The Management of acute lateral ankle sprains: A survey of South African Surgeons and best evidence available

by

Stefan Wever

MBChb Stell

1244778

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Supervisor(s): Dr Graham McCollum

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Table of Contents

Declaration

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Abstract

Introduction: Ankle sprains remain the single most frequent injury in modern sports with increasing evidence that it is not as innocuous as previously thought. Conservative treatment options include various forms of immobilization such as casts, moonboots and stirrup braces, followed by a rehabilitation period involving different modalities. Despite clinical evidence there seems to be a divergence between research and practice with an increase in acute surgical repair especially with regards to professional athletes.

Design: Descriptive cross-sectional survey analysis

Aim of the study: To assess the approach on management of acute ankle sprains by orthopaedic surgeons in South Africa.

Methods: A two part study. Firstly, a questionnaire was emailed to participating orthopaedic surgeons, consisting of eight treatment options for a grade 3 lateral ankle sprain in a non-professional athlete. Secondly, a literature review to establish the current best practice concerning ankle sprain management.

Results: The total number of respones where 129 out of 719 that were sent out. Surgical repair was offered in 24 (19%). Conservative treatment including either cast or moonboot for a period of 6 weeks was chosen by 49 (38%) and 2 to 4 weeks by 55 (43%) as their preferred treatment. Only 39 (30%) of responding SAOA members chose a short period of immobilization followed by functional rehabilitation in accordance with the current best evidence available, based on the literature review done.

Conclusion: Despite good clinical evidence there seem to be a lack of consensus in the management of grade 3 lateral ankle sprains.

Acknowledgements

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List of tables and figures

Abbreviations

ATFL – Anterior Talofibular Ligament

CFL – Calcaneofibular Ligament

LAS – Lateral Ankle Sprain

NSAIDs – Non-Steroidal Anti Inflammatory Drugs

NATA – National Athletics Trainers Association

PTFL – Posterior Talofibular Ligament

SAOA – South African Orthopaedic Association

Part A: LITERATURE REVIEW

Objectives: To search the literature for the current best evidence in the management of acute lateral ankle sprains.

Search strategy: The author performed an in-depth search of electronic databases on the management of ankle sprains. Databeses include EBSCOhost, Scopus, Google Scholar, Science Direct, Springer and Web of Science. Search words included the following: “Ankle Sprain”, “Ligament injury”, “Acute”, “Lateral ankle injury”, “Treatment”, “Management”. All studies looking at acute lateral ankle sprains where used. The focus was on recent published articles dating from 2013 but landmark studies prior to 2013 were also included. Exclusion criteria were chronic ankle injuries.

Summary of literature: There seems to be a divergence in the management of acute ankle sprains between current evidence and clinical practice. Simpson et al. noted in a survey done under physiotherapists that many treatment modalities are still used despite evidence showing minimal to no benefit.(1)

Ligaments fail usually under tensions greater than their yieldpoint and this causes either partial or complete tears. The bodies response to this is through a complex inflammatory response that involves 3 distinc phases overlapping each other.
The acute inflammatory phase begins within in minutes of injury and continues over the next 48-72 hours. During this phase, a haematoma forms at the site of injury and platelet cells interact with matrix components. Growth factors are released necessary for healing and provides a platform on which many cellular events occur.
The proliferative/repair phase begins when immune cells release various growth factors and cytokines, which initiate fibroblast proliferation to rebuild the ligament tissue matrix. Initially tissue appears as disorganized scar tissue with more blood vessels, fat cells, fibroblastic and inflammatory cells than normal ligament tissue.
Subsequently a complex healing process occurs over several weeks, fibroblast cells deposit various types of collagen, proteoglycans, other proteins and glycoproteins to the matrix. The collagen becomes aligned with the long axis of the ligament during this time, however, the newly formed type of collagen fibrils are abnormal and smaller in diameter than normal ligament tissue. After a few weeks, the remodeling phase starts in which collagen maturation occurs. This can last for months to years after the initial injury. With time, the tissue matrix starts to resemble normal ligament tissue. Evidence does show that the new

tissue is grossly, histologically, biochemically, and biomechanically inferior to the normal tissue.(2)

It has been shown that immobilization for a prolonged period leads to muscle wasting and joint stiffness. There is a decrease in the tensile strength of ligaments as well as collagen numbers. Nash et al. pointed out that early mobilization increases blood flow and reduce muscle atrophy, adhesions and joint stiffness which in turn leads to decreased pain.(3) This effect is called, causal histiogenesis, where functional stress is needed for remodelling of connective tissue.(4) Kerkhoff et al. reported in a meta-analysis that exercise is associated with less instability and earlier return to function.

Current evidence recommend early functional rehabilitation is better than immobilization for grade 1 and 2 ankle sprains and a short period of immobilization followed by functional rehabilitation for grade 3 lateral ankle sprains.(3-10) Bleakley et al.(11) indicated that accelerated functional treatment, incorporating therapeutic exercises during the first week after ankle sprains, produced significant improvements to short term ankle function compared with standard treatments. Woitzik et al. in his systematic review however found no difference in outcome between an accelerated exercise program (flexibility, strengthening and proprioceptive exercises in addition to RICE in first week) and the standard exercise program.(12) Protecting the joint acutely, then slowly adding exercise help the newly laid collagen to align with the forces of the ankle according to Hubbard et al.(6)

With regards to external supports one of the landmark studies is the Cohrane review by Kerkhoff done in 2001 looking specifically at young active individuals with ankle sprains. A vast amount of literature spanning a period of close to 30 years was included. It is important to note however that all research looking at surgical and pharmacological interventions where excluded. They compared 4 types of functional treatments most commonly used: Elastic bandage, tape, lace up braces (using canvas-like or nylon material e.g. Push-Brace) and semi-rigid braces (using thermoplastic material e.g Stirrup). Outcome measures included return to work and sport, pain, swelling and instability, measured subjectively by the patient and objectively using the anterior draw test. They also looked at recurrence, mobility and general patient satisfaction. Semi-rigid ankle braces compared to elastic bandages had a significant earlier return to work and sport. When comparing semi-rigid braces with lace-up braces there was a significant decrease in swelling but no

difference in outcomes measuring instability, motion and return to work. In Conclusion the Cochrane review showed that lace-up ankle braces are superior to semi-rigid braces, elastic bandages and tape in the short term. Furthermore, tape increases the possibility of adverse dermatological reactions. Lardenoye et al. found increased patient satisfaction with regard to braces compared to tape, however no difference in functional outcome and pain.(13) Beynnon et al. noted that air stirrup braces with elastic wrap lead to return to function in half the time compared to wrap or bracing alone.(14) They also found no difference between casting and air stirrup bracing for the first 10 days in grade 3 LAS. A prospective randomized study including 186 patients by Prado et al. compared functional braces with a walking boot and found that the braces resulted in earlier return to activity.(15) The improved outcome results from better compression and decreased oedema with increased range of motion after 7 days when functional treatment (tape/ brace) is compared to semi-rigid external supports.(9, 16)

There is strong evidence that within 1 year of injury, athletes have twice the risk of a recurrent ankle sprain.(17) Van Rijn et al. reported in a systematic review a 30% chance of recurrent ankle sprains after the initial injury.(4, 18) Doherty et al.'s Meta-analysis of 46 systematic reviews containing 309 studies reported a lower incidence of re injury in the group using braces or tape compared to the group using no support. They recommend wearing a brace for a minimum of 6 months with benefit up to 1 year with lace up better than semi rigid braces.(17)

With regards to NSAIDs Hauser et al.(19) did a review of treatment options in ligament injuries in general and found that although effective in decreasing pain and swelling for the first 6 to 8 weeks they did inhibit the histological, biochemical and biomechanical properties of ligament healing. Van den Bekerom et al. (20) reported in a meta-analysis of 22 trials that oral and topical NSAIDS are superior to placebo regarding pain and swelling in the short term. They did conclude that there was a low number of studies with a lack of good quality methods and small sample sizes, but still recommended the use. NATA recommendations advised caution in use because of possible decrease in tensile strength of healing ligaments. The found earlier return to training in military recruits, however noted greater instability and swelling after 14 days most likely due to the analgesic effects that allowed return before the healing process was complete.(7)

Regarding Platelet rich therapies it is thought that they could enhance the healing process due to the production of growth factors, however numerous RCT's as well as a Cochrane

review have shown no benefit regarding pain and function in both the short and long term.(21, 22) Further research in this field is required.

Petrella et al. and Jakobs et al. both showed in prospective RCT's that hyaluronic acid per articular injections results in earlier return to activity, decreased pain and increased patient satisfaction. However the literature on viscoelastic injections for acute LAS limited.(23, 24)

Cryotherapy is part of the so-called RICE (Rest, Ice, Compression, Elevation) treatment. Nata recommendations noted that there is limited strong evidence for using cryotherapy but no evidence not to apply it. It is thought to decrease pain through reduced nerve conduction and muscle spasm and swelling through vasoconstriction of vessels leading to decreased permeability, but is only effective 15 – 30 minutes after treatment. Bleakley et al. compared 2 different cryotherapy regimens based on the duration of application and found no difference in functional status, swelling or pain at rest.

Regarding manual therapy Ojha et al. did a systematic review and concluded that early manual therapy decreases total episode cost. Although the mechanism by which manual therapy works is unknown, Cleland et al reported it to be superior to home base exercises regarding pain and function.(25) Hubbard reported, only anecdotal evidence in the form of case studies, improved motion but only after multiple sessions.(6, 26) Evidence to support manual therapy is only moderate regarding effects on swelling and improved motion.(27, 28) Seventy eight percent of physiotherapists in a survey by Guillodo et al.(29) indicated that they would use it, however Kerkhoffs et al. showed in a systematic review that evidence is limited regarding the benefits and that most positive effects disappeared 2 weeks after the injury, thus recommended against using.(30)

Evidence also shows that ultrasound and laser therapy has no benefit and only adds extra cost.(9, 17, 31-33)

Neuromuscular training is defined as training to enhance unconscious motor responses by stimulating both afferent signals and central mechanisms responsible for dynamic joint control.(34) Freeman's concept was that it serves as an adjunct to functional treatment since joint injury results in proprioceptive deficit that prevents functional recovery and risks long term instability.(35) It has been shown that neuromuscular/ proprioceptive training decreases re injury rates and improves functional instability.(5) Rapid improvements have been reported by clinicians such as Bahr, showing greater effects with a longer balanced training program, however Hubbard et al. pointed out that to date published research

primarily use prospective cohort designs where the baseline measurement is pre-intervention and not pre injury. So while the literature shows improvements in postural control, it is not clear if these training programs restore postural strength and control to the same level is prior to the injury.(6, 36) Hupperets et al did a RCT including 522 athletes comparing standard care(defined as any form of rehabilitative treatment used by the athlete) with an 8 week home based proprioceptive training program. 145 athletes had a reported re-sprain (56 in intervention group and 89 in the control group) and concluded that the home based training programs where effective in reducing recurrent ankle injuries. (37) It is important to note that the re -sprain injuries were self-reported by the athletes and could have been related to events of instability rather than re- sprain. Most studies also included athletes and insured patients whom are often managed differently to the uninsured and/or the general population. Petersen et al.(4) concluded in their systematic review that proprioceptive training and neuromuscular training can be used in an effort to decrease future risk of re sprain using mainly the 2Fit trial that included 522 participants which was more powered than the studies by van Rijn and Bleakly with a mere 102 participants.(4, 11, 18)

In our survey we found that 1 in 5 orthopaedic surgeons (20%) would do an acute surgical repair, which is in contrast to current best practice. Kerkhoffs et al. in their Cochrane review, comparing surgery versus conservative treatment for acute lateral ankle ligament injuries, failed to demonstrate a clear superior treatment approach. There was evidence for longer recovery times, higher incidence of ankle stiffness, impaired ankle mobility and more complications in the surgical treatment group.(38) Doherty et al.(17) did a meta-analysis including 46 systematic reviews consisting of 309 studies. Most RCT's used function, determined as time taken to return to work/activity, as their outcome. None of the reviews reported on the primary outcome of recurrent ankle sprains. The consensus regarding surgery is that it is not indicated prior to a conservative trial or with persistent symptoms decided on an individual basis. Several reviewers further reported the propensity for a surgical intervention to have a higher risk of complications, including issues with wound healing, infection, dystrophy, iatrogenic nerve injury leading to sensory deficit and paraesthesia compared to conservative treatment.(5, 17, 38)

Identification of gaps in literature: High quality randomised controlled trials of primary surgical repair versus the best available conservative treatment for well-defined injuries are required.(39)

References

1. Simpson H, Crous L, Louw Q. Physiotherapy for acute ankle sprains: How do we compare to evidence based clinical guidelines? South African Journal of Physiotherapy. 2014;70(2):19-26.
2. Nash CE, Mickan SM, Del Mar CB, Glasziou PP. Resting injured limbs delays recovery: a systematic review. Journal of family practice. 2004;53(9):706-.
3. Petersen W, Rembitzki IV, Koppenburg AG, Ellermann A, Liebau C, Brüggemann GP, et al. Treatment of acute ankle ligament injuries: a systematic review. Archives of orthopaedic and trauma surgery. 2013;133(8):1129-41.
4. Bleakley CM, McDonough SM, MacAuley DC. Some conservative strategies are effective when added to controlled mobilisation with external support after acute ankle sprain: a systematic review. Australian Journal of Physiotherapy. 2008;54(1):7-20.
5. Hubbard TJ, Wikstrom EA. Ankle sprain: pathophysiology, predisposing factors, and management strategies. Open Access Journal Of Sports Medicine. 2010;1:115-22.
6. Kaminski TW, Hertel J, Amendola N, Docherty CL, Dolan MG, Ty Hopkins J, et al. National Athletic Trainers' Association Position Statement: Conservative Management and Prevention of Ankle Sprains in Athletes. Journal of Athletic Training (Allen Press). 2013;48(4):528-45.
7. Lamb SE, Marsh JL, Hutton JL, Nakash R, Cooke MW. Mechanical supports for acute, severe ankle sprain: a pragmatic, multicentre, randomised controlled trial. The Lancet.373(9663):575-81.
8. van den Bekerom MP, Kerkhoffs GM, McCollum GA, Calder JD, van Dijk CN. Management of acute lateral ankle ligament injury in the athlete. Knee surgery, sports traumatology, arthroscopy. 2013;21(6):1390-5.
9. O'Connor SR, Bleakley CM, Tully MA, McDonough SM. Predicting functional recovery after acute ankle sprain. Plos One. 2013;8(8):e72124-e.
10. Bleakley CM, O'Connor SR, Tully MA, Rocke LG, MacAuley DC, Bradbury I, et al. Effect of accelerated rehabilitation on function after ankle sprain: randomised controlled trial. BMJ. 2010;340:c1964.
11. Woitzik E, Jacobs C, Wong JJ, Cote P, Shearer HM, Randhawa K, et al. The effectiveness of exercise on recovery and clinical outcomes of soft tissue injuries of the leg, ankle, and foot: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. Manual Therapy. 2015;20(5):633-45.
12. Lardenoye S, Theunissen E, Cleffken B, Brink PR, de Bie RA, Poeze M. The effect of taping versus semi-rigid bracing on patient outcome and satisfaction in ankle sprains: a prospective, randomized controlled trial. BMC musculoskeletal disorders. 2012;13(1):81.
13. Beynnon BD, Renström PA, Haugh L, Uh BS, Barker H. A prospective, randomized clinical investigation of the treatment of first-time ankle sprains. The American journal of sports medicine. 2006;34(9):1401-12.
14. Prado MP, Mendes AAM, Amodio DT, Camanho GL, Smyth NA, Fernandes TD. A comparative, prospective, and randomized study of two conservative treatment protocols for first-episode lateral ankle ligament injuries. Foot and Ankle International. 2014;35(3):201-6.
15. Bilgic S, Durusu M, Aliyev B, Akpancar S, Ersen O, Mehmet Yasar S, et al. Comparison of two main treatment modalities for acute ankle sprain. Pakistan Journal of Medical Sciences. 2015;31(6):1496-9.

16. Van Rijn RM, Van Os AG, Bernsen RM, Luijsterburg PA, Koes BW, Bierma-Zeinstra SM. What is the clinical course of acute ankle sprains? A systematic literature review. The American journal of medicine. 2008;121(4):324-31. e7.
17. Doherty C, Bleakley C, Delahunt E, Holden S. Treatment and prevention of acute and recurrent ankle sprain: an overview of systematic reviews with meta-analysis. British Journal of Sports Medicine. 2016:bjsports-2016-096178.
18. Hauser R, Dolan E, Phillips H, Newlin A, Moore R, Woldin B. Ligament injury and healing: a review of current clinical diagnostics and therapeutics. The Open Rehabilitation Journal. 2013;6(1).
19. van den Bekerom MP, Sjer A, Somford MP, Bulstra GH, Struijs PA, Kerkhoffs GM. Non-steroidal anti-inflammatory drugs (NSAIDs) for treating acute ankle sprains in adults: benefits outweigh adverse events. Knee Surgery, Sports Traumatology, Arthroscopy. 2015;23(8):2390-9.
20. Rowden A, Dominici P, D'Orazio J, Manur R, Deitch K, Simpson S, et al. Double-blind, randomized, placebo-controlled study evaluating the use of platelet-rich plasma therapy (PRP) for acute ankle sprains in the emergency department. The Journal of emergency medicine. 2015;49(4):546-51.
21. Moraes VY, Lenza M, Tamaoki MJ, Faloppa F, Belloti JC. Platelet-rich therapies for musculoskeletal soft tissue injuries. The Cochrane Library. 2014.
22. Petrella RJ, Petrella MJ, Cogliano A. Periarticular hyaluronic acid in acute ankle sprain. Clinical Journal of Sport Medicine. 2007;17(4):251-7.
23. Jakobs C, Wirbel R, Korner J. Influence of hyaluronic acid on the clinical course of ankle sprains. Clin Sport Med Int (CSMI). 2015;8:1-5.
24. Cleland JA, Mintken P, McDevitt A, Bieniek M, Carpenter K, Kulp K, et al. Manual Physical Therapy and Exercise Versus Supervised Home Exercise in the Management of Patients With Inversion Ankle Sprain: A Multicenter Randomized Clinical Trial. Journal of Orthopaedic & Sports Physical Therapy. 2013;43(7):443-55.
25. Hubbard TJ, Hicks-Little CA. Ankle ligament healing after an acute ankle sprain: an evidence-based approach. Journal of athletic training. 2008;43(5):523-9.
26. Eisenhart AW, Gaeta TJ, Yens DP. Osteopathic manipulative treatment in the emergency department for patients with acute ankle injuries. The Journal of the American Osteopathic Association. 2003;103(9):417-21.
27. Bleakley CM, McDonough SM, MacAuley DC. Cryotherapy for acute ankle sprains: a randomised controlled study of two different icing protocols. British journal of sports medicine. 2006;40(8):700-5.
28. Guillodo Y, Le Goff A, Saraux A. Adherence and effectiveness of rehabilitation in acute ankle sprain. Annals of physical and rehabilitation medicine. 2011;54(4):225-35.
29. Kerkhoffs GM, van den Bekerom M, Elders LA, van Beek PA, Hullegie WA, Bloemers GM, et al. Diagnosis, treatment and prevention of ankle sprains: an evidence-based clinical guideline. British journal of sports medicine. 2012;46(12):854-60.
30. de Bie RA, de Vet HC, Lenssen TF, van den Wildenberg FA, Kootstra G, Knipschild PG. Low-level laser therapy in ankle sprains: a randomized clinical trial. Archives of Physical Medicine and Rehabilitation. 1998;79(11):1415-20.
31. van den Bekerom MPJ, van der Windt D, ter Riet G, van der Heijden GJ, Bouter LM. Therapeutic ultrasound for acute ankle sprains. Cochrane Database of Systematic Reviews. 2011(6).
32. van der Windt DA, van der Heijden GJ, Van den Berg S, ter Riet G, De Winter AF, Bouter LM, et al. Therapeutic ultrasound for acute ankle sprains. The Cochrane Library. 2002.
33. BSCHER MH, Zech A, Pfeifer K, NSEL FH, Vogt L, Banzer W. Neuromuscular training for sports injury prevention: a systematic review. 2010.

34. Freeman M. Instability of the foot affer injuries to the lateral ligament of the ankle. Bone & Joint Journal. 1965;47(4):669-77.
35. Bahr R, Bahr I. Incidence of acute volleyball injuries: a prospective cohort study of injury mechanisms and risk factors. Scandinavian journal of medicine & science in sports. 1997;7(3):166-71.
36. Hupperets MD, Verhagen EA, Van Mechelen W. Effect of unsupervised home based proprioceptive training on recurrences of ankle sprain: randomised controlled trial. Bmj. 2009;339:b2684.
37. Kerkhoffs GM, Handoll HH, de Bie R, Rowe BH, Struijs PA. Surgical versus conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults. The Cochrane Library. 2007.
38. Pellow JE, Brantingham JW. The efficacy of adjusting the ankle in the treatment of subacute and chronic grade I and grade II ankle inversion sprains. Journal of manipulative and Physiological therapeutics. 2001;24(1):17-24.
39. Verhagen E, Van Tulder M, van der Beek AJ, Bouter L, Van Mechelen W. An economic evaluation of a proprioceptive balance board training programme for the prevention of ankle sprains in volleyball. British journal of sports medicine. 2005;39(2):111-5.
40. Gribble PA, Bleakley CM, Caulfield BM, Docherty CL, Fourchet F, Fong DT-P, et al. 2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains. British journal of sports medicine. 2016:bjsports-2016-096188.
41. Hertel J. Functional anatomy, pathomechanics, and pathophysiology of lateral ankle instability. Journal of athletic training. 2002;37(4):364.
42. Feger MA, Glaviano NR, Donovan L, Hart JM, Saliba SA, Park JS, et al. Current Trends in the Management of Lateral Ankle Sprain in the United States. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine. 2016.

THE MANAGEMENT OF ACUTE ANKLE SPRAINS: A SURVEY OF SOUTH AFRICAN SURGEONS AND THE BEST EVIDENCE AVAILABLE

Author(s): Dr GS Wever, Dr G McCollum
Sponsor(s): N/A
Funder(s): N/A
Study coordination centre: University of Cape Town

PART B: MANUSCRIPT IN ARTICLE FORMAT

Introduction: Ankle sprains remain the single most frequent injury in modern sports with increasing evidence that it is not as innocuous as previously thought. Conservative treatment options include various forms of immobilization such as casts, moonboots and stirrup braces, followed by a rehabilitation period involving different modalities. Despite clinical evidence there seems to be a divergence between research and practice with an increase in acute surgical repair especially with regards to professional athletes.

Design: Descriptive cross-sectional survey analysis

Aim of the study: To assess the approach on management of acute ankle sprains by orthopaedic surgeons in South Africa.

Methods: A two part study. Firstly, a questionnaire was emailed to participating orthopaedic surgeons, consisting of eight treatment options for a grade 3 lateral ankle sprain in a non-professional athlete. Secondly, a literature review to establish the current best practice concerning ankle sprain management.

Results: The total number of respones where 129 out of 719 that were sent out. Surgical repair was offered in 24 (19%). Conservative treatment including either cast or moonboot for a period of 6 weeks was chosen by 49 (38%) and 2 to 4 weeks by 55 (43%) as their preferred treatment. Only 39 (30%) of responding SAOA members chose a short period of immobilization followed by functional rehabilitation in accordance with the current best evidence available, based on the literature review done.

Conclusion: Despite good clinical evidence there seem to be a lack of consensus in the management of grade 3 lateral ankle sprains.

Introduction

Musculoskeletal problems are a significant health problem and burden. Ankle injuries are extremely common during sports and activities. Eighty five percent of ankle injuries are sprains and of these, 95% involve mainly the lateral ankle ligament complex.(40) Grade 1 and 2 LAS remain the most prevalent injury. However, recent evidence show that there is

no such thing as a simple sprain.(4) Verhagen et al. reported a calculated total cost of 360 Euro per injured person in 2005(41), while Feger et al reported a financial burden of 152 million USD per year of which 88% was spent on diagnosis and not actual treatment.(28) Acute ankle sprains significantly affect daily activity and cause a high incidence of absenteeism in both work and physical activities adding to the burden.(10) Impact measured in disability-adjusted life-years(DALY), which is a measure of overall disease burden expressed as the number of **years** lost due to a certain disability, has increased by 50% from 2000 to 2010.(27) Although reported that over 90% return to activity after 10 days, 72% will have persistent symptoms at 6 months and 45% would not have fully recovered by 3 years.(42) Strong evidence suggests that athletes in the first year of competition have twice the risk of suffering a recurrent ankle sprain and of these, 50% will develop chronic symptoms.(43) Despite compelling evidence of the importance of managing acute ankle sprains as well as clear guidelines from numerous systematic reviews and meta analyses, 90% of patients seeking medical care are managed incorrectly.
(4, 5, 15, 17, 42, 44)
Simpson et al did a descriptive cross-sectional survey looking at whether physiotherapists follow evidence based guidelines when treating ankle sprains. They found that between 49 to 91% used interventions for which there was no evidence.(41) Our question: Do all orthopaedic surgeons in South Africa treat acute ankle sprains according to best current evidence? Thus the nul hypothesis is that there is no difference between current evidence based guidelines and the management that orthopaedic surgeons will choose to treat an acute LAS.

Methods

A descriptive cross-sectional survey analysis was performed to assess the approach to management of acute ankle sprains by orthopaedic surgeons in South Africa. An anonymous questionnaire emailed to members of the South African Orthopaedic association on the current practice of LAS consisted of eight treatment options for a grade 3 lateral ankle sprain in a non-professional athlete.(see Illustration 1) The questions focused on the surgeons treatment in the first 6 weeks after the sprain. Published research concerning lower back pain has utilized case studies of typical clinical presentations to elicit information about the selection of management approaches. (45) This method was also selected for the case used in this study, as it reflects the difference in orthopaedic

surgeon's choices of interventions, rather than the differences in presentation of the patient.

A similar survey under physiotherapists was done and validated by a panel of experts in the field to ensure that the answers where objective and non-bias.(1) Ethics clearance was obtained from the Faculty of Health Sciences Human Research Ethics Committee. (081/2017) The author also did an in-depth search of electronic databases including EBSCOhost, Scopus, Google Scholar, Science Direct, Springer and Web of Science regarding the management of acute lateral ankle sprains. Search words included the following: "Ankle Sprain", "Ligament injury", "Acute", "Lateral ankle injury", "Treatment", "Management" , with the focus on current research, to review the current best practice regarding the management approach of lateral ankle sprains.

Management of Ankle Sprain

Clinical Scenario:

A 28 year old active male presents to your practice after an ankle sprain sustained while playing soccer. You diagnose him with a grade 3 isolated acute lateral ankle sprain. Please choose from the list below the most appropriate answer as to your initial management plan for him:

- Surgery with acute repair of the ATFL and CFL
- Plaster Cast for 6 weeks
- Plaster Cast for 2-4 weeks
- Moonboot for 6 weeks
- Moonboot for 2 weeks
- Short period immobilization followed by functional rehabilitation
- Ankle brace (e.g stirrup brace) only
- Compressive bandage

Please mark your answer with a tick

Illustration 1

Results

A total of 719 SAOA members where invited to participate with 129 of the distributed questionnaires returned. Five hundred and three questionnaires were not returned, 77 questionnaires were not delivered to the recipients and 10 surgeons declined filling in the questionnaire. Twenty Four(19%) surgeons chose acute surgical repair compared to 105 that chose a conservative approach.(Figure 1) Fourty nine(38%) recommended a 6-week period of immobilization in either a cast or moonboot compared to 56(53%) recommending a shorter period.(Figure 2) Only 39(30%) of surgeons chose a short period of immobilization followed by functional rehabilitation in accordance with the current best evidence available. Regarding the type of immobilization, the majority chose an ankle brace (39%) followed by below knee POP (32%) and Moonboot (29%). None of the Orthopaedic Surgeons chose to use compressive bandage alone. (Figure 3)

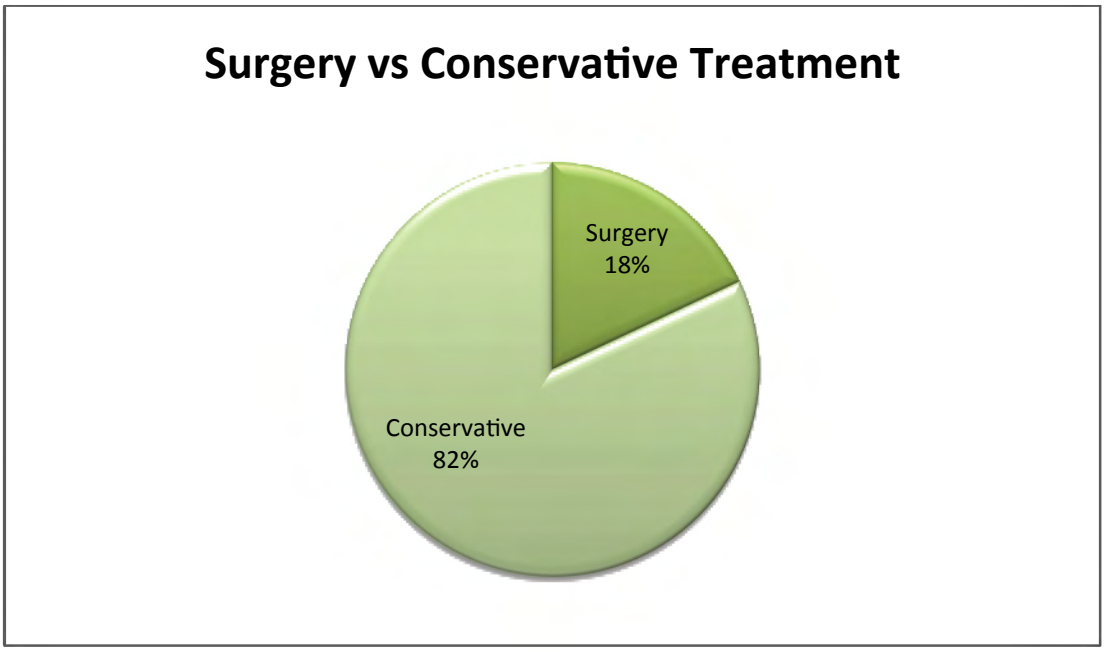


Figure 1. Surgery vs Conservative treatment

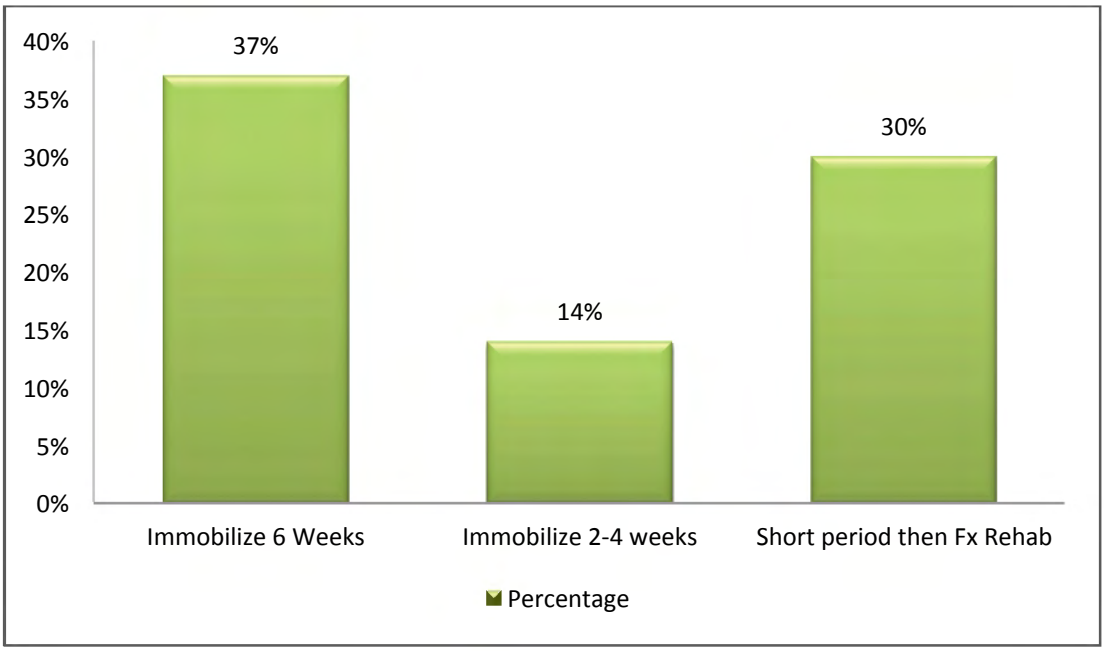


Figure 2. Total period of Immobilization

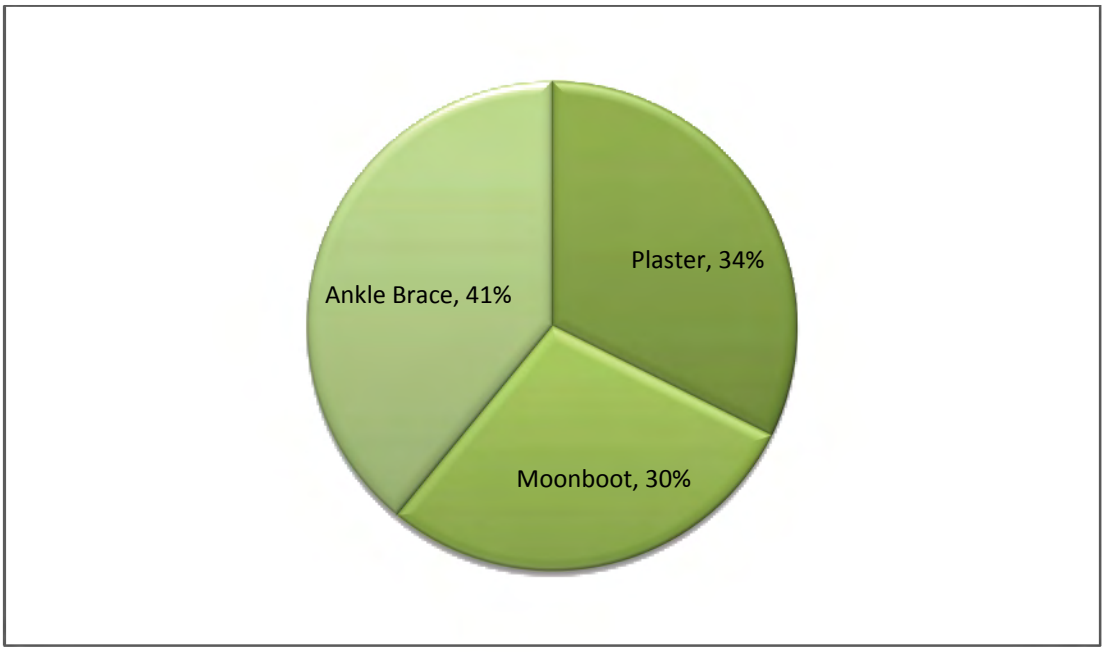


Figure 3. Type of Immobilization

Discussion and review of current literature

There seems to be a divergence in the management of acute ankle sprains between current evidence and clinical practice. Simpson et al. noted in a survey done under physiotherapists that many treatment modalities are still used despite evidence showing minimal to no benefit.(1)

Immobilization

It has been shown that immobilization for prolonged periods lead to muscle wasting and joint stiffness. There is a decrease in the tensile strength of ligaments as well as collagen fibril numbers and thickness. We also know that fibroblasts mainly produce type 3 collagen after an injury compared to type 1 collagen which makes up 85% of the collagen in normal ligaments.(19) Nash et al. pointed out that early mobilization increases blood flow, reduces muscle atrophy, adhesions and joint stiffness which in turn leads to decreased pain.(3) This effect is called, causal histiogenesis, where functional stress is needed for remodelling of connective tissue.(4) Kerkhoffs et al. showed in a meta-analysis that exercise is associated with less instability and earlier return to function. Current evidence recommend early functional rehabilitation is better than immobilization for grade 1 and 2 ankle sprains and a short period of immobilization(7 to 10 days) followed by functional rehabilitation for grade

3 lateral ankle sprains.(3-10) In our survey we found that nearly 40% of Orthopaedic Surgeons chose 6 weeks immobilization as their initial management.

Type of immobilization

With regards to different external supports, Kerkhoffs et al. cochrane review showed that a lace up ankle braces are superior to semi rigid braces, elastic bandage and tape in the short term. Tape also tends to have more skin problems.(38) Lardenoye et al. found increased patient satisfaction regarding braces compared to tape, however no difference in functional outcome and pain.(13) Beynnon et al. found that Air-stirrup brace with elastic wrap lead to return to function in half the time as compared to wrap or bracing alone.(14) They also found no difference in casting or Air-stirrup bracing for the first 10 days in grade 3 LAS. A prospective randomized study including 186 patients by Prado et al. compared functional braces with a walking boot and found that the brace resulted in earlier return to activity.(15) Doherty et al.'s meta-analysis of 46 systematic reviews containing 309 studies reported a lower incidence of re injury with the use of braces or tape compared to no support. They recommend wearing a brace during sporting activities for a minimum of 6 months with benefit up to 1 year with lace up braces better than semi rigid braces.(17) In our survey only 39% of SAOA members used ankle braces in managing acute lateral ankle sprains

NSAIDS

NATA recommendations advised caution in use because of possible decrease in tensile strength of healing ligaments. They found earlier return to training in military recruits, however noted greater instability and swelling after 14 days most likely due to the analgesic effects that allowed return before the ligaments where healed.(7) Hauser et al. did a review of treatment options in ligament injuries in general and found that although effective in decreasing pain and swelling for the first 6 to 8 weeks NSAIDS did inhibit the histological, biochemical and biomechanical properties of ligament healing.(19) Van den Bekerom et al. (20) reported in a meta-analysis of 22 trails that oral and topical NSAIDS are superior to placebo regarding pain and swelling in the short term. They did conclude that there was a low number of studies with a lack of methodological quality and small sample sizes but still recommended the use.

Local Injections

Regarding Platelet rich therapies it is thought that they could enhance the healing process due to the production of growth factors, however numerous randomised controlled trials

as well as a Cochrane review have shown no benefit regarding pain and function in both the short and long term.(21, 22) Petrella et al. and Jakobs et al. both showed in prospective RCT's that hyaluronic acid per articular injections results in earlier return to activity, decreased pain and increased patient satisfaction. However the literature on viscoelastic injections for acute LAS limited.(23, 24)

Cryotherapy

Cryotherapy is part of the so-called RICE (Rest, Ice, Compression, Elevation) treatment. Nata recommendations noted that there is limited strong evidence for using cryotherapy but no evidence not to apply it. It is thought to decrease pain through reduced nerve conduction and muscle spasm and swelling through vasoconstriction of vessels leading to decreased permeability, but is only effective 15 – 30 minutes after treatment. Bleakley et al. compared 2 different cryotherapy regimens based on the duration of application and found no difference in functional status, swelling or pain at rest.(28)

Manual Therapy and Physical Agents

Regarding manual therapy Ojha et al. did a systematic review and concluded that early manual therapy decreases total episode cost.(46) Although the mechanism by which manual therapy works is unknown, Cleland en al reported it to be superior to home base exercises regarding pain and function.(25) Hubbard reported, only anecdotal evidence in the form of case studies, improved motion but only after multiple sessions.(6, 26) Evidence to support manual therapy is only moderate regarding effects on swelling and improved motion.(27, 28) Seventy eight percent of physiotherapists in a survey by Guillodo et al.(29) indicated that they would use it, however Kerkhoffs et al. showed in a systematic review that evidence is limited regarding the benefits and that most positive effects disappeared 2 weeks after the injury, thus recommended against using.(30)

Evidence also shows that ultrasound and laser therapy has no benefit and only adds extra cost.(9, 17, 31-33)

Neuromuscular training

Neuromuscular training is defined as training to enhance unconscious motor responses by stimulating both afferent signals and central mechanisms responsible for dynamic joint control.(34) Freeman's concept was that it serves as an adjunct to functional treatment since joint injury results in proprioceptive deficit that prevents functional recovery and risks long term instability.(35) It is been shown that neuromuscular and proprioceptive training

decreases re injury rates and functional instability.(5) Petersen et al. concluded in their systematic review that proprioceptive and neuromuscular training can be used in an effort to decrease future risk of re sprain using mainly the 2Fit trail that included 522 participants which was more powered than the studies by van Rijn et al. and Bleakery with a mere 102 participants. (4, 11, 18)

Surgery versus Conservative Treatment

In our survey, we found that 1 in 5 orthopaedic surgeons (20%) would do an acute surgical repair, which is in contrast to current best practice Kerkhoffs et al. in their Cochrane review, comparing surgery versus conservative treatment for acute lateral ankle ligament injuries, failed to demonstrate a clear superior treatment approach.(38) There was evidence for longer recovery times, higher incidence of ankle stiffness, impaired ankle mobility and more complications in the surgical treatment group. Doherty et al. did a meta-analysis including 46 systematic reviews consisting of 309 studies.(17) Most randomised controlled trials used function, determined as time taken to return to work/activity, as their outcome. None of the reviews reported on the primary outcome of recurrence. The consensus regarding surgery is that it is not indicated prior to a conservative treatment trial, persistent symptoms and on an individual basis. Several reviewers further reported the propensity for a surgical intervention to have a higher risk of complications, including issues with wound healing, infection, dystrophy, iatrogenic nerve injury leading to sensory deficit and paraesthesia compared to conservative treatment.(9, 17, 47) Van den Bekerom et al. however did note that early surgical repair in professional athletes can be beneficial. In the narrative review article they noted that objective instability measured as talar tilt or the anterior draw test was a predictor of recurrent instability and that surgery decreases this. This outcome is dependent on multiple factors including patient factors and access to an expert orthopaedic surgeon.an den(9) White et al. more recently reported on a series of 42 professional athletes, median age of 22 years, that underwent a modified broström repair for grade 3 LAS. They found that surgical management “lead to a more predictable return to sport” which is essential in professional athletes. Of note is also a 25 % incidence of associated injuries such as osteochondral lesions that where identified and successfully treated during surgery.(48)

Conclusion

Regarding the management of acute lateral ankle sprains, evidence seem to support lace up braces in grade 1 and 2 ankle sprains. Grade 3 acute LAS one can consider a short period of

immobilization followed by a lace up brace. A phase adapted functional rehabilitation program is recommended, incorporating neuromuscular training which has specific benefits on the re-sprain rates. Regarding surgery there is a need for sufficiently powered, high quality randomised trials and currently there is limited evidence for the young professional athlete. In the South African setting taking cost and resources into consideration the treatment algorith for grade 3 LAS could be as follows. Wear a lace up brace for 1st week, which is much cheaper than a moonboot that is often given, but if not available place in a below knee cast and prescribe NSAIDS as part of the pain regimen. From week 2 start with functional rehabilitation referring to the physiotherapist. Specific instruction should include proprioceptive and neuromuscular training with early weightbearing as able protecting the ankle from excessive inversion. Advise the patient to continue the neuromuscular trainging and wearing of lace up brace to prevent recurrent injuries.

In our survey we found that less than half of Orthopaedic Surgeons follow the current best evidence in managing acute LAS regarding type and duration of immobilisation. The survey was limited in the sense that no demographical data was collected to comment on experience or background. However this study shows a difference in the management of acute ankle sprains regarding current evidence and clinical practice.

Contributions of authors, competing interests and funding

All authors confirm that no benefits of any form have been received from any party related directly or indirectly to the subject of this article.

All authors hereby declare that they have no competing interests to disclose.

Ethics clearance was obtained from our institution's ethics committee.

References

1. Simpson H, Crous L, Louw Q. Physiotherapy for acute ankle sprains: How do we compare to evidence based clinical guidelines? South African Journal of Physiotherapy. 2014;70(2):19-26.
2. Hauser RA, Dolan EE. Ligament injury and healing: an overview of current clinical concepts. Journal of Prolotherapy. 2011;3(4):836-46.
3. Nash CE, Mickan SM, Del Mar CB, Glasziou PP. Resting injured limbs delays recovery: a systematic review. Journal of family practice. 2004;53(9):706-.
4. Petersen W, Rembitzki IV, Koppenburg AG, Ellermann A, Liebau C, Brüggemann GP, et al. Treatment of acute ankle ligament injuries: a systematic review. Archives of orthopaedic and trauma surgery. 2013;133(8):1129-41.

5. Bleakley CM, McDonough SM, MacAuley DC. Some conservative strategies are effective when added to controlled mobilisation with external support after acute ankle sprain: a systematic review. Australian Journal of Physiotherapy. 2008;54(1):7-20.
6. Hubbard TJ, Wikstrom EA. Ankle sprain: pathophysiology, predisposing factors, and management strategies. Open Access Journal Of Sports Medicine. 2010;1:115-22.
7. Kaminski TW, Hertel J, Amendola N, Docherty CL, Dolan MG, Ty Hopkins J, et al. National Athletic Trainers' Association Position Statement: Conservative Management and Prevention of Ankle Sprains in Athletes. Journal of Athletic Training (Allen Press). 2013;48(4):528-45.
8. Lamb SE, Marsh JL, Hutton JL, Nakash R, Cooke MW. Mechanical supports for acute, severe ankle sprain: a pragmatic, multicentre, randomised controlled trial. The Lancet.373(9663):575-81.
9. van den Bekerom MP, Kerkhoffs GM, McCollum GA, Calder JD, van Dijk CN. Management of acute lateral ankle ligament injury in the athlete. Knee surgery, sports traumatology, arthroscopy. 2013;21(6):1390-5.
10. O'Connor SR, Bleakley CM, Tully MA, McDonough SM. Predicting functional recovery after acute ankle sprain. Plos One. 2013;8(8):e72124-e.
11. Bleakley CM, O'Connor SR, Tully MA, Rocke LG, MacAuley DC, Bradbury I, et al. Effect of accelerated rehabilitation on function after ankle sprain: randomised controlled trial. BMJ. 2010;340:c1964.
12. Woitzik E, Jacobs C, Wong JJ, Cote P, Shearer HM, Randhawa K, et al. The effectiveness of exercise on recovery and clinical outcomes of soft tissue injuries of the leg, ankle, and foot: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. Manual Therapy. 2015;20(5):633-45.
13. Lardenoye S, Theunissen E, Cleffken B, Brink PR, de Bie RA, Poeze M. The effect of taping versus semi-rigid bracing on patient outcome and satisfaction in ankle sprains: a prospective, randomized controlled trial. BMC musculoskeletal disorders. 2012;13(1):81.
14. Beynnon BD, Renström PA, Haugh L, Uh BS, Barker H. A prospective, randomized clinical investigation of the treatment of first-time ankle sprains. The American journal of sports medicine. 2006;34(9):1401-12.
15. Prado MP, Mendes AAM, Amodio DT, Camanho GL, Smyth NA, Fernandes TD. A comparative, prospective, and randomized study of two conservative treatment protocols for first-episode lateral ankle ligament injuries. Foot and Ankle International. 2014;35(3):201-6.
16. Bilgic S, Durusu M, Aliyev B, Akpancar S, Ersen O, Mehmet Yasar S, et al. Comparison of two main treatment modalities for acute ankle sprain. Pakistan Journal of Medical Sciences. 2015;31(6):1496-9.
17. Doherty C, Bleakley C, Delahunt E, Holden S. Treatment and prevention of acute and recurrent ankle sprain: an overview of systematic reviews with meta-analysis. British Journal of Sports Medicine. 2016:bjsports-2016-096178.
18. Van Rijn RM, Van Os AG, Bernsen RM, Luijsterburg PA, Koes BW, Bierma-Zeinstra SM. What is the clinical course of acute ankle sprains? A systematic literature review. The American journal of medicine. 2008;121(4):324-31. e7.
19. Hauser R, Dolan E, Phillips H, Newlin A, Moore R, Woldin B. Ligament injury and healing: a review of current clinical diagnostics and therapeutics. The Open Rehabilitation Journal. 2013;6(1).
20. van den Bekerom MP, Sjer A, Somford MP, Bulstra GH, Struijs PA, Kerkhoffs GM. Non-steroidal anti-inflammatory drugs (NSAIDs) for treating acute ankle sprains in adults: benefits outweigh adverse events. Knee Surgery, Sports Traumatology, Arthroscopy. 2015;23(8):2390-9.
21. Rowden A, Dominici P, D'Orazio J, Manur R, Deitch K, Simpson S, et al. Double-blind, randomized, placebo-controlled study evaluating the use of platelet-rich plasma

therapy (PRP) for acute ankle sprains in the emergency department. The Journal of emergency medicine. 2015;49(4):546-51.
22. Moraes VY, Lenza M, Tamaoki MJ, Faloppa F, Belloti JC. Platelet-rich therapies for musculoskeletal soft tissue injuries. The Cochrane Library. 2014.
23. Petrella RJ, Petrella MJ, Cogliano A. Periarticular hyaluronic acid in acute ankle sprain. Clinical Journal of Sport Medicine. 2007;17(4):251-7.
24. Jakobs C, Wirbel R, Korner J. Influence of hyaluronic acid on the clinical course of ankle sprains. Clin Sport Med Int (CSMI). 2015;8:1-5.
25. Cleland JA, Mintken P, McDevitt A, Bieniek M, Carpenter K, Kulp K, et al. Manual Physical Therapy and Exercise Versus Supervised Home Exercise in the Management of Patients With Inversion Ankle Sprain: A Multicenter Randomized Clinical Trial. Journal of Orthopaedic & Sports Physical Therapy. 2013;43(7):443-55.
26. Hubbard TJ, Hicks-Little CA. Ankle ligament healing after an acute ankle sprain: an evidence-based approach. Journal of athletic training. 2008;43(5):523-9.
27. Eisenhart AW, Gaeta TJ, Yens DP. Osteopathic manipulative treatment in the emergency department for patients with acute ankle injuries. The Journal of the American Osteopathic Association. 2003;103(9):417-21.
28. Bleakley CM, McDonough SM, MacAuley DC. Cryotherapy for acute ankle sprains: a randomised controlled study of two different icing protocols. British journal of sports medicine. 2006;40(8):700-5.
29. Guillodo Y, Le Goff A, Saraux A. Adherence and effectiveness of rehabilitation in acute ankle sprain. Annals of physical and rehabilitation medicine. 2011;54(4):225-35.
30. Kerkhoffs GM, van den Bekerom M, Elders LA, van Beek PA, Hullegie WA, Bloemers GM, et al. Diagnosis, treatment and prevention of ankle sprains: an evidence-based clinical guideline. British journal of sports medicine. 2012;46(12):854-60.
31. de Bie RA, de Vet HC, Lenssen TF, van den Wildenberg FA, Kootstra G, Knipschild PG. Low-level laser therapy in ankle sprains: a randomized clinical trial. Archives of Physical Medicine and Rehabilitation. 1998;79(11):1415-20.
32. van den Bekerom MPJ, van der Windt D, ter Riet G, van der Heijden GJ, Bouter LM. Therapeutic ultrasound for acute ankle sprains. Cochrane Database of Systematic Reviews. 2011(6).
33. van der Windt DA, van der Heijden GJ, Van den Berg S, ter Riet G, De Winter AF, Bouter LM, et al. Therapeutic ultrasound for acute ankle sprains. The Cochrane Library. 2002.
34. BSCHER MH, Zech A, Pfeifer K, NSEL FH, Vogt L, Banzer W. Neuromuscular training for sports injury prevention: a systematic review. 2010.
35. Freeman M. Instability of the foot affer injuries to the lateral ligament of the ankle. Bone & Joint Journal. 1965;47(4):669-77.
36. Bahr R, Bahr I. Incidence of acute volleyball injuries: a prospective cohort study of injury mechanisms and risk factors. Scandinavian journal of medicine & science in sports. 1997;7(3):166-71.
37. Hupperets MD, Verhagen EA, Van Mechelen W. Effect of unsupervised home based proprioceptive training on recurrences of ankle sprain: randomised controlled trial. Bmj. 2009;339:b2684.
38. Kerkhoffs G, Kennedy JG, Calder JD, Karlsson J. There is no simple lateral ankle sprain. 2016.
39. Kerkhoffs GM, Handoll HH, de Bie R, Rowe BH, Struijs PA. Surgical versus conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults. The Cochrane Library. 2007.
40. Pellow JE, Brantingham JW. The efficacy of adjusting the ankle in the treatment of subacute and chronic grade I and grade II ankle inversion sprains. Journal of manipulative and Physiological therapeutics. 2001;24(1):17-24.

41. Verhagen E, Van Tulder M, van der Beek AJ, Bouter L, Van Mechelen W. An economic evaluation of a proprioceptive balance board training programme for the prevention of ankle sprains in volleyball. British journal of sports medicine. 2005;39(2):111-5.
42. Gribble PA, Bleakley CM, Caulfield BM, Docherty CL, Fourchet F, Fong DT-P, et al. 2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains. British journal of sports medicine. 2016:bjsports-2016-096188.
43. Hertel J. Functional anatomy, pathomechanics, and pathophysiology of lateral ankle instability. Journal of athletic training. 2002;37(4):364.
44. Feger MA, Glaviano NR, Donovan L, Hart JM, Saliba SA, Park JS, et al. Current Trends in the Management of Lateral Ankle Sprain in the United States. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine. 2016.
45. Mikhail C, Korner-Bitensky N, Rossignol M, Dumas J-P. Physical therapists' use of interventions with high evidence of effectiveness in the management of a hypothetical typical patient with acute low back pain. Physical therapy. 2005;85(11):1151-67.
46. Ojha HA, Wyrsta NJ, Davenport TE, Egan WE, Gellhorn AC. Timing of Physical Therapy Initiation for Nonsurgical Management of Musculoskeletal Disorders and Effects on Patient Outcomes: A Systematic Review. Journal of Orthopaedic & Sports Physical Therapy. 2016;46(2):56-70.
47. Kerkhoffs GM, Struijs PA, Marti RK, Assendelft WJ, Blankevoort L, Van Dijk C. Different functional treatment strategies for acute lateral ankle ligament injuries in adults. The cochrane library. 2002.
48. White WJ, McCollum GA, Calder JD. Return to sport following acute lateral ligament repair of the ankle in professional athletes. Knee Surgery, Sports Traumatology, Arthroscopy. 2016;24(4):1124-9.

THE MANAGEMENT OF ACUTE ANKLE SPRAINS; A SURVEY OF SOUTH AFRICAN SURGEONS AND THE BEST AVAILABLE EVIDENCE

Dear participant

We are conducting a study to assess the management of acute lateral ankle sprains by orthopaedic surgeons in South Africa.
We would like you to participate in our study by completing a short questionnaire based on a clinical case on how you would treat an acute lateral ankle sprain.

Voluntary Participation
Your participation in this project is entirely voluntary. You can withdraw at any time.

Confidentiality
No personal information will be collected.

Anonymity
Through the survey monkey website we will not be saving IP addresses, thus your answers will be completely anonymous.

What happens after the study?

Data will be used as part of a paper to review the current best evidence in treating acute lateral ankle sprains.

The UCT's Faculty of Health Sciences Human Research Ethics Committee can be contacted on 021 406 6338 in case you have any ethical concerns or questions about your rights or welfare as a participant on this research study

Certificate of Consent

I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it, and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate in this study.

Print Name of Participant_____

Signature of Participant _____

Date _____
Day/month/year

Management of Ankle Sprain

Clinical Scenario:

A 28 year old active male presents to your practice after an ankle sprain sustained while playing soccer. You diagnose him with a grade 3 isolated lateral ankle sprain. Please choose from the list below the most appropriate answer as to your initial management plan for him:

- Surgery with acute repair of the ATFL and CFL
- Plaster Cast for 6 weeks
- Plaster Cast for 2-4 weeks
- Moonboot for 6 weeks
- Moonboot for 2 weeks
- Short period immobilization followed by functional rehabilitation
- Ankle brace (e.g stirrup brace) only
- Compressive bandage

Please mark your answer with a tick

PROTOCOL: THE MANAGEMENT OF ACUTE ANKLE SPRAINS: A SURVEY OF SOUTH AFRICAN SURGEONS AND THE BEST EVIDENCE AVAILABLE

Author(s): Dr GS Wever, Dr G McCollum
Sponsor(s): N/A
Funder(s): N/A
Study coordination centre: University of Cape Town

Study Management Group

Principal Investigator: GS Wever, G McCollum

Co-investigators: S Rauch, I Douglas

Statistician: W Msemburi

Study Coordination Centre

For general queries, supply of study documentation, and collection of data, please contact:

Study Coordinator: GS Wever

Address: H49, OMB, Groote Schuur Hospital

Tel: 021 4045108 E-mail:

stefanwever@gmail.com

Cell: 0845879038

Clinical Queries

Clinical queries should be directed to study coordinator who will direct the query to the appropriate person.

Sponsor

UCT is the main research sponsor for this study. For further information regarding the sponsorship conditions, please contact the Deputy Director at:

University of Cape Town, Clinical Research Centre

Old Main Building, L51

Groote Schuur Hospital

Observatory

0214066281

Funder

Every care was taken in drafting this protocol, but corrections or amendments may be necessary. These will be circulated to investigators and approved before implementation. Problems relating to this study should be referred, in the first instance, to the Principal Investigator.

This study will be conducted in compliance with the protocol, data protection and other relevant regulatory requirements.

Table of Contents

GLOSSARY OF ABBREVIATIONS

LAS	Lateral Ankle Sprain
SAOA	South African Orthopaedic Association

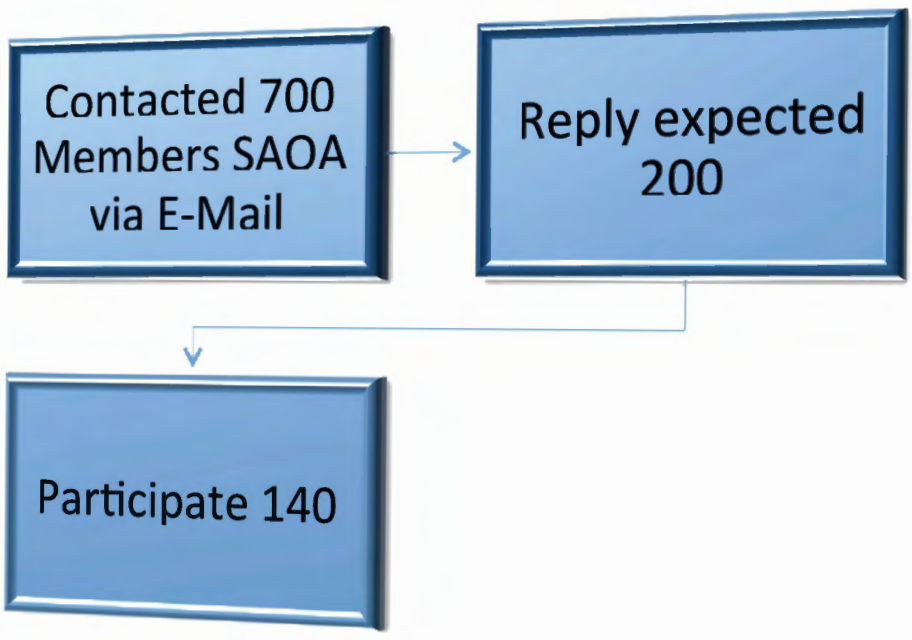
KEYWORDS

ACUTE ANKLE SPRAIN, MANAGEMENT, LATERAL LIGAMENT INJURY, TREATMENT

STUDY SUMMARY

TITLE	The management of acute ankle sprains: A Survey of South African surgeons and the best evidence available.
DESIGN	Descriptive Cross-sectional survey analysis
AIMS	Asses the management approach of acute ankle sprains by orthopaedic surgeons in South Africa
OUTCOME MEASURES	A Questionnaire sent out to all participants
POPULATION	Orthopaedic Surgeons residing in South Africa registered at South African Orthopaedic Association (SAOA)
ELIGIBILITY	All Orthopaedic Surgeons registered at the South African Orthopaedic Association willing to complete the survey questionnaire.
DURATION	N/A

REFERENCE DIAGRAM (E.G. FLOW OF ASSESSMENTS)



According to surveymonkey the average response rate is 20%

1. INTRODUCTION

1.1 Background

Musculoskeletal problems are a significant health problem and burden. Ankle injuries are extremely common during sports and activities. (49) 85% of ankle injuries are ankle sprains and of these, 95% involve mainly the lateral ankle ligament complex.(40) Grade 1 and 2 LAS remain the most prevalent. However, recent evidence show that there is no such thing as a simple sprain.(50) Verhagen et al reported a calculated total cost of 360 Euro per injured person in 2005 (41), while Feger et al reported a financial burden of 152 million USD per year of which 88% was spent on diagnosis and not actual treatment.(51) Acute ankle sprains significantly affect daily activity and cause a high incidence of absenteeism in both professional and physical activities adding to the burden.(52) Impact measured in disability-adjusted life-years has increased by 50% from 2000 to 2010.(46) Although reported that over 90% return to activity after 10 days, 72% will have persistent symptoms at 6 months and 45% would not have fully recovered by 3 years.(53) Strong evidence suggests that athletes in the first year of competition have twice the risk of suffering a recurrent ankle sprain and of these, 50% will develop chronic symptoms.(54) Despite compelling evidence of the importance of managing acute ankle sprains as well as clear guidelines from numerous systematic reviews and meta analyses, 90% of patients seeking medical care are managed incorrectly. (external support and rehabilitation) (2, 7, 11, 12, 15, 19).

1.2 Rationale for current study

Simpson et al did a descriptive cross-sectional survey looking at whether physiotherapists follow evidence based guidelines when treating ankle sprains. They found that between 49 to 91% used interventions for which there was no evidence.(1) Our question: Do all orthopaedic surgeons in South Africa treat acute ankle sprains according to best current evidence? Thus the nul hypothesis is that there is no difference between current evidence based guidelines and the management that orthopaedic surgeons will choose to treat an acute LAS.

2. STUDY OBJECTIVES

Primary objective: Asses the management approach of acute ankle sprains by orthopaedic surgeons in South Africa

Secondary Objective: Review the current evidence regarding the management of acute LAS

3. STUDY DESIGN

Descriptive Cross-sectional survey analysis

Study population: Orthopaedic Surgeons residing in South Africa registered at South African Orthopaedic Association.

Methods: A survey will be created using the website www.surveymonkey.com, which will contain a clinical scenario with different management options. The SAOA will be contacted in order to get access the the members e-mail contact details.

Methods protecting against bias: Research have shown that using a clinical scenario to elicit information about selection of management is accurate. It reflects the difference in the orthopaedic surgeons choice of interventions, rather than the difference in presentation of the patient.(1, 45)

Randomization: No randomization was done

Data Collection: Will be collected by the surveymonkey website anonymously in the form of a excel sheet.

Statistical methods: The Chi-Square test will be used to analyze the categorical variables, comparing the differences in the orthopaedic surgeons response to current guidelines.

Literature Review: The author performed an in depth search of electronic data bases using platforms including; EBSCOhost, Scopus, Google Scholar, ScienceDirect, Springer and Web of Science. Key words where used as mentioned earlier.

3.1 Study outcome measures

This is only a survey based study however the information can be used afterwards to direct under and post graduate teaching and training.

4. PARTICIPANT ENTRY TO THE STUDY

4.1 Inclusion criteria

All Orthopaedics Surgeons Registered at the SAOA willing to participate by answering a clinical case questionnaire.

4.2 Exclusion criteria

None

4.3 Withdrawal criteria

N/A

5. ADVERSE EVENTS

This is a descriptive cross-sectional survey that will not be implementing a treatment modality, thus not expecting any adverse events.

6. STATISTICS AND DATA ANALYSIS

To minimize confounding when analyzing the results we will employ the following: Continuous variables with normal distribution will be compared using t-tests, while those with non normal distribution will employ the Wilcoxon rank-sum test. Confidence interval of 95% will be used. Unless otherwise indicated, a two-tail test hypothesis will be used with an alpha-value of 0.05 as discriminator for rejection of the null-hypothesis.

7. REGULATORY ISSUES

7.1 Ethics approval

Approval will be obtained from the UCT Human Research Ethics Committee [and the following local ethics committees, as appropriate]. Data and all appropriate documentation will be stored for a minimum of 5 years after the completion of the study, including the follow-up period.

7.2 Consent

Consent will be requested to use the results of the questionnaire. It will be included on the questionnaire.

7.3 Confidentiality

All data will be collected on a simple excel sheet created by the website, this data collection will not capture any identifying variables.

8.4 Indemnity

UCT holds a non-negligent harm insurance policy which applies to this study.

8.5 Sponsor

UCT will act as the main Sponsor for this study. Delegated responsibilities assigned to the research team running this study will be documented.

8.6 Funding

Since this is a cross-sectional survey, minimal costs are expected and the author will cover any costs.

8.7 Audits

The study may be subject to inspection and audit by UCT CRC under their remit as Sponsor and other regulatory bodies to ensure adherence to South African Good Clinical Practice if required.

9. STUDY MANAGEMENT

The author will be contactable via e-mail or telephonically if any questions arise.

10. PUBLICATION POLICY

The aim will be to publish the study in a peer review journal

11. REFERENCES

1. Pellow JE, Brantingham JW. The efficacy of adjusting the ankle in the treatment of subacute and chronic grade I and grade II ankle inversion sprains. Journal of manipulative and Physiological therapeutics. 2001;24(1):17-24.
2. Petersen W, Rembitzki IV, Koppenburg AG, Ellermann A, Liebau C, Brüggemann GP, et al. Treatment of acute ankle ligament injuries: a systematic review. Archives of orthopaedic and trauma surgery. 2013;133(8):1129-41.
3. van den Bekerom MP, Kerkhoffs GM, McCollum GA, Calder JD, van Dijk CN. Management of acute lateral ankle ligament injury in the athlete. Knee surgery, sports traumatology, arthroscopy. 2013;21(6):1390-5.
4. Bleakley CM, McDonough SM, MacAuley DC. Cryotherapy for acute ankle sprains: a randomised controlled study of two different icing protocols. British journal of sports medicine. 2006;40(8):700-5.
5. O'Connor SR, Bleakley CM, Tully MA, McDonough SM. Predicting functional recovery after acute ankle sprain. Plos One. 2013;8(8):e72124-e.
6. Eisenhart AW, Gaeta TJ, Yens DP. Osteopathic manipulative treatment in the emergency department for patients with acute ankle injuries. The Journal of the American Osteopathic Association. 2003;103(9):417-21.
7. Gribble PA, Bleakley CM, Caulfield BM, Docherty CL, Fourchet F, Fong DT-P, et al. 2016 consensus statement of the International Ankle Consortium: prevalence, impact and

long-term consequences of lateral ankle sprains. British journal of sports medicine. 2016:bjsports-2016-096188.
8. Hertel J. Functional anatomy, pathomechanics, and pathophysiology of lateral ankle instability. Journal of athletic training. 2002;37(4):364.
9. Petrella RJ, Petrella MJ, Cogliano A. Periarticular hyaluronic acid in acute ankle sprain. Clinical Journal of Sport Medicine. 2007;17(4):251-7.
10. Verhagen E, Van Tulder M, van der Beek AJ, Bouter L, Van Mechelen W. An economic evaluation of a proprioceptive balance board training programme for the prevention of ankle sprains in volleyball. British journal of sports medicine. 2005;39(2):111-5.
11. Bleakley CM, McDonough SM, MacAuley DC. Some conservative strategies are effective when added to controlled mobilisation with external support after acute ankle sprain: a systematic review. Australian Journal of Physiotherapy. 2008;54(1):7-20.
12. Feger MA, Glaviano NR, Donovan L, Hart JM, Saliba SA, Park JS, et al. Current Trends in the Management of Lateral Ankle Sprain in the United States. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine. 2016.
13. Ojha HA, Wyrsta NJ, Davenport TE, Egan WE, Gellhorn AC. Timing of Physical Therapy Initiation for Nonsurgical Management of Musculoskeletal Disorders and Effects on Patient Outcomes: A Systematic Review. Journal of Orthopaedic & Sports Physical Therapy. 2016;46(2):56-70.
14. Hupperets MD, Verhagen EA, Van Mechelen W. Effect of unsupervised home based proprioceptive training on recurrences of ankle sprain: randomised controlled trial. Bmj. 2009;339:b2684.
15. Prado MP, Mendes AAM, Amodio DT, Camanho GL, Smyth NA, Fernandes TD. A comparative, prospective, and randomized study of two conservative treatment protocols for first-episode lateral ankle ligament injuries. Foot and Ankle International. 2014;35(3):201-6.
16. Tully MA, Bleakley CM, O'Connor SR, McDonough SM. Functional management of ankle sprains: what volume and intensity of walking is undertaken in the first week postinjury. British Journal of Sports Medicine. 2012;46(12):877-82.
17. Cleland JA, Mintken P, McDevitt A, Bieniek M, Carpenter K, Kulp K, et al. Manual Physical Therapy and Exercise Versus Supervised Home Exercise in the Management of Patients With Inversion Ankle Sprain: A Multicenter Randomized Clinical Trial. Journal of Orthopaedic & Sports Physical Therapy. 2013;43(7):443-55.
18. Hubbard TJ, Wikstrom EA. Ankle sprain: pathophysiology, predisposing factors, and management strategies. Open Access Journal Of Sports Medicine. 2010;1:115-22.
19. Doherty C, Bleakley C, Delahunt E, Holden S. Treatment and prevention of acute and recurrent ankle sprain: an overview of systematic reviews with meta-analysis. British Journal of Sports Medicine. 2016:bjsports-2016-096178.
20. Simpson H, Crous L, Louw Q. Physiotherapy for acute ankle sprains: How do we compare to evidence based clinical guidelines? South African Journal of Physiotherapy. 2014;70(2):19-26.
21. Mikhail C, Korner-Bitensky N, Rossignol M, Dumas J-P. Physical therapists' use of interventions with high evidence of effectiveness in the management of a hypothetical typical patient with acute low back pain. Physical therapy. 2005;85(11):1151-67.

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52 46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [illegible]
Email: [illegible]
Website: www.health.uct.ac.za/sites/research/humanethics/default.htm

02 May 2017

HREC REF: 081/2017

Dr G McCallum
Orthopaedics Surgery
H49, OMB

Dear Dr McCallum

PROJECT TITLE: THE MANAGEMENT OF ACUTE ANKLE SPRAINS; A SURVEY OF SOUTH AFRICAN SURGEONS AND THE BEST AVAILABLE EVIDENCE (MMED CANDIDATE - MR G WEVER)

Thank you for submitting your response to the Faculty of Health Sciences Human Research Ethics Committee received on 24 April 2017.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 May 2018.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

The HREC acknowledge that the student, GS Wever will also be involved in this study.

Yours sincerely

Signature Removed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB0000[illegible]
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a membership, in part(s), based on the Medical