

## Double-modality therapy in the management of closed soft tissue injuries among sports men and women in Jos, North Central, Nigeria

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### Abstract

**Background:** The use of phonophoresis and cryotherapy in isolation or in combination with other therapies in the management of CSTIs associated with sports has been reported. On the contrary, the combine therapy protocol lacks sufficient evidence base to support its efficacy or superiority over the single protocol.

**Objective:** This prospective study was designed to investigate the efficacy of phonophoresis and cryotherapy as double-modality therapy (combine therapy) in the management of pain among sports men and women who sustained closed soft tissue injuries (CSTIs).

**Methods:** Twenty (20) subjects who sustained various sports related CSTIs were recruited for this study. Three (3) subjects dropped out of the study as a result of non-compliance and only seventeen (17) completed treatment. Subjects' pre- and post-treatment pain perception scores (PPS) using visual analogue scale (VAS) were assessed and the treatment sessions were recorded. Continuous ultrasound at an intensity of 1.5 W/cm<sup>2</sup> and frequency of 1 MHz for 8 minutes was used to apply methyl salicylate by direct contact method while intermittent (ice pack) cryotherapy for a total of 20 minutes was the mode of application on alternate days respectively. The study was designed for a period of 4 weeks.

**Results:** Sixteen (94%) subjects had less pain or were pain free and fit for discharge within the first week of treatment while the overall discharge pattern indicates that all (100%) subjects were pain free and fit for discharge on the completion of 10 sessions of treatment. The pre and post-treatment PPS ( $5.47 \pm 0.94$  and  $2.00 \pm 0.79$ ) shows the difference in pain severity was statistically significant ( $P < 0.05$ ) which suggests optimal pain relief.

**Conclusion:** The double-modality therapy (combine therapy) has demonstrated significant therapeutic efficacy and it may suggest a paradigm shift from the conventional procedure of applying cryotherapy as a single treatment protocol for hours before resorting to phonophoresis. Furthermore, the discharge pattern suggests it might take fewer sessions to treat and make more than 90% of the subjects pain free and fit to return to active sports performance.

**Keywords :** Cryotherapy, Double-modality therapy, Closed soft tissue injuries, Phonophoresis, Ultrasound, Sport men and women

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### Introduction

Phonophoresis or cryotherapy have been used for many years and are currently being used to reduce pain, control swelling or inflammation and improve or restore function in the management of closed soft tissue injuries (CSTIs).<sup>1,2</sup> Davis<sup>3</sup> recommended the application of cryotherapy as a single treatment protocol for hours (i.e 72 hours) when there is trauma (i.e rotator cuff syndrome) before resorting to phonophoresis for the remaining period of treatment. Cold application prior to phonophoresis produces an intense hyperemia which may improve the absorption and distribution of the

medication.<sup>4</sup> Santiesteban<sup>4</sup> and Balogun<sup>5</sup> have suggested that the combination therapy of phonophoresis and cryotherapy could result to better outcome in the management of pain associated with musculoskeletal or closed soft tissue injuries (MSIs or CSTIs). The use of phonophoresis and cryotherapy in isolation or in combination with other therapies in the management of musculoskeletal injuries (MSIs) associated with sports has been widely reported.<sup>6,7,8</sup> On the contrary, the combine therapy (double modality therapy - phonophoresis + cryotherapy - DMT) protocol lacks evidence base to support its efficacy or superiority over the single protocol.<sup>5,9</sup> However, a recent work by Onuwe et al<sup>10</sup> showed that the combine therapy (double modality therapy - phonophoresis + cryotherapy - DMT) has demonstrated significant therapeutic efficacy. More clinical trials are therefore, required to generate sufficient evidence base data to support clinical decision making on the use of phonophoresis and cryotherapy as double-modality therapy (DMT) protocol for optimal outcome or response following closed soft tissue injuries (CSTIs) management. The current study was therefore, designed to investigate the therapeutic efficacy of double-modality

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therapy (DMT) in the management of common CSTIs among sports men and women.

## Materials and Methods

### Subjects

Twenty (20) subjects who sustained sports related closed soft tissue injuries (CSTIs) were all recruited as they presented before the physician for treatment at the Jos University Teaching Hospital and Sports Council Clinic in Jos, Plateau State of Nigeria. Only subjects who sustained one CSTI (i.e subjects with multiple injuries were not eligible) with acute onset of symptoms or occurring as an acute exacerbation of chronic lesion were included in the study. Subjects who were on any form of analgesics (steroids and non-steroidal anti-inflammatory drugs – NSAIDs), muscle relaxants and any form of physiotherapy treatments were all excluded from the study. Subjects with open wounds over the injury sites, pregnancy, disease conditions (e.g thrombophlebitis, cardiac disease patient with pacemaker, tumour, etc) and those allergic to topical methyl salicylate or cold which contra-indicate the treatment protocols used in this study were all excluded. The use of NSAIDs or analgesics and any other form of treatment was not permitted or allowed throughout the study period. Before entry into the study all subjects voluntarily signed the informed consent forms after the protocol for the trial was explained to them. The University of Jos Teaching Hospital Health Research Ethics Committee approved all the procedures involved in the study.

### Procedure

The ultrasound machine (EMS Therasonic MK IV) and the transducer (5cm<sup>2</sup>, 1MHz and 3MHz treatment head) were all tested and certified functional. Subjects pain perception was subjectively assessed or measured and recorded using a 10cm visual analogue scale (VAS)<sup>11,12</sup> marked “no pain” at one end and “worst pain ever” at the other end after the subjects were carefully educated on the use of VAS and it was observed that subjects could identify their pain levels or scores on the scale without any difficulties. This form of assessment was considered most appropriate because of its high level of repeatability when used serially on the same patient.<sup>13</sup> Sensory test was conducted among the subjects to ascertain that there was no sensory loss.<sup>14</sup> Subjects were instructed and made to understand that at no time during insonation (phonophoresis) should they suffer discomfort. There might be a sensation of very mild warmth, but other than that only the pressure and the movement of the transducer should be felt. Any other sensation should be reported at once. Further-more, all subjects were made to understand that during cryotherapy sensation like cold,

burning, aching and numb would be felt during the treatment procedure which causes no harm.<sup>6</sup> Subjects were comfortably supported and positioned to maximise circulation to the area being treated<sup>15</sup> when they were ready for treatment. Of the 20 subjects that started treatment, only 17(12 males, 5 females; mean age 29.9 years; range 18 to 45 years) completed. Three (3) subjects dropped out of the study one after the other as a result of non-compliance. Injuries sustained by the subjects were diagnosed as low back pain (n=5), first degree ankle sprain (n=5), hamstring tendinitis (n=4) and tennis elbow (n=3). Intermittent cryotherapy<sup>10,13,16</sup> using ice pack (16cm x 12cm) was applied directly over the subjects conditions for 10 minutes. The ice pack was then removed after the initial 10 minutes application and the treatment part was allowed to rest at room temperature for 10 minutes. The ice pack was reapplied immediately following the expiration of the rest period for another 10 minutes (total cryotherapy period = 20 minutes). At the expiration of the second ice pack application the treatment part was cleansed with a towel, after which continuous ultrasound at an intensity of 1.5W/cm<sup>2</sup> and frequency of 1MHz<sup>11,15,17</sup> was used to apply 1.5g of 15% methyl salicylate cream thoroughly mixed with 1.5g of aquasonic gel<sup>18</sup> as coupling medium to the treatment part by direct contact method for 8 minutes. The ultrasound head was moved over the part under treatment in small, continuous and overlapping circular movements<sup>18,19,20</sup> to avoid or prevent periosteal pain.<sup>4</sup> These treatment values or settings were selected to capture both the thermal and non-thermal effects of ultrasound in order to optimize transdermal methyl salicylate 15% delivery.<sup>17,19</sup> Combine treatment protocol was administered on alternate days until subjects were fit for discharge. At the end of weeks 1, 2, 3 and 4 after treatment, subjects post-treatment pain perception scores (PPS) were assessed and recorded together with treatment sessions per subject. Assessment and recording of pre-and post-treatment pain perception scores (PPS) were blinded from the researchers to reduce or eliminate bias (assessment by neutral assessors). Treatment was terminated and subjects discharged when subjects felt pain was sufficiently relieved and no longer needed treatment. Descriptive and inferential statistics were used for data analysis. Independent and paired mean difference tests (t test) were used to compute subjects repeated measures with the level of significance for all tests set at 0.05.

### Results

Distribution of the subjects (12 males, 5 females; mean age 29.9 years; range 18 to 45 years) by the types of sports played at the time of injury is presented in Table 1. It shows that the subjects participated in various sporting activities cutting across long jump, power lifting, table

tennis, football, basketball and volleyball. The total number of treatment sessions recorded throughout the study was 61 with a mean of 3.59 (3.59 ± 1.87).

Table 1: Types of Sports played by Subjects

Sports	Subjects (n=17)
Long jump	2 (11.8%)
Power(weight) Lifting	5 (29.4%)
Table Tennis	3 (17.6%)
Football	2 (11.8%)
Basketball	2 (11.8%)
Volleyball	3 (17.6%)

Table 2: Subject Discharge Pattern

Sessions of treatment	Discharged subjects(n=17)
1 - 2	6 (35.3%)
3 - 5	10 (58.8%)
6 - 10	1 (5.9%)

Table 2 presents the number of subjects fit for discharge on or before completion of treatment period. Six (35.3%) subjects were fit for discharge after 1 to 2 treatment sessions, 10 (58.8%) reported no more pain and got discharged after 3 to 5 sessions of treatment while the remaining one (5.9%) subject got discharged pain free after 10 treatment sessions. In all, 16 (94%) subjects had less pain or were pain free and fit for discharge within the first week of treatment while the overall discharge pattern shows that at the completion of 10 sessions of treatment, all (100%) the subjects were pain free and fit for discharge. The pre-treatment pain perception score (PPS) was 5.47 ± 0.94 while the post-treatment PPS was 2.00 ± 0.79. This result shows that the difference in the severity of pain perception before and after treatment among the subjects was statistically significant ( $P < 0.05$ ) which suggests optimal pain relief. No subject complained of any discomfort or adverse effect; such as periosteal pain, skin allergy, frostbite or nerve palsy; instead the subjects reported treatments were effective, tolerable and pleasant. No subject was discharged on the account that pain was not being relieved and needed another type of therapy.

### Discussion

The finding of the current study has shown that in the first week (less than 5 sessions) of treatment, 94% (16) of the subjects were pain free, side-effect free and fit for discharge to resume their sporting activities. This is consistent with the pioneer work of Onuwe et al<sup>10</sup> which

reported that 95% (19) of the subjects (n = 20) who applied double-modality therapy protocol to their injuries (MSIs) were pain free and fit for discharge after receiving five (5) sessions of treatment. The overall discharge pattern in the current study has shown that at the completion of 10 sessions of treatment, all (100%) the subjects were pain free and fit for discharge. This discharge pattern corroborates again with the work of Onuwe et al.<sup>10</sup> The finding of their study shows that all (100%) subjects in the DMT group (n = 20) were pain free and fit for discharge to return back to activities of daily living (ADL) after 10 sessions of treatment.

With the pressure to treat athletes who sustained CSTIs safely, efficiently and fit to return to active performance as quickly as possible,<sup>21,22</sup> double-modality therapy could be a treatment protocol of preference. This may suggest a paradigm shift from the conventional procedure of applying cryotherapy as a single treatment protocol for hours before resorting to phonophoresis for the remaining period of treatment. The fewer treatment sessions may be an advantage for the sports men and women, the employer and the sports clinician. On the part of the sports men and women, absenteeism from training sessions to keep hospital or clinic treatment appointments and subsequent loss of training hours is minimized; while the workload usually experienced by the sports physical therapist is reduced.

### Conclusion

The double-modality therapy (combine therapy) has demonstrated significant therapeutic efficacy and it may suggest a paradigm shift from the conventional procedure of applying cryotherapy as a single treatment protocol for hours before resorting to phonophoresis. Furthermore, the discharge pattern suggests it might take fewer sessions to treat and make more than 90% of the subjects pain free and fit to return to active sports performance.

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