

EFFECTIVENESS OF ULTRASOUND MODALITY IN ANKLE SPRAIN

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Abstract

Ligament tears often occur as a result of physical injuries, such as falling, kicking something, so they commonly occur in athletes such as football, basketball, volleyball and other sports. Chronic ankle instability (CAI) can be defined as a condition caused by multiple ankle sprains, with instability caused by limited range of motion (ROM) The aim of this research is to determine the effectiveness of ultrasound to reduce pain in Ankle Sprain sufferers. The research method used is a literature review approach, by searching for PICO method references in the Google Scholar database over a period of 10 years. There were 5 journals that met the criteria showing that ultrasound can reduce pain and increase functional ability in ankle sprains with a frequency of 0.5 to 3.5 MHz which is then converted into mechanical energy with the same intensity of up to 3.5 W /Cm². Conclusion : the study confirms that ultrasound is an important method for assessing the fascial layers of the foot because it provides an excellent anatomical image.

Keywords: Ultrasound, Exercise, Ankle Sprain

INTRODUCTION

As we surely know, the most common injury caused by physical exertion during sports or daily activities is the ankle sprain . More than 50% of ankle injuries are caused by ligament injuries, which usually occur during dynamic movements. Chronic ankle instability (CAI) can be defined as a condition caused by multiple ankle sprains, with instability caused by limited range of motion (ROM) (Hosseinian et al., 2022). This injury usually indicates damage to the lateral ligaments of the ankle, with incomplete tears in one or more ligaments, can be treated conservatively, after an acute ankle sprain, initial immobilization using a soft splint produces faster results. Injury to the ankle due to sudden sprains can occur both medially and laterally which can result in tearing of ligament fibers in the joint (Sumartiningsih, 2012). Ankle sprains can cause localized joint disorders that affect the entire musculoskeletal and sensory systems. There are supporting ligaments such as medial collateral ligaments and lateral collateral ligaments consisting of Anterior Talofibular Ligament (ATFL), Posterior Talofibular Ligament (PTFL) and Fibular Calcane Ligament (CFL). AFTL stretches in the inversion and plantar directions, CFL is injured when resisting excessive inversion,

and PTFL is the strongest and rarely injured. PTFL itself serves to limit excessive external rotation (Attia et al., 2021). Many studies using ultrasound have linked leg muscle atrophy, tendon rupture, tendinopathy, slow peroneal reaction time etc., with ankle sprains. Recently, involvement in the literature has increased regarding the role of cryotherapy plus ultrasound, a modality of physical agents that combines cryotherapy (cold therapy) with therapy (Radwan et al., 2016). This treatment has been used for soft tissue injuries and inflammatory conditions, especially in sports medicine and rehabilitation. However, there is a considerable knowledge gap regarding the therapeutic effects of cryo plus ultrasound therapy in patients with acute ankle sprains (Doherty et al., 2017). Moreover, to date never before, the trial marks the role of specific cryo therapy plus ultrasound with one conventional rehabilitation device of elite athletes with acute ankle sprains. Therefore, a player's ankle ligament injury can be treated with various Physiotherapy Techniques such as ultrasound therapy (UT) (Terada et al., 2013). The purpose of this study was to determine the effectiveness of ultrasound to reduce pain in patients Ankle Sprain.

METHODS

The research method used is the approach Literature Review, Literature review is an important component in many scientific studies. with reference search with PICO P method (Population) = patient with Ankle Sprain Pain I (Intervention) = Ultrasound C (Comparison) = none O(Outcome) = relieving pain in ankle sprain, in database Google Scholar with a span of the last 10 years. Inclusion Criteria, namely: (1) The article contains an explanation of Ankle Sprain (2) The article contains an explanation of the benefits Ultrasound (3) The article contains an explanation of the case Ankle Sprain by using modalities Ultrasound. Exclusion Criteria, namely: (1) The time span of the article published is not in the last 10 years (2) The article does not discuss about Ankle Sprain (3) The article does not discuss the benefits of Ultrasound with Ankle Sprain. The research instruments of each article are: (1) Visual Analogue Scale (VAS) (2) Numeric Rating Scale (NRS) (3) Body mass index (BMI).

RESULTS AND DISCUSSION

Of the 5 journals that can be researched through Screening, Eligibility and inclusion. Ultrasound It is one of the modalities of physiotherapy therapy that uses sound waves with vibrations to produce longitudinal waves. Ultrasound is a treatment using vibrations from sound waves that have frequencies above 20,000 Hz. From this understanding, ultrasound is a generator and transducer device (Ganesh Chandar, 2016). This generator will produce electromagnetic energy with a frequency of 0.5 to 3.5 MHz which is then converted by the transducer into mechanical energy with the same intensity up to 3.5 W / Cm². From laboratory-based studies in the US it is used in physiotherapy to reduce pain, reduce edema, and improve joint space in various musculoskeletal disorders including the ankle (Van Den Bekerom et al., 2012).

Table 1. Comparison of Experimental Group and Control Group

Reviewer	Participant		Intervention		Measurement	Results	Design Study
	Intervention group	Control group	Experimental group	Control group			
(Tristian et al., 2021)	n=19 years	-	Ultrasound	No intervention	NRS	P<0,05	Case Study
(Bullock et al., 2018)	n= 100 ≥18 years	-	Ultrasound	No intervention	VAS	P<0,05	RCT
(Pirri et al., 2021)	n=15 18 years	n= 15 18 years	Ultrasound	Ultrasound	BMI	P>0.001	cross-sectional study
(Thompson et al., 2018)	Participant 28 years	Intervention	Measurement	Results	Design Study	P<0,05	Interventiongroup
(Kim et al., 2023)	Experimental group 27 years	Control group	Ultrasound	No intervention	NRS	Tristian, et al	n=1

Based on the literature review study conducted, the authors found that from 182 sample results the average was dominated by patients with the age of >18 years. Of the large amounts of literature found, most literature uses RCT and NRS research designs.

Table 2. Dosage of Ultrasound Interventional Therapy

Reviewer	Type of Intervention	Therapeutic Dosage				Duration Therapy
		F	I	T	T	
(Tristian et al., 2021)	Ultrasound is a device of a generator and a transducer	3.5 MHz	3.5W/Cm2	Ultrasound	5 – 10 Minutes	5 Week
(Bullock et al., 2018)	ultrasound examination	15 MHz	4 W/Cm2	Ultrasound	15 Minutes	3 and 6 Month
(Pirri et al., 2021)	Ultrasound	10 MHz	3.5W/Cm2	Ultrasound	10 Minutes	3 Week
(Daniel, 2017)	Ultrasound	15 MHz	3.5W/Cm2	Ultrasound	10 Minutes	3 Week
(Ammendolia et al., 2023)	Ultrasound	3.5 MHz	3.5W/Cm2	Ultrasound	7 Minutes	8 Week

Based on research that has been done, researchers found that the ultrasound modality can be applied to patients with Ankle Sprain with a frequency of 3 times / week, intensity 3.5W / Cm2, with a duration of 10 minutes for 3 months.

Tabel 3. Mean of Study Characteristics

Reviewer	Measurement	Group experiment		Control group		Significant
		Pre	Post	Pre	Post	
(Tristian et al., 2021)	NRS	41.3± 36.3	13.6± 6.94	-	-	P<0,05
(Bullock et al., 2018)	VAS	0.89± 0.72	0.51 ± 0.83	-	-	P<0,05
(Pirri et al., 2021)	BMI	0.46 ± 0.10	0.35 ± 0.08	-	-	P>0.001
(Daniel, 2017)	VAS	66.3±66.7 5	66.35±65.75	-	-	P<0,05
(Ammendolia et al., 2023)	NRS	22.5 ± 12.4	22.8 ± 12.62	-	-	P<0,05

Based on the table above, when compared to the control group, the intervention group showed a good and significant improvement.

With 302,000 new cases reported each year in the UK, ankle injuries are one of the most common symptoms in emergency rooms. These patients often have no known outcome, and although many of them achieve a full recovery, up to 30% of them can experience dysfunction and disability in the long run. The initial management of an ankle injury varies by doctor and department, but is usually determined by its severity and how the patient behaves. Patients are regularly referred to fracture clinics for assessment and treatment if the injury appears severe or there are visible abnormalities on radiographs. In professional and amateur sports, ankle injuries usually occur due to a combination of plantar flexion and foot inversion. This injury usually indicates a torn lateral ligament of the ankle, with an incomplete tear in one or more ligaments, which can be treated conservatively. In addition, early immobilization with a soft splint after an acute ankle sprain can speed recovery. Although there is substantial evidence regarding the management of ankle injuries, there is a difference of opinion regarding the management of ankle injuries. Better therapeutic management for acute ligament injuries in elite athletes. However, non-surgical treatment may be indicated for most grade I to grade III collateral ligament sprains with good to excellent results. In particular, physical therapy and certain drug treatments and modalities of physical agents can be used to improve pain relief and tissue healing, including: diathermy, laser therapy, ultrasound therapy, and other complementary forms of general electrotherapy applied to patients. Based on the results of the study, the use of ultrasound (ultrasound) showed a decrease in pain, silent pain reduced from 5 to 3, tenderness from 8 to 6, and pain when moving from 8 to 6. In addition, there is a decrease in edema. difference 3 cm to 2 cm. Pain relief thanks to the use of ultrasonic waves. According to research, exposure to a frequency of 1 MHz at a rate of 50 joules/cm² can increase tissue temperature, which is considered a mediator in tissue repair mechanisms, increase soft tissue extensibility, relax muscles, increase blood flow and reduce inflammation. The findings of Wilke et al. Analysis of the study showed that the posterior compartment is thicker than the anterior compartment, likely for postural

reasons. The results showed a statistically significant difference between the two groups only at Post 3 level, where basketball players had thinner deep fascia lata than the healthy group. This alteration can also be seen more clearly if we consider that the area evaluated is located near the superior retinaculum of the ankle. The second is the physiological thickening of the deep fascia around the ankle that increases joint stability and proprioception, as shown by Stecco et al.

CONCLUSION

In conclusion, the results of the study confirm that ultrasound is an important method for assessing the fascial layer of the foot because it provides an excellent anatomical picture. The use of ultrasound, ice packs, exercise therapy, and kinesio tape produces the following results:

(1) Physiotherapy treatment with ultrasound, ice packs, exercise therapy, and kinesio tape can reduce pain in right lateral ankle sprains. (2) Physiotherapy treatment with ultrasound, ice packs, exercise therapy, and kinesio tape can reduce pain in right lateral ankle sprains. (3) Physiotherapy treatment with ultrasound, ice packs, exercise therapy, and kinesio tape

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