to the medial and lateral malleolus. Both the

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dorsalis pedis and tibial pulses were present. Stress testing the ankle ligaments caused the patient to complain of slight nausea, so stress testing was recommenced at the second consultation.

The patient received light soft tissue therapy to the ankle and 10 minutes 80-150MHz interferential to the area. At the second consultation stress tests were performed to assess the lateral ligament integrity. Although an end-feel was present, some degree of pain was elicited. A working diagnosis of grade two lateral ligament complex strain with medial impingement was made. Treatment continued with the use of soft tissue therapy and interferential stimulation for two visits during the first week. This treatment assisted the reduction of the swelling. On the fourth consultation ankle mobilisations were introduced to the treatment regime, with the patient having progressed to using a cane to aid walking rather than using crutches. On the sixth treatment sub-talar distraction adjustments were performed with the patient noticing almost simultaneous increased ROM, particularly in dorsi-flexion. Resistance home exercises were also given to maintain strength. At this stage the patient was able to walk unaided. After five weeks of treatment, the patient was seen to be walking without a limp and was able to feel a stretch in the calf muscles on dorsi-flexing the ankle. The patient was given a wobble board to do exercises to increase proprioception. Appointments were now scheduled once per week (as opposed to two per week for the first five weeks). The patient continued to improve and straight line running was introduced at nine weeks post injury. The patient slowly added cutting movements to the training regime and at twelve weeks post injury was able to complete shuttle runs without any problem.

The player started soccer again with protective strapping on the ankle which continued to the end of the season. During this time exercises to strengthen the leg muscles particularly the peroneals were regularly performed, as was ankle dorsi-flexion range of motion exercises. At the end of the soccer season, two months after the resumption of play, the patient remains pain free.

CASE REPORT 2

A twenty-eight year old overweight female presented for treatment of an achilles tendon swelling and pain. The pain came on one year earlier following being hit heavily on the distal part of the gastrocnemius muscle by a shopping trolley. There was recurrent swelling in the para-tendinous area accompanied with chronic low grade pain. She specifically complained of pain pressure soreness at the site. She was referred to a physiotherapist after presenting to a medical practitioner for an opinion.

On presentation, she complained that walking aggravated the swelling slightly. This swelling however did not restrict movement in the ankle. During case history taking she did not report any previous involvement of the leg or back. Her history was otherwise unremarkable.

On examination she demonstrated full active, passive and resisted range of motion of the ankle. Stress tests of the ankle were unremarkable. Palpation of the involved site revealed a painful thickening of the para-tendinous region posteriorly with a slight swelling (approximately 5 centimeters in diameter) at the site which was later identified as a bursal thickening.

She received soft tissue therapy and interferential to the effected tissues with stretching of the gastrosoleus complex. She was given four treatments with no response in symptoms. She was then referred to a local medical practitioner for referral for ultrasound, who subsequently excised a nodule of scarred bursal material after performing the ultrasound. Her swelling and sensitivity to touch were resolved completely within two weeks of the surgery.

Six months following the resolution of the achilles complaint the patient presented for treatment after falling off rocks whilst at the beach when on a holiday. She fell approximately six feet, and landed with greater weight on her left foot causing an inversion strain injury.

She presented on crutches three weeks later complaining of posterolateral and medial left ankle pain. She presented after being cleared by x-ray and CT scans for fracture by the local hospital. Her examination revealed severe tenderness about the antero-lateral and posteromedial joint lines without severe ligamentous rupture. All directions of motion were guarded. There was a pain on compression testing of the ankle. There was no instability present on testing, but all tests produced much pain.

A working diagnosis of lateral ligament strain (grade II) and synovitis was established. Treatment consisted of soft tissue therapy, gentle joint mobilisations (to tolerance), cryotherapy and interferential therapy. This treatment was conducted over the following month at twice per week intervals. The treatment resolved some pain, and improved function and weight bearing, but following the treatments there was still a significant amount of pain and running was not possible. More importantly, some night pain had become noticeable. Re-testing the compression of the ankle revealed ongoing pain.

The patient was referred to a surgeon for an opinion on the likelihood of a osteochondral lesion of the tibial plafond and/or a soft tissue impingement associated with the joint, as a cause of her symptoms.

The surgeon performed an arthroscopic examination (as x-ray and CT were negative) which revealed the presence of a grade III medial tibial plafond chondral lesion,
are most commonly injured lateral stabilisers, it is the lateral group of ligaments that commonly involved and the lateral collateral ligaments which are most injury, but it is the latter group, namely the medial collateral ligaments. Both these groups may succumb to glide. These include the medial collateral and lateral collateral ligaments.

The anatomy of the lateral ankle includes the deltoid ligament, originating from the borders of the medial malleolus and fans out distally to insert in a continuous line on the navicular anteriorly and on the talus and calcaneus distally and posteriorly. It is extremely strong and controls medial distraction (eversion stretch) and also checks motion at the extremes of eversion.

The lateral collateral ligament (LCL) is comprised of three individual bands that are commonly referred to as separate ligaments. These are the anterior talo-fibular ligament (ATFL), the calcaneo-fibular ligament (CFL), and the posterior talo-fibular ligament (PTFL). Generally, the LCL is weaker and more prone to injury than the MCL. The ATFL is the most frequently damaged of the LCL ligaments, followed by the CFL and then the PTFL, which is rarely injured. The ATFL extends from the anterior portion of the distal fibula stretching forward to insert on the talus. Its role in ankle mechanics is checking plantar flexion and inversion of the ankle. Thus it is these movements that stress the ligament most and cause it to be damaged.

The CFL lies deep to the peroneal sheath, however it is supra capsular. It extends from the distal fibula and spans both the upper (talo-crural) and lower (talo-calcaneal) ankle joints to insert postero-laterally on the calcaneus. Karlsson and Lassinger site Brostrom, 1966, stating that it lacks major significance, but also site Percy, et al., 1967, who have shown that it is the most important of the inversion limiting ligaments of the ankle. The function of the CFL is not disputed, with all authors acknowledging that it is the major limiting ligament to inversion of the ankle.

The PTFL is the strongest of the lateral ligaments. As mentioned earlier, it is rarely damaged in isolation but may be torn in severe ankle injuries. It originates from the posterior portion of the distal fibula passing directly backwards to insert on the posterior surface and postero-lateral tubercle of the talus. Its function is in checking dorsi-flexion of the ankle and therefore it may be involved with inversion sprains that have a component of dorsi-flexion. Examples of these injuries are seen when the whole foot is in contact with the ground at the time when a damaging medial to lateral directed force occurs.

Other important anatomical structures of the ankle are the peroneal tendons and the tibia/fibula syndesmosis. The tendons of the peroneous longus and brevis muscles run in a synovial sheath together behind the lateral malleolus. They then separate to pass around the peroneal tubercle of the calcaneus on their way to their respective insertions at the base of the first metatarsal, the medial cuneiform, and to the base of the fifth metatarsal. Their function in foot mechanics is primarily plantar flexion and eversion; however, the peroneus brevis is also involved in maintaining the lateral longitudinal arch. The syndesmosis between the tibia and fibula is comprised of a fibrosis tissue and other associated ligaments spanning the space between the tibia and fibula. Distally, this fibrous union has an
THE MECHANISM OF ANKLE INJURY

The mechanisms of ankle ligament injury are varied but are commonly due to inversion coupled with plantar flexion\(^\text{14}\). Thus, lateral ankle ligament injury is most common, often associated with peroneal tendon strain or rupture\(^\text{12}\), accounting for in excess of 40% of all ankle injuries\(^\text{10,15}\). Medial ankle ligament injuries are less common. This is due to the strength of the deltoid ligament and structure of the ankle joint itself\(^\text{14}\). However, injury may occur with excessive pronation, eversion and dorsiflexion, or pronation and external rotation\(^\text{4}\). These movements may also induce sprains to the ankle syndesmosis, such injury only occurs in 10% of ankle injuries\(^\text{8,10}\).

Ligament injury is graded depending on the degree of damage (see table 2). Grade 1 injuries cause stretching of the ligament without any macroscopic tear. The joint is considered stable on testing. Grade 2 injuries consist of partial microscopic tearing with mild to moderate damage (see table 2). Grade 1 injuries cause stretching of the ligament without any macroscopic tear. The joint is considered stable on testing. Grade 2 injuries consist of partial macroscopic tearing with mild to moderate swelling and tenderness are present. The grade 3 injury may occur with excessive pronation, eversion and dorsiflexion, or pronation and external rotation\(^\text{4}\). These movements may also induce sprains to the ankle syndesmosis, such injury only occurs in 10% of ankle injuries\(^\text{8,10}\).

**Severity** Pathology Signs and Symptoms Disability
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**Grade 1 (mild)** Stable
- Mild stretch
- No instability
- No haemorrhage
- Minimal swelling
- No varus laxity
- No or little limp
- Difficulty hopping
- Recovery 8 days (range 2-10)

**Grade 2 (moderate)** Stable
- Large spectrum of injury
- Complete tearing of anterior talo-fibular ligament
- Localised swelling
- Margins of achilles tendon less defined
- May be anterior drawer
- No varus laxity
- Limp with walking
- Inability to toe raise
- Unable to run
- Recovery 20 days (range 10-30)

**Grade 3 (severe)** Two-ligament, unstable
- Significant instability
- Complete tear of anterior and calcaneofibular ligament
- Diffuse swelling
- Both sides of achilles tendon
- Early haemorrhage
- Unable to bear weight fully
- Significant pain
- Initially almost complete loss of range of motion
- Recovery 40 days (range 3-60)

**Table 2:** Classification of ankle injury (adapted from Andreasi A. Chondral and osteochondral lesions of the talus associated with capsulo-ligamentous lesions of the ankle joint. Chir Organi Mov 1990; 75(1): 41-50.)

**DIFFERENTIAL DIAGNOSIS OF LATERAL ANKLE INJURY**

Pain that persists following an acute lateral ankle sprain should alert the clinician to the possibility of other injury concomitant with the ligament injury. The differential list should include several possibilities not limited to: chronic instability, early degenerative joint disease, loose bodies, osteochondral lesions, occult fractures, intra-articular meniscoid lesions and peroneal tendon injury (including tendinitis, rupture and subluxation)\(^\text{16,17}\).

**IMPINGEMENT**

Ankle impingement has been long recognized as a common source of pain in and around the ankle\(^\text{21}\). These pain syndromes often go undiagnosed and can result from intra and peri-articular pathology, and can mimic the pain of a chronic lateral ligament sprain. They can present in anterior, posterior and combined syndromes. According to Henderson\(^\text{18}\), anterior impingement can result from soft tissue and/or osteochondral lesions of the anterolateral compartment of the ankle. Pathological lesions causing these impingement syndromes include: post traumatic synovitis, the meniscoid lesion, Basset’s ligament, impingement pads, tibial plafond and talar neck osteophytes\(^\text{20}\).

**MENISCOID LESION**

The meniscoid lesion is a common but an under-diagnosed cause of chronic antero-lateral upper ankle pain fibula\(^\text{21}\). The most common presentation is that of chronic pain and swelling over the anterolateral aspect of the upper ankle\(^\text{21}\). Consistent with the second case presentation, soccer players seem to be at risk of the meniscoid lesion of the lateral ankle\(^\text{21}\). It is said to result from the hyalinisation of tissue trapped between the lateral aspect of the talus and the fibula\(^\text{21}\). These lesions are frequently associated with synovitis, and are also associated with chondromalacia and osteophytosis\(^\text{31}\). The meniscoid lesion appears to be associated with those patients with a chronic pain syndrome that has not been responsive to conservative care, and are often diagnosed during arthroscopy\(^\text{24}\).

**CHONDRAL AND OSTEOCHONDRAL LESIONS OF THE TALO-TIBIAL JOINT**

Sijbrandij et al\(^\text{25}\) reported on 146 consecutive ankles that had undergone an MRI investigation following acute or recurrent ankle sprain. Of the 146 ankles, 42 osteochondral lesions were revealed in 26 ankles (18%). 23 of the injuries were of the talar dome and 19 were of the talo-
tibial plafond. In 11% of cases lesions were present in the opposing bones (a kissing lesion). Of particular note was the fact that of the 26 ankles with osteochondral injury, only 6 of 12 talar fractures and none of the tibial fractures were visualised with conventional radiography. Such findings have led many authors to recommend that MRI is the investigation of choice for peri-articular pathology of the talo-tibial joint. Stroud & Marks concluded that as no prospective studies have been performed to test the relative merits of CT or MRI in such cases, such a recommendation is preliminary. However, they did conclude that should a practitioner be ordering an investigative MRI scan, it is likely that a bone scan would not be required.

DiGiovanni et al retrospectively reviewed all aspects of case management of 61 patients receiving primary ankle lateral ligament reconstruction. They noted that at surgery no patient had an isolated injury to the lateral ligaments. Ogilvie-Harris et al in 100 consecutive arthroscopic patients revealed that 95 of 100 patients could be classified into three groups: the instabilities (lateral and syndesmotic), the impingements (anterior and anterolateral), and the articular lesions (chondral and osteochondral). The remaining 5% were deemed to be non-specific lesions such as osteoarthritis or synovitis. They concluded that good results can be achieved with patients with pure instability or impingement. They also reported that patients with an isolated articular lesion showed good resolution compared to a poorer outcome when the lesion was also associated with instability.

Bernt & Hardy introduced a classification system of osteochondral lesions of the talar dome. This system is still currently in use with an additional lesion described in the classification system. According to Flick & Gould, the osteochondral lesion is a commonly overlooked cause of chronic ankle pain. It is a condition that is associated with compression loading of the dome of the talus by the tibial plafond thereby damaging the osteochondral surface. It is particularly associated with the supero-medial and supero-lateral corners of the talus. If the resultant lesion is large, they tend to show up at the initial radiographic investigation. However, this is frequently not the case.

Osteochondral lesions usually present after failed conservative therapy for ankle inversion sprains, and they generally present with chronic pain, swelling and stiffness. In such cases it is wise to obtain additional imaging studies to confirm the presence of such a lesion. The bone scan is the investigation of choice as it can detect all types of osteochondral lesion. If positive, CT or MRI should follow. Note that the CT scan only visualises the grade II, III, IV lesions. The MRI scan can visualise the type I lesion.

It is recommended that grade I and II lesions are casted for 6-8 weeks, and that grades IIa, III, IV lesions be referred for arthroscopic/open debridement; a procedure that removes the osteochondral fragment/cyst followed by the curetting/drilling of the lesion down to bleeding bone. Arthroscopic procedures are increasingly being performed. All lesions should undergo appropriate rehabilitation to improve strength and coordination following the casting period. Baker & Morales have demonstrated that patients treated with arthroscopic debridement and curettage for osteochondral talar dome lesions demonstrate a high percentage of successful outcomes with low morbidity.

By contrast to the symptomatic lesion, Rosenberg & Mellado have reported the presence of a central pseudo-defect of the talus as a common asymptomatic finding due to the insertion of the tibio-talar fibres of the deltoid ligament into the talus. They caution against the misinterpretation of this lesion as a symptomatic osteochondral lesion. Andreassi supports this view when concluding that many of the sites of these osteochondral lesions (18%) occur with capsuloligamentous lesions.

**ASSESSMENT**

There is little research into the effects of manual therapy on peripheral joints especially of the ankle. Much of the research is in the form of case histories, commentaries or pure research into combined procedures. Little research has purely investigated single treatment approaches, and this is particularly true of randomised controlled trials of manipulative treatments for ankle injury. Methods for assessing the grade of ankle injury vary greatly. By far the most prevalent method evident in the literature is stress radiography. By this method, an ankle joint is said to be unstable if the talus shows greater than 10mm translation and a tilt from 9° to 15° or more. Often, this method has been incorporated with the use of orthopaedic tests such as the anterior draw test and the talar tilt test. These tests examine the amount of aberrant movement in the ankle following injury.

Ultrasonography, stress ultrasound, bone scan (Marder & Lian 1997), magnetic resonance imaging (MRI) and patient balance are other methods suggested for diagnosis of the type and degree of ankle injury. However, Blanshard et al found that tests utilising proprioception and ultrasound had a poor degree of accuracy and recommended common peroneal tenography, MRI and arthroscopy for definitive diagnosis.

**TREATMENT**

Treatment regimes for lateral ankle sprain are indeed quite varied. The injury type often dictates the form of the
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treatment, but in many cases, several approaches have been used for the same injury. Grade one injuries occur when there is mild disruption to the connective tissue, grade two has moderate disruption whilst grade three injuries have severe or total disruption to the connective tissue. The most commonly used forms of treatments are mobilisation, immobilisation, and surgery4,12.

MOBILISATION

Early mobilisation (pain limited weight bearing activity) is by far the most common approach in contemporary sports medicine4,6,9-12,38,44. Mobilisation is a generic term for treatments where the ankle joint is left relatively free to move in the first few days to weeks following trauma. As such, there are numerous variations and modifications on the general theme. It is seen as a low cost, high-result therapy4,16 that has been shown on multiple occasions to be more effective in getting injured ankles functioning quicker than other treatment forms4,44. It is also noted that these therapies are safe and complications free4,11. Most methods involve a 3 phase treatment regime4,6,8 started as soon as the injured ankle is seen. The first phase utilises standard first aid (PRICER) treatment, ie the joint is Pain medication, Rested as much as possible, the ankle is Iced; a Compression bandage is applied, the foot is kept Elevated; and the joint is Pain soon as the injured ankle is seen. The functional activities progress through weight bearing as the pain allows. The acute phase generally lasts for a period of 1 to 3 days, depending on the grade of injury.

In order to promote increased removal of swelling and tissue debris, electrophysical therapies such as ultrasound and interferential have been suggested4,6,8,12,44. These would be most effective in this first phase, however, the literature fails to provide evidence that supports these suggestions. In a double-blind study on the effect of ultrasound treatment on ankle injury, Williamson et al44 concluded that the therapy was ineffective, stating that “there was no significant difference between the results achieved by the group treated with ultrasound and by those managed without”.

The second phase immediately follows the first phase with the time frame varying for each grade of injury. For a grade one injury, the second phase would generally start on day two and last two to four days. In a grade two injury it may start on day two to three and last eight to twelve days. With a grade three injury, the second phase may start in six to ten days and last three to four weeks. The second phase consists of general ankle muscle strengthening, notably of the dorsi-flexor and peroneal groups, and stretching the achilles tendon. Exercises such as toe writing (where the alphabet is scribed by the foot in the air), and plantar and dorsi-flexion movements against resistance (eg rubber tubing or bands)1,3,4,8,11 may be performed during this phase.

The third phase involves conditioning and proprioceptive training. Materials commonly used include wobble boards1,3,4,8,43,44, mini tramps and rocker boards1,6, which are used in conjunction with a regime of increasing functional activities (ie progressing from brisk walking, to running, etc, and ultimately to jumping, hopping and cutting)1,3,4,6,8,47. The functional activities progress through to sport-specific exercises for the patient. This phase follows the second phase and starts when the patient has 80% strength returned to the injured site.

This general 3-phase treatment regime is seen in most treatment plans, but with either a different emphasis or an altered format. The time frame for each phase varies depending on a number of factors. The site and severity of the injury, the chronicity of the problem, the previous history of injury and the performance of aggravating factors by the patient with the injury are some reasons that prolong healing. Table 3 presents causes of delayed healing in lateral ankle strains.

Table 3: Causes of delayed healing in lateral ankle ligament sprain (adapted from Reid DC. Sports injury assessment and rehabilitation. New York: Churchill Livingston Inc; 1992; 176.)

| Conditions Causing Delayed Recovery from Ankle Sprains |
|--------------------------------------------------------|
| Problems directly related to ligament damage. |
| Functional instability |
| Loss of fibular and subtalar motion |
| Tight sensitive scar |
| Incomplete rehabilitation. |
| Problems indirectly related to ligament damage |
| Chronic synovitis |
| Soft tissue impingement |
| Nerve traction injury |
| Exostosis from tibia and talus |
| Avulsion fragments from malleoli |
| Osteochondral fracture or loose body |
| Interossseous membrane ossification |
| Dislocating peroneal tendons |
| Degenerative joint changes |
| Reflex Sympathetic Dystrophy |
| Unrecognised tibiofibular diastasis. |
| Conditions confused with a sprain |
| Ankle fracture |
| Ankle dislocation |
| Fracture base fifth metatarsal |
| Fracture anterior process of the calcaneous |
| Stress fractures |
| Peroneal tendonitis |
| Rupture of tibialis posterior tendon |
| Symptomatic os trigonum |
| Posterior talar fracture. |

IMMOBILIZATION

In cases where immobilisation is used (generally grade 2 or 3 strains), the ankle is prevented from moving as soon as the diagnosis is made. Immobilisation is achieved most commonly through a plaster cast, although fibreglass and air casts also being used1,3,6,8,15,38. The period of immobilisation ranges between 10 days1 to 4 or 6 weeks4,6,12,15,41. Following this period rehabilitation phases 2 and 3 are usually undertaken.
Studies performed on the comparisons of mobilisation and immobilisation have noted that although restoration of ankle function is quickest with mobilisation, they also report that in follow up examinations, the long term results are similar between groups.11,12 Eiff et al, in particular, found that the difference in time between restoration of normal function by mobilisation, and restoration by immobilisation, was the same as the time the ankle was kept in plaster, suggesting that the plaster was the only limiting factor.

To date, the literature seems to suggest that immobilisation is best performed in those patients who suffer chronic lateral instability11 or are professional athletes8,10, and then only in conjunction with surgery. This is refuted by Tiling et al9 who have provided evidence to suggest that the treatment of athletes should contain functional / mobilisation techniques.

**MANIPULATION**

One treatment type applicable to this review is the articular manipulation. Although an important sub-category of mobilisation, it could be considered an entity unto itself. Of the literature so far screened, evidence showing the effectiveness and methods of chiropractic treatment of ankle injury is scarce. The only articles found to date that advocate the use of this treatment failed to illustrate what techniques were performed, referring only to “manipulations” and “attention to foot biomechanics”48. Other articles followed standard 3 phase treatment regimes1,49 again without specific references to chiropractic management or protocol.

A recent single blinded placebo controlled study by Pellow & Bratingham50 represents the first attempt to quantify the effect of manipulation on the recovery of grade I & II inversion sprains of the ankle from a chiropractic perspective. They performed both subjective (short form McGill Pain Questionnaire and Numerical Pain Rating Scale 01) and objective goniometric measurements of range of motion and pain pressure assessments via an algometer. Whilst both the treatment and the control group improved during the study, there was a significant difference between the groups. However, due to the small subject numbers, a very poor statistical power was recorded for many of these significant findings therefore heightening the possibility of a type two statistical error (accepting a false null hypothesis). Thus, this study (denoted as a pilot in the abstract) remains a good early attempt to investigate the effects of ankle manipulation on the recovery of common ankle injuries and serve to highlight some of the problems associated with conducting clinical research.

Hunter48 and Logan51 suggest that chiropractic physicians may aid the injured ankle by re-educating the peroneal and soleus muscle groups, an approach taken by numerous other non-chiropractic practitioners. Authors Miller and Narson49 have formulated protocols to deal with ankle injury, promoting the use of conservative and functional treatment regimes but again avoiding suggestions on what manipulative techniques to use. However, most of the research presented is merely the opinion of the author of the case studies and not randomised control trials.

Stavrou52, in his “Manual of Peripheral Technique”, describes various ankle manipulations and their methods. He outlines five manipulations specific to the upper ankle joint and a further six involving the lower ankle joint and related hind foot joints. Although the aim of each manipulation is clearly stated there is no narrative on indications for use or relevant patient history that would call for the use of these manipulations.

This lack of clear indications for the use of ankle manipulations is partially eliminated by texts such as Esposito and Stutter who have included a detailed, joint by joint motion palpation (MP) routine in their “Chiropractic Peripheral Technique”. Notably, anterior-posterior, posterior-anterior, and long axis extension motion palpation of the talo-crural and sub-talar joint are presented with instruction on MP of the cuboid, navicular, and cuneiforms and how these restrictions of motions should be dealt with by manipulation. This work based on the earlier work of Schafer & Faye41, describes the basic mechanics of applying manipulation to restricted joint motion, but they do not integrate the severity or stage of healing of the injured joints (and other supporting structures). As such, correlation of lateral ankle injury with both static and motion palpation, as well as subjective indications such as pain, is absent.

**SURGERY**

The use of surgery in the correction of ankle injuries is well documented throughout the literature. Surgery is indicated in the case of instability and joint decompression secondary to loose or foreign bodies (meniscoid lesions, impingement and talar dome osteochondral injuries). Arthroscopic & open debridement was considered with the discussion on talar dome injury. By contrast, there are several methods used to achieve stabilisation of the unstable ankle following trauma, notably the Evans-Jones, the Watson-Jones, and Chrissman-Snook procedures11. The procedures involved are beyond the scope of this article. For a detailed explanation the reader is referred to Karlson and Lassinger11.

Karlson and Lassinger11 promote the use of surgery only after conservative methods have been tried and have failed. These methods should also only be used following appropriate imaging of the injury (see figure 2). They further suggest that only anatomical reconstruction with shortening, reinsertion and imbrication of the damaged ankle ligaments is best performed in those patients who suffer chronic lateral instability or are professional athletes.
tissues be used. This method is 90% effective and has very few complications. However, Weiss, Rupf, and Weinelt\textsuperscript{41} state that surgery, in conjunction with cast immobilisation, is a superior form of treatment for ankle injury. This opinion by Weiss et al conflicts greatly with the view of many other researchers\textsuperscript{6,8}.\

**SUBJECTS IN ANKLE RESEARCH**

Research on the incidence of ankle injuries and their response to different types of treatment is important to the manual therapy professions. It is important to document protocols for research as this underpins what practitioners are doing in their clinics for many types of injuries. Due to the incidence of ankle injury in athletes, most researchers have utilised the athletic population in their studies\textsuperscript{2-8,37,38,40,41}. Goldie et al\textsuperscript{13}, completed a comparative study between the recovery times of trained (athletic) and untrained subjects. The subject’s postural (balance) control was investigated and was found to recover significantly better in trained subjects. This finding indicates that the use of trained athletes in further investigations may enhance the quality and increase the ease of obtaining useful results. It also suggests that any sample population for this type of investigation should include separate trained or untrained subjects. The use of appropriate control populations would decrease the number of aberrant results. Most studies that have not used trained / athletic subjects have a subject population too diverse from which to derive accurate conclusions\textsuperscript{2,8,37,38,40,41}. These results demonstrate that the results of many studies can be potentially biased by the way they are conducted.

Only Hopper et al\textsuperscript{2}, who investigated female netballers has completed a gender specific work, but no investigations have been located that compare the recoveries of males and females. The number of subjects used in ankle injury studies range from 4 to over 150\textsuperscript{7,39,44,46}. Most papers used between 80 and 120 subjects to obtain their results\textsuperscript{2,28,37,38,40,41}.

**CONCLUSION**

This paper presented the successful outcome of two cases of similar presentation that required either a conservative or surgical resolution to their problem. The indications for these therapies have been discussed as has a review of the pertinent literature. Whilst managing inversion sprains of the ankle, a detailed knowledge of the anatomy of the ankle is important in developing a plan to treat, as is the recognition of factors that may delay the rate of healing. Movement therapy and its various forms appear to be the most efficient and most effective method of treating uncomplicated ankle injury. However, considering the lack of specific chiropractic literature on ankle injury treatment, it would be an important investigation to determine what effect chiropractic treatment (manipulation) may have on the injured ankle via a randomised controlled study.

The criteria for producing a scientifically based ideal study includes the production of a random controlled trial of 80-120 participants matched for sex, age and activity. Such a population would also control for the closure of epiphyseal plate and minimises the occurrence of degenerative changes within the population sample. Also, care needs to be given to the selection of subjects from specific population groups such as trained athletes, as any conclusions drawn from such research would be applicable to that group and not the general population.

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LATERAL ANKLE INJURY
POLLARD / SIM / MCHARDY
SUMMARY OF IMPORTANT POINTS

- Injury to the ankle joint is the most common peripheral joint injury accounting for 40% of ankle injuries.
- Sports and other activities that involve running, balance and quick stop-start movements appear to be of a higher risk of ankle injury.
- Ankle impingement is often an undiagnosed cause of ankle pain and can be hard or soft tissue in nature.
- The meniscoid lesion is another under-diagnosed cause of ankle pain.

- Chondral and osteochondral lesions are another cause of chronic ankle pain, and diagnosis is aided by the used of the bone scan or MRI.
- Instability of the ankle in the chronic presentation maybe determined through the use of testing such as the talar tilt test and the anterior draw sign.
- Early mobilisation (pain limited weight bearing activity) is by far the most common and effective management approach in contemporary sports and medicine.
- Little evidence currently exists to support the use of manipulation over other forms of mobilisation for ankle pain.
- This paper presents the results of two different yet common ankle presentations and their treatment and discusses the literature relevant to their management.