

A Case Report On the Impact of Epsom Salt Pack and Earthing in The Treatment of Ankle Sprain

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Abstract

A significant issue in emergency medical care is ankle sprains, which happen roughly once every 10,000 people every day. Ankle injuries involving the lateral ligament complex account for 25% of all sports-related injuries. Pharmacological drugs such as NSAIDs are used for reducing pain and swelling but it has many side effects, Naturopathy is a complementary system of medicine offers potential beneficial in reducing pain and swelling in ankle sprain. In this case a 21 year old female slipped while getting down from bus and her left ankle twisted. The patient presents with typical ankle sprain symptoms like pain, swelling on the lateral side of the ankle. For around one week the pain and swelling does not reduce. Thorough clinical examination and imaging studies was done, there is no sign of fracture and confirmed the ankle sprain due to accidental trauma. The patient's medical history, personal history, co morbidities, was carefully assessed. The naturopathic treatment included cold pack, Epsom salt pack and Earthing for 10 days. The patient's progress was monitored for the duration of 10 days using a single subject research design. The above treatments significantly reduce pain, swelling and increased joint mobility in patient with ankle sprain. This case study suggest that Epsom salt pack and Earthing shows promise as a comprehensive approach to manage ankle sprain

Keywords: Ankle Sprain, Earthing, Epsom salt pack, Naturopathy

1. Introduction

A significant issue in emergency medical care is ankle sprains, which happen roughly once every 10,000 people every day. Ankle injuries involving the lateral ligament complex account for 25% of all sports-related injuries.(1) A history of discomfort and edema following a twisting injury could indicate anything from a little sprain to a fracture. If the patient can walk and the bruises are only minor and take time to show up, it's most likely a sprain; if the bruises are noticeable and the patient can't bear any weight on the foot, it indicates a more serious injury. Ankle sprains are injuries to the ankle caused by trauma to the soft tissue structures, which causes the soft tissue to strain painfully. Ankle inversion and

plantar flexion cause unequal loading, which results in the typical "twisted ankle." The anterior talofibular ligament is strained first, followed by the calcaneofibular ligament; occasionally, the talocalcaneal ligaments are also damaged.(2)

Ankle sprains are the second most common sports injury after knee injuries, in which around 85% of cases it damages the lateral ligaments because of inward twisting. (3) Acute ankle sprains are typically treated conservatively, and when conservative measures fail to restore functional rehabilitation, chronic ankle instability develops, necessitating surgery. (2) Inversion injuries that result in ankle sprains can harm the lateral ligament complex, occasionally leading to tendon damage.

Both extrinsic and intrinsic factors contribute to the development of chronic ankle sprains. Training mistakes, subpar performance, improper technique, and treading on uneven surfaces are examples of extrinsic variables. Intrinsic factors include soft tissue damage, instability of the active foot and ankle muscles (muscle weakness), poor proprioception, and hypermobile foot and ankle. Atypical foot posture, including dynamic pes planus, pes cavus, and flat foot, can contribute to the risk factors of chronic ankle sprain injuries. Classification aids in determining the extent of harm and the best course of action. Table 1 shows the three grades of acute ankle sprain.

To cut down on pointless radiographs and determine when radiographic tests are necessary for patients who sustain ankle damage, the Ottawa Ankle Rules (OAR) was created. If there is (a) pain around the malleolus; (b) difficulty bearing weight on the ankle right after the injury; (c) difficulty walking four steps in the emergency room; or (d) bone tenderness at the base of the fifth metatarsal bone or the posterior edge or tip of the medial or lateral malleolus, an X-ray examination is necessary. (2)

Table 1. Classification of acute ankle sprain according to its grade, severity, pathophysiology and clinical findings.(2)

Grade	Severity	Pathophysiology	Clinical Findings
Grade 1	Mild	Stretch of the anterior talofibular ligament (ATFL), causing microscopic tearing of ligament fibers	Mild swelling, no laxity, minimal ecchymosis, difficulty with full weight bearing
Grade 2	Moderate	Moderate injury to the lateral ligament complex with complete tear of the ATFL ± partial tear of the calcaneofibular ligament (CFL)	Localized swelling, hemorrhagic ecchymosis, anterolateral tenderness; abnormal laxity may be mild or absent
Grade 3	Severe	Complete disruption of the ATFL along with the CFL and posterior talofibular ligament (PTFL)	Marked tenderness, swelling, and ecchymosis over the lateral ankle and heel with significant laxity

Biological ligament healing can be divided into three different phases [1] Inflammatory Phase (up to ~10 days after trauma) - Bleeding and clot formation, Influx of inflammatory cells (neutrophils, macrophages), Debridement of necrotic tissue, Release of cytokines and growth factors to initiate healing [2] Proliferation Phase (4th to 8th week) - Fibroblast proliferation, Production of extracellular matrix (mainly type III collagen), Formation of granulation tissue, Neovascularization (formation of new blood vessels) [3] Remodelling (Maturation) Phase (can continue up to 1 year or more) - Collagen fiber alignment along stress lines, Gradual replacement of type III with type I collagen, Increase in tensile strength of the ligament, Vascularity decreases as tissue matures.(4)

Naturopathy is a unique primary healthcare method that places emphasis on the body's innate ability to cure itself. Its fundamental ideas are based on the comprehensive fusion of several components, including as physical activity, exposure to sunlight, proper hydration, stress reduction, and a healthy diet. By definition, drugless therapy allows naturopathic practitioners to explore the vast field of drugless healing without the need of pharmaceuticals. (5)

Epsom salts, which are made of hydrated magnesium sulfate, are among the most widely used medications having therapeutic properties.(6) Many people who have knee discomfort use Epsom salt baths as one of these common treatments. It's an affordable way to manage pain, swelling, inflammation, and discomfort related to Bruises and sprains at home. (7)

Earthing is a simple lifestyle practice that affects the body's fundamental bioelectrical function by reestablishing the conductive human body's connection to the Earth's natural and subtle surface electric charge.(8) This natural anti-inflammatory, in our opinion, is the best non-pharmaceutical treatment. It raises living standards, is free, and is simple to apply. The term "grounding" is used by our study team to describe electronic nutrition or possibly vitamin G. Grounding studies have been shown to promote sleep, reduce inflammation and discomfort, increase response to trauma and injuries with faster wound healing, improve blood flow, and lower blood viscosity, according to other study conducted in the past ten years. Earthing has amazing health benefits while being essentially innocuous. Blood thinning, supporting HRV, and blood pressure reduction all significantly minimize the risk of cardiovascular disease, including sudden cardiac death.(9)

CASE DESCRIPTION

This case study presents the clinical observation of a 21 year old female slipped while getting down from bus and her left ankle twisted. The patient presents with typical ankle sprain symptoms like pain, swelling on the lateral side of the ankle. For around one week the pain and swelling does not reduce. Thorough clinical examination and imaging studies was done, there is no sign of fracture and confirmed the ankle sprain due to accidental trauma. The patient's medical history, personal history, co morbidities, was carefully assessed.

THERAPEUTIC INTERVENTION

This study utilized an integrated approach consists of Epsom salt pack and Earthing.

Epsom salt pack – Materials Needed: a) cotton cloth (size: approximately 50 cm x 25 cm) b) tablespoons of Epsom salt (magnesium sulfate) c) 1 cup of cold water of 80°F d) A bowl for mixing e) A towel (to catch excess moisture).

Steps to Prepare and Apply the Epsom Salt Pack: Pour 1 cup of cold water into a bowl and add 2 tablespoons of Epsom salt, Stir until the salt is completely dissolved, soak the cloth and place the cotton cloth in the salt solution, Let it soak for about 1-2 minutes to absorb the mixture, remove the cloth from the solution and gently wring out any excess liquid, the cloth should be damp but not dripping, wrap the cloth around the ankle and ensure it covers the area well, leave it on for 15-20, After 15-20 minutes, remove the pack.

Earthing - Materials Needed: Copper wire (preferably stranded, 12–18 gauge). Copper rod (or any metal rod that can be inserted into the ground), Electrical tape or soft bandage, moist cloth (optional, for better conductivity) **Procedure:** Cut a piece of insulated or bare copper wire (about 6–10 feet long). If using insulated wire, strip both ends (1-2 inches) to expose the copper. Take a copper rod (or a long nail/metal rod) and push it 6–12 inches into moist soil outside. Wrap one end of the copper wire securely around the rod. Wrap the other end of the copper wire around your injured ankle. You can gently tape it in place using electrical tape or a soft bandage. For better conductivity, you may place a moist cloth between the wire and your skin. Leave it for 30 minutes after 30 minutes remove the copper wire. **Precautions:** Ensure good contact with the skin but avoid wrapping too tightly. Do not use electrical outlets or exposed wiring as a grounding source. Keep the wire away from live electrical sources to avoid interference. Stop using if you experience discomfort, irritation, or unusual sensations.(10)

PHARMACOLOGICAL DRUGS

NSAIDs are commonly used in ankle sprain management, but their role as adjuvant therapy requires careful evaluation of both effectiveness and adverse effects. Frequently prescribed agents include oral NSAIDs such as naproxen, ibuprofen, diclofenac, piroxicam and celecoxib, along with various topical diclofenac formulations and other NSAID options.(1) NSAIDs may cause gastrointestinal adverse effects such as nausea, dyspepsia, heartburn, and abdominal discomfort or cramping. They can also lead to mucosal erosions and silent ulcers, as well as peptic ulcers that may occur with or without associated gastrointestinal bleeding.(11) NSAID use may cause renal impairment ranging from reversible reductions in glomerular filtration rate to permanent kidney damage. They are also associated with increased cardiovascular risks, including myocardial infarction, stroke, heart failure, and cardiovascular mortality. In patients with liver cirrhosis, NSAIDs are contraindicated due to heightened risks of variceal bleeding and worsening hepatic function.(1) Using NSAIDs in the final 6–8 weeks of pregnancy has been contraindicated.(12) According to recent studies, using NSAIDs during pregnancy may raise the chance of birth abnormalities and miscarriages.(13)

ASSESSMENT CRITERIA

Pre Assessment

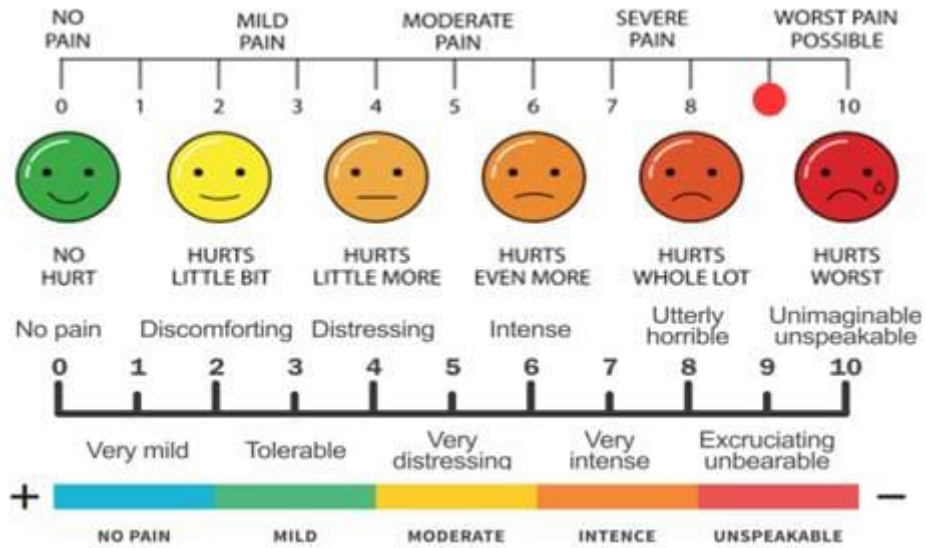


FIG 2: Day 1



FIG 3: Ice pack application



Fig 4 : Earthing

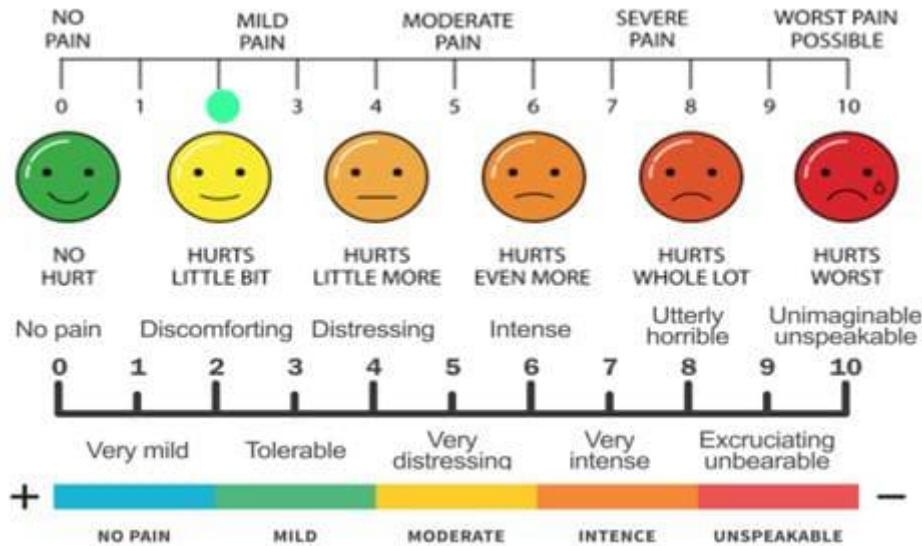


FIG 5: Epsom salt pack



Fig 5: Day 10

Post treatment assessment



DISCUSSION

Epsom salt chemically known as Magnesium sulphate ($MgSO_4$), it's a common, affordable, and over-the-counter product. It can be administered topically or intravenously, among other medical applications. It is known that magnesium sulfate is harmless for the skin and has been used in various areas to lessen pain and discomfort.(14) it is commonly used for baths , immersions, and packs to relieve pain, inflammation and swelling, especially in muscles and joints(7). The possible mechanism of Epsom salt pack in reducing the ankle joint pain are 1) Magnesium absorbs through the skin and helps in reducing inflammation by regulating inflammatory cytokines and modulating immune system and it also aids muscle relaxation by blocking calcium channels and reducing nerve excitability. 2) Sulphate helps in draw out the excess fluids from tissues through osmosis which reduces swelling and puffiness and also removes toxins and metabolic wastes from muscles.3) Magnesium sulphate combined with warm water increases the circulation and enhances the delivery of oxygen and removal of waste products from tissues and also relaxes tense muscles and soothes minor aches and pain.

The preferred non-pharmaceutical, natural anti-inflammatory treatment is earthing. The possible mechanism of earthing in reducing pain and swelling are 1)Earth possesses a negative electric charge when direct contacts made such as walking barefoot or using grounding devices the electrons from the Earth's surface can flow into the body. Free radicals are positively charged molecules that can cause oxidative stress and inflammation. The influxes of electrons from the Earth neutralize these free radicals, potentially reducing inflammation and associated pain.2) Earthing may help balance the ANS by shifting the body from a sympathetic (fight or flight) state to a parasympathetic (rest and repair) state. This shift can lead to reduced stress hormone levels, such as cortisol, further aiding in inflammation reduction.3) some studies suggest that grounding can decrease blood viscosity, enhancing circulation. Improved blood flow can facilitate the removal of inflammatory byproducts and deliver oxygen and nutrients more effective. A cold pack helps reduce pain and swelling in an ankle sprain through two

main mechanisms: 1) Vasoconstriction: Cold causes blood vessels in the area to constrict (narrow), which reduces blood flow. This helps limit internal bleeding and swelling in the injured tissue. 2) Numbing Effect: Cold reduces nerve activity in the area, which dulls pain signals being sent to the brain, providing temporary pain relief.

Conclusion:

This case study suggests effectiveness of Earthing and Epsom salt pack for managing the ankle sprain in a 21 year old female patient. The 10 days intervention includes cold pack, Epsom salt pack and Earthing. Positive outcomes were observed like reducing pain, swelling and increase the ankle joint mobility. This can be used in large scale for further research.

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Limitation of study

The limitation of the study is that it was a single subject study design and intervention was of short duration

Consent of patient

Patient consent was taken before the study

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