ULTRASOUND AND PHONOPHORESIS EFFECT ON ECZEMA LESIONS IN A 37-YEAR-OLD MALE PATIENT: A SINGLE CASE STUDY

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ABSTRACT

Eczema is a very common form of the dermatological condition with painful lesions and ultrasound is most commonly used electrotherapy modality by physical therapist to provide tissue healing. In this case study, we have treated two such lesions on the left ankle for a 37-year-old patient with ultrasound and phonophoresis. Ultrasound alone was provided to lateral lesion on the ankle. Phonophoresis was provided to the anterior lesion on the ankle. Outcome measures were pain, swelling, itching, redness, litchenification and quality of life. We have seen improvements in the clinical features of both lesions but the anterior lesion where we provided phonophoresis had shown more effect that plain ultrasound.

الأكزيما هو شكل شائع جدا من الامراض الجلدية التي تحتوي علي جروح مؤلمة وتستخدم الموجات فوق الصوتية كأكثر الطرق شيوعا من قبل أخصائي العلاج الطبيعي لشفاء الأنسجة. في هذه الحالة ، فقد عالجنا مريض يبلغ من العمر ٣٧ عاما و يعاني من اثنين من هذه الجروح على الكاحل الأيسر, تمت المعالجة بالموجات فوق الصوتية فقط وبالموجات فوق الصوتية مع مرهم هايدروكورتيزون (phonophoresis) . استخدمت الموجات فوق الصوتية فقط للجرح الطرفي (الوحشي) للكاحل و الموجات فوق الصوتية مع مرهم هايدروكورتيزون phonophoresis للجرح الامامي للكاحل . استخدم الالم, التورم, الحكاك, الاحمرار, التلين, ونوعية الحياة كمقاييس للنتائج . لقد شهدنا تحسن على العلامات السريرية لكلا الجرحين ولكن الاصابة الأمامية والتي استخدمنا فيها ال phonophoresis فقد أظهرت نتائج افضل من نتائج استخدام الموجات فوق الصوتية فقط

INTRODUCTION

Eczema is a broad term used to designate a variety of skin conditions that cause an itchy, inflamed skin rash.[1] It is a very common form of the dermatological condition[2] and extensively studies in literature.[3] Eczema is broadly classified into two types exogenous (contact) and endogenous (non - contact). The clinical features are varied for each sub-type of eczema, but the features common to most patterns divided into three stages, i.e. acute, sub acute and chronic.[4] In acute stage there are erythema, epidermal swelling, or vesciculation, papules, blisters, oozing or crusting.

In sub-acute stage along withabove features there will be scaling. In chronic stages the skin is scaly, hypo or hyper pigmented and thickened. As the condition persists, the skin reaches to a dry leathery thickened stage called litchenification, with increased skin markings and painful fissures secondary to scratching or rubbing.[2,5]

Ultrasound is commonly used as a diagnostic method, operative tool and therapeutic intervention.[6] Ultrasound is the most widely used therapeutic modality in physical therapy departments throughout the world.[7-12] The major effects of ultrasound are divided into thermal and

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nonthermal effects. The thermal effects are due to increased tissue temperature this leads to increase in blood flow, increased metabolic activity, and analgesic effect on nervous system results in improvements in healing and pain relief.[13] The non-thermal effects include cavitation and microstreaming that are useful for altering the cellular function and make it more useful for tissue healing.

CASE DESCRIPTION

Patient history

The subject chosen in this case study is a male 37-year-old Asian originated from India, but currently residing in the Kingdom of Saudi Arabia. He had chronic eczema with inflamed painful fissures at the ankle region on the anterior and lateral aspect of the left ankle. The itching was so severe in the night disturbing his sleep; unknowingly he used to scratch it in the night leading to an inflamed fissure. To relieve his symptoms he was prescribed a topical hydrocortisone cream, but it was not decreasing his problems even after many weeks of application. He consulted physical therapy department casually for his problem. Discussing his condition we decided to provide him effective drug delivery into the cutaneous system by using an ultrasound technique called Phonophoresis.

Examination

After obtaining the written consent form, treatment protocol was explained to him. Following this procedure, we started with the clinical examination of symptoms on visual analog scores. Each symptom visual analog score was assessed on a 10cm line without any markings. The left-hand side starting point was denoted with '0' which indicates no symptom at all and right hand sides ending point was denoted by number '10' which indicates maximum symptoms which they cannot tolerate (Figure-1).

No symptom '0'_____ '10' Maximum
at all symptom

Figure -1 : Sample of visual analog scale

The subject was asked to tick any point of the line. After ticking, the length of the line from '0' to the tick mark was measured by scale and distance was noted in centimeters. This kind of VAS was assessed for all the following clinical features, i.e. pain, swelling, itching, redness, litchenification and quality of life. The scores of all these symptoms related to eczema are provided in table-1.



Figure 2: Pre and post phonophoresis treatment for anterior eczema lesion

Table-1: VAS scores of clinical characteristics, pre and post intervention

Clinical characteristics	*Ultrasound for lateral lesion*		*Phonophoresis for anterior lesion*	
	Pre	Post	Pre	Post
Pain	7	0.5	6.2	0
Swelling	8.7	0.9	8	0
Itching	10	6.4	8.7	0.6
Redness	10	4.8	6.8	1
Litchenification	10	5.6	8.3	1
Quality of life	10	6	7.7	0.4



Figure 3: Pre and post ultrasound treatment for lateral eczema lesion

Treatment Method

We choose Enraf-Nonius™ ultrasound mission for both phonophoresis and plain ultrasound treatment. For phonophoresis the frequency of ultrasound was 1MHz, mode continuous, intensity 0.8 w/cm2 for the anterior lesion on the ankle with hydrocortisone ointment prescribed by the clinician to him. We mixed the ultrasound gel and cream thoroughly, and applied onto the skin and set the apparatus with appropriate settings discussed above and applied for five minutes on the first day and increased one minute every day for five days in a week reached a duration of 10 minutes. Treatment continued same 10 minutes of duration for five days in the next week as well. The other lesion on the lateral aspect of the ankle was treated with plain ultrasound of 1MHz frequency, pulsed mode 1:4, intensity 0.8 w/cm2 for the same duration of the anterior lesion. Total frequency of treatment is 10 days in two weeks. Post treatment we have seen improvements in both of the lesions, but anterior lesion with phonophoresis had showed better results than plain ultrasound alone. We present both the lesion pre and post photographs and scores in figures-2, 3 and table -1 respectively.

DISCUSSION

The major clinical problem with eczema are inflamed lesion with pain, swelling, itching, redness, scaling and disturbed life. As the thermal effects of ultrasound increase the local blood flow [14]. The substances which precipitate inflammation will be washed off and all the signs of inflammation that is swelling, pain, and redness will be decreased.

Therapeutic ultrasound alters the platelet membrane permeability leading to release of serotonin and it also stimulates the release of macrophages and neutrophils.[15] Therapeutic ultrasound can alter the permeability of various ions especially calcium,[16,17] by increasing the intracellular calcium there will be mast cell degranulation and which releases histamine in the surrounding tissues.[18] These are the important steps in inflammatory phase of tissue healing by which there will be adequate readiness of the system for the repair process.

In the second phase of tissue repair, the ultrasound is pro-proliferative by stimulating fibroblasts, myofibroblasts and endothelial cells.[15] It maximizes the proliferative phase of tissue repair and enhances optimal scar formation.[15] The ultrasound is even effective in scar remodelling during this phase of tissue repair it acts on collagen in terms of appropriate orientation and conversion of type-3 collagen to type-1 by this there will be increased tensile strength and scar mobility.[15] By all these cellular changes, the ultrasound helps in all phases of tissue repair this may be the reason for healing of the lesion and decreased symptoms.

Phonophoresis is defined as transferring chemical molecules in to skin by using ultrasound[19]. In our study, one of the lesion was applied phonophoresis using hydrocortisone topical cream. This lesion has shown better effect than the plain ultrasound. This can be due to additional anti-inflammatory effect of the steroid along with the usual effects of ultrasounds. In future, we recommend multi centric

randomized controlled trial with large sample to prove the effectiveness of ultrasound and phonophoresis on eczema related lesions.

CONCLUSION

Application of ultrasound on eczema is innovative mode of physical therapy application in dermatological conditions. In our case study we have seen improvements in the eczema related clinical problems with plain ultrasound as well as with phonophoresis. But phonophoresis was better than ultrasound in this patient. In future we require further research to ultimately conclude these effects.

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