

The Effect of Massage Versus Transcutaneous Electrical Nerve Stimulation on Reducing Children's Distress during Burn Dressing Change

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ABSTRACT

Pain is the main problem of burn injury especially during dressing change in children. Although the analgesics are widely used to decrease pain, there is certain physical therapy modalities used as pain killers. This study was done to investigate the effect of massage versus transcutaneous electrical nerve stimulation (TENS) on reducing distress of children during burn dressing. Forty five children had scald burn injury with the mean age of 4.04 ± 0.74 years participated in this study and assigned randomly into three groups. Massage group (n=15) who received 30 minutes massage before dressing change, TENS group (n=15) who received an hour TENS application before dressing change, and control group (n=15) who received verbal communication. Assessment was done using Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) to measure the children's distress behavior before and during dressing change. Wilcoxon and descriptive statistical tests were used to investigate the effect of massage versus TENS on reducing children's distress during burn dressing change. The results of this study showed that there is no significant difference between the two treatment modalities ($p > 0.05$), although each modality showed no increase in children's distress ($p > 0.05$) during dressing change in comparison with the control group ($p < 0.05$). We conclude that either massage or TENS could be used to decrease children's distress during burn dressing change.

INTRODUCTION

According to burn statistics, scald burns are the most frequent type of burn injury for infants and toddlers, accounting for 72% of burns in this age group².

Burn pain can cause psychological and functional difficulties. The initial painful stimulation of nerve endings by the burn with continued painful stimuli result in peripheral and central mechanisms causing amplification of painful stimuli, and the development of chronic pain syndromes that can be difficult to treat⁶. Despite pain medication, the daily dressing change is undoubtedly one of the most painful experiences that the burn patient must endure¹⁴. Dressing change procedures for treating severe burns can be painful and stressful for young patients⁷.

Opioid analgesic alone may not fully relieve all aspects of acute postoperative pain. Complementary medicine techniques used as adjunctive therapies have the potential to improve pain management and palliate post operative distress⁵. Certainly, the treatment that is appropriate for adults with burn injuries is not necessarily applicable to children with these same injuries and vice versa. Some of these treatment measures that may be helpful in minimizing pain during dressing changes in pediatric patients include relaxation techniques, visualization, distraction techniques, and toys and music brought to the treatment room¹⁴.

Researchers have documented improvement in several medical and psychiatric conditions after massage therapy, including growth in preterm infants,

depression and addictive problems, pain syndromes, and immune and autoimmune conditions⁴. In a controlled study, burned children who received 30 minutes massage therapy before debridement or dressing change reported more relaxation during the procedure⁵.

Burn pain affects a significant proportion of the population. Transcutaneous electrical nerve stimulation (TENS) was introduced more than 30 years ago as an adjunct to the pharmacological management of pain.

In a pilot study, auricular acupuncture-like transcutaneous electrical nerve stimulation significantly reduced the pain experienced by 11 patients with burn immediately after wound debridement, and dressing changes⁸.

METHODS

Subjects

Forty five children (males and females) ranged in age from 3 to 5 years old were participated in this study in the out clinic of El-Azhar University hospitals. The children with the mean age of 4.04 ± 0.74 years had a lower limb scald burn injury less than 10% of total body surface area with the mean percentage of $7.66 \pm 2.01\%$.

The children were enrolled in the study after burn injury during the acute phase with the mean days after injury of $2.29 \text{ days} \pm 0.46$ days.

After informed consents were taken, the children were randomly assigned to massage therapy group (n=15), TENS therapy group (n=15) and control group (n=15).

Procedures

Standard medical care: Before dressing by an hour all children received their analgesic prescribed by their physician. No differences were found regarding the type of medication they received.

Control group: The therapist spent about 30 minutes before dressing change, communicating with the child and talking with him to control for attention.

Massage group: Massage in this group was applied through all the body surface area including face, arms, back and shoulder and legs (except burned areas).

Massage was applied with gentle and moderate pressure to the previous areas as described by Hernandez et al., 2001⁷ but with some modification:

Face

- 1- Using flats of fingers, long stroking to both sides of face;
- 2- Starting at midline of forehead, stroking with flats of fingers outward toward temples;
- 3- Small circular stroking over the temples and jaw area.

Arms

- 1- Stroking from hands to shoulders;
- 2- Squeezing and twisting in wringing motion from the hands to the elbows.

Back and shoulders

- 1- Long gliding downward stroking along the back from neck to the hip.
- 2- Hand over hand movements from upper to the lower back paraspinal.
- 3- Starting at the top of the spine, alternating hand strokes across the back down toward the sacrum.
- 4- Rubbing and kneading shoulders.

Legs

- 1- Three long gliding strokes from feet to the hips.
- 2- Squeezing and twisting in wringing motion from the feet to the knees.
- 3- Gliding thumbs across the bottom of each foot.

TENS group

Fifteen children in this group received low intensity high frequency TENS therapy for an hour before dressing change. TENS

equipment used in this study a battery powered device (DH808, manufactured by Dae Han Co.). The electrodes were placed paravertebral on the lumbar region¹³ in relation to the corresponding burned area of the lower limb. The current frequency was set at 100 Hz, pulse width was set at 250 μ s and was delivered in an asymmetric rectangular biphasic wave form. The intensity was set according to the patients comfort, below the threshold of muscular contraction (< 39 mA) and the sensation was described to the patients as tingling sensation. The parameters used in this study were the same as Farina et al., 2004³.

Assessment

During this study, the child's behavior variables were recorded before and during the dressing change for the three groups; massage group, TENS group, and control group.

In this study we distinguish between two phases as follows:

(1) **Before dressing change:** it is the period immediately after the therapist finished the intervention in the three groups (30 minutes massage in the massage group, an hour of low intensity high frequency TENS application in TENS group, and control period in control group) till the time the nurse approached the child to start the dressing procedures.

(2) **During dressing change:** it is the period where the nurse started to change dressing and ended when the procedures were completed.

In our study we used The Children's Hospital of Eastern Ontario Pain Scale^{7, 10} (CHEOPS) to record the distress behavior variables before and during the dressing change. Six behavior variables were recorded as shown in table (1):

Table (1): The children's Hospital of Eastern Ontario Pain Scale used to code distress behavior.

Cry	
No cry	1
Moaning	2
Crying	2
Screaming	3
Facial	
Smiling	0
Composed	1
Grimace	2
Verbal	
Positive	0
No talking	1
Other complaint	1
Pain complaint	2
Both complaints	2
Torso	
Neutral	1
Shifting	2
Tense	2
Shivering	2
Upright	2
Restrained	2
Touch	
No touching	1
Reaching	2
Touching	2
Grabbing	2
Restrained	2
Legs	
Neutral	1
Squirm/kick	2
Drawn up/tense	2
Standing	2
Restrained	2

Interrater reliability between 90 and 99.5% has been reported for the CHEOPS for 1 to 5 years old after various surgical procedures¹⁰.

Results

Wilcoxon matched pair signed ranks test which is non parametric test was used because CHEOPS variables were measured along an ordinal scale (ranked according to pain severity). Descriptive statistics was used to record the percentage of frequency of variable scores in all study groups during burn dressing change.

The results of this study presented under the following headings:

(1) Results of treatment groups:

A) Massage group: the results showed that there was no significant difference (no change in behavioral variables) $P > 0.05$ (Table 2).

Table (2): Results of massage group before and during dressing change:

Behavior variables	statistics	Before-during	Behavior variables	statistics	Before-during
cry	z-value	1.732	torso	z-value	1.414
	P- value	0.083		p-value	0.157
	Level of significant	NS		Level of significant	NS
facial	z-value	1.933	touch	z-value	1.414
	p-value	0.053		p-value	0.157
	Level of significant	NS		Level of significant	NS
verbal	z-value	1.732	leg	z-value	1.732
	p-value	0.083		p-value	0.083
	Level of significant	NS		Level of significant	NS

NS = no significant difference.

B) TENS group: the results showed that there was no significant difference (no

change in behavioral variables) $P > 0.05$ (Table 3).

Table (3): Results of TENS group before and during dressing change

Behavior variables	statistics	Before-during	Behavior variables	statistics	Before-during
cry	z-value	0.302	torso	z-value	0.000
	P- value	0.763		p-value	1.000
	Level of significant	NS		Level of significant	NS
facial	z-value	0.333	touch	z-value	0.447
	p-value	0.739		p-value	0.655
	Level of significant	NS		Level of significant	NS
verbal	z-value	0.920	leg	z-value	0.000
	p-value	0.358		p-value	1.000
	Level of significant	NS		Level of significant	NS

NS=no significant difference.

(2) Results of control group: The results showed a significant increase in all behavioral variables $P < 0.05$ (table4).

Table (4): Results of control group before and during dressing change:

Behavior variables	statistics	Before-during	Behavior variables	statistics	Before-during
cry	z-value	3.314	torso	z-value	3.464
	P- value	0.001		p-value	0.001
	Level of significant	S		Level of significant	S
facial	z-value	3.358	touch	z-value	3.162
	p-value	0.001		p-value	0.002
	Level of significant	S		Level of significant	S
verbal	z-value	3.314	leg	z-value	3.162
	p-value	0.001		p-value	0.002
	Level of significant	S		Level of significant	S

S= significant difference.

(3) Comparison between the three groups before and during dressing change showed the following results:

A) Before dressing changes there was no significant difference in behavior variables between all studying groups with $P > 0.05$.

B) Comparison between massage and control groups during dressing change showed a

significant increase in variables in control group $P < 0.05$.

C) Comparison between TENS and control groups during dressing showed a significant increase in variables in control group $P < 0.05$.

D) Comparison between massage and TENS groups during dressing change showed no significant difference $P > 0.05$ (table5).

Table (5): Comparison between massage and TENS groups during dressing change:

Behavior variables	statistics	During dressing	Behavior variables	statistics	During dressing
cry	z-value	0.750	torso	z-value	0.447
	P- value	0.803		p-value	0.655
	Level of significant	NS		Level of significant	NS
facial	z-value	1.299	touch	z-value	1.134
	p-value	0.194		p-value	0.257
	Level of significant	NS		Level of significant	NS
verbal	z-value	1.425	leg	z-value	0.577
	p-value	0.154		p-value	0.564
	Level of significant	NS		Level of significant	NS

NS=no significant difference.

(4) Descriptive analysis: The percentages of each score in all behavioral variables in

the three studying groups are presented in the following figures (from 1-6)

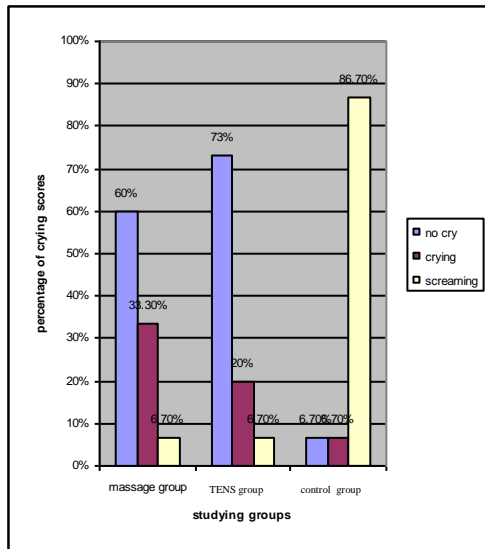


Figure (1): Percentages of cry variable scores in all studying groups.

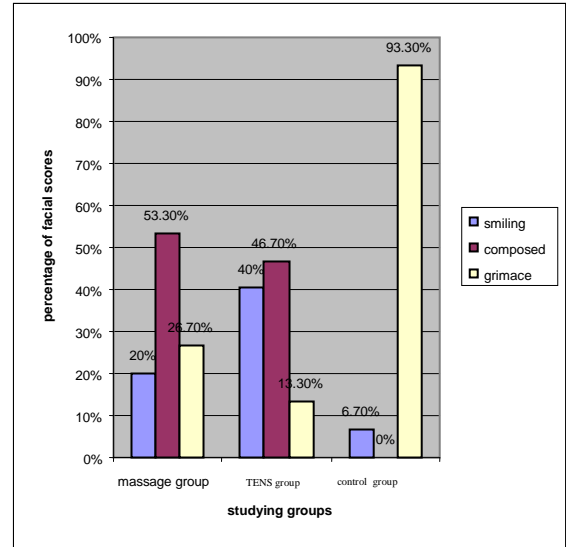


Figure (2): Percentages of facial variable scores in all studying groups.

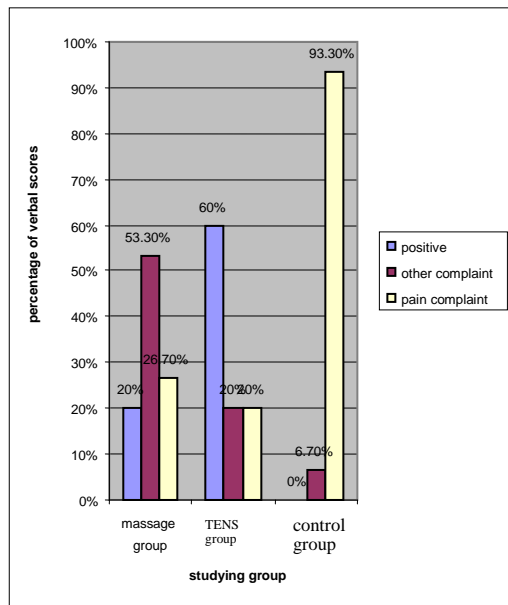


Figure (3): Percentages of verbal variable scores in all studying groups.

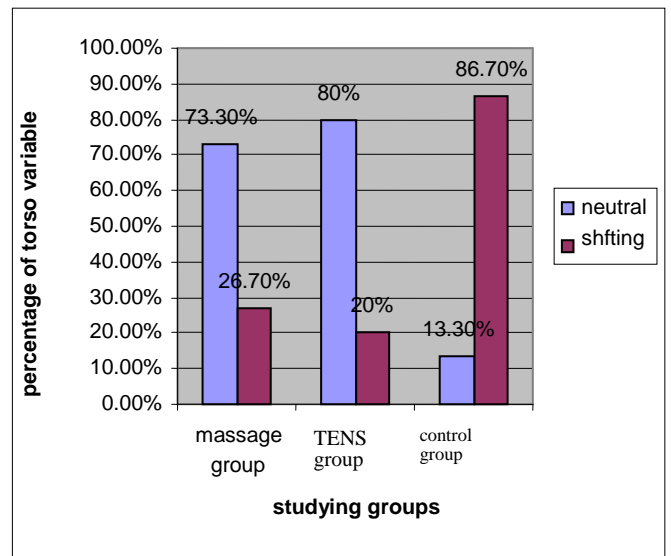


Figure (4): Percentages of torso variable scores in all studying groups.

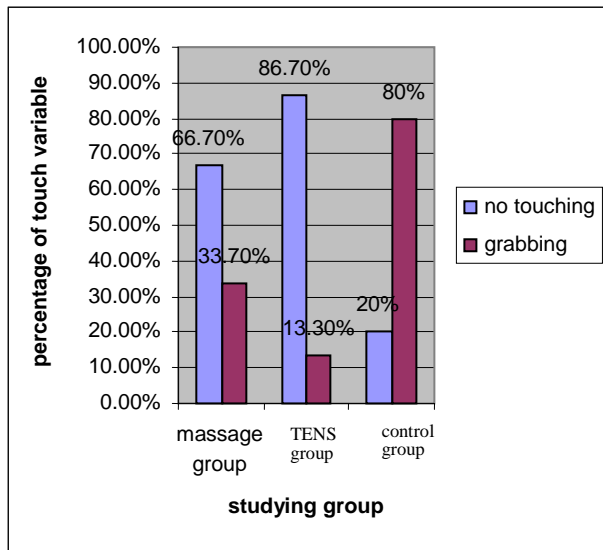


Figure (5): Percentages of touch variable scores in all studying groups.

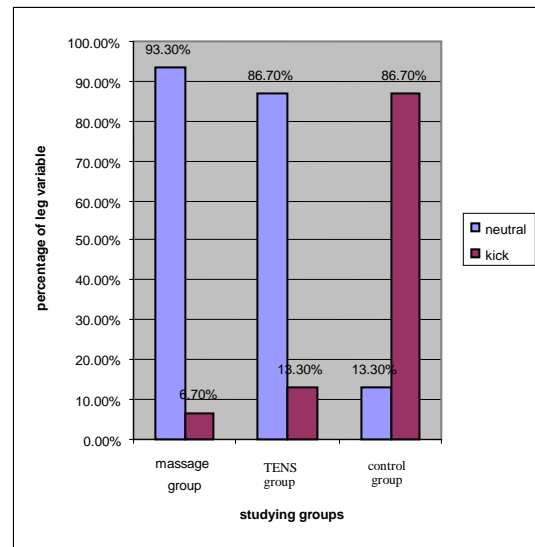


Figure (6): percentages of leg variable scores in all studying groups.

DISCUSSION

A burn injury is one of the most painful events an individual can experience. In addition, the treatments administered, including some administered by the therapist, are themselves painful.

It was stated that poorly controlled pain and anxiety each has adverse psychological and physiologic effects that account for the 30% rate of posttraumatic stress disorder in individuals who suffer burns. Also, it was contended that excessive pain and anxiety further fuels the hypermetabolic response by increasing the liberation of stress hormones¹².

Children are very sensitive to the pain and dealing with them is very critical.

The child's pain and anxiety must be considered and treated appropriately throughout all phases of healing.

Pain during changing dressing is a main complaint of all population suffering from burn injury.

Forty five children with burn injury participated in this study with the mean age of 4.04 ± 0.74 years. Children were divided randomly into three groups (massage therapy group, TENS therapy group, and control group).

All groups received their analgesics before changing burn dressing by an hour.

Massage group received 30 minutes massage for body areas except the burned areas in the lower limbs. TENS group received an hour of low intensity high frequency TENS applied paravertebrally while control group obtained only verbal communication with the therapist.

Assessment was done immediately after intervention and is known as before dressing change and another assessment was done during dressing change and we record all the data concerning the distress behavior variables.

Results of massage group before and during change dressing revealed no significant change in behavior variables of children with

$P > 0.05$ and in comparison with control group the results showed a significant increase in behavior variables of children in control group with $P < 0.05$ which reflect the effectiveness of massage therapy in decreasing children distress during dressing change which is consistent with other studies^{5,7}.

Results of TENS group before and during change dressing revealed also no significant change in behavior variables of children with $P > 0.05$ and in comparison with control group the results showed a significant increase in behavior variables of children in control group with $P < 0.05$ which reflect the effectiveness of TENS therapy in decreasing children distress during dressing change which is consistent with Lewis et al., 1990⁸.

In comparison between massage and TENS groups the results showed no significant difference between both groups with $P > 0.05$, as the massage therapy stimulate mechanoreceptors that activate the non painful nerve fibers, preventing pain transmission from reaching consciousness¹⁵, which is the same in case of TENS as TENS reduces pain through central mechanism by the pain gate effect on both A delta and C pain fibers in the posterior horn due to stimulation of mechanoreceptors (A beta) fibers^{1,9}.

So, our study encourages the use of massage and TENS to reduce pain and decrease children distress during burn dressing change.

Thanks for all parents and their children who participated in this study.

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الملخص العربي

تأثير التدليك ضد التنبيه الكهربائي عبر الجلد لتقليل ضيق الأطفال أثناء تغيير ضمادة الحرق

يعتبر الألم هو المشكلة الأساسية في أصابات الحروق خاصة أثناء تغيير ضمادة الحرق في الأطفال . بالرغم من استخدام المسكنات بشكل كبير لتقليل الألم ، هناك أساليب عديدة من العلاج الطبيعي تستخدم كقتلة ألم . تهدف هذه الدراسة إلى بحث تأثير التدليك ضد التنبيه الكهربائي عبر الجلد لتقليل ضيق الأطفال خلال تغيير ضمادة الحرق . أشترك في هذه الدراسة 45 طفلاً وقد قسموا عشوائياً إلى 3 مجموعات. مجموعة التدليك (عددهم 15 طفلاً) عولجوا لمدة 30 دقيقة قبل تغيير الضمادة بالتدليك، ومجموعة التنبيه الكهربائي عبر الجلد (عددهم 15 طفلاً) عولجوا لمدة ساعة واحدة قبل تغيير الضمادة بالتنبيه الكهربائي عبر الجلد بالإضافة إلى المجموعة الحاكمة التي عولجت بالاتصال الشفوي . استخدم التقييم بمقياس معدل الألم عند الأطفال لقياس سلوك ضيق الأطفال قبل واثناء تغيير الضمادة . لقد استخدم اختبار ويلكوكسن وأختبارات وصفية لقياس تأثير التدليك ضد التنبيه الكهربائي عبر الجلد على التقليل من ضيق الأطفال قبل واثناء تغيير الضمادة . ولم تظهر النتائج وجود دلالة احصائية بين وسيلتي العلاج بالرغم من وجود تحسن ذو دلالة احصائية عند مقارنة مجموعتي التدليك والتنبيه الكهربائي عبر الجلد بالمجموعة الحاكمة . وقد استنتجنا من هذا البحث أن كلاً من التدليك والتنبيه الكهربائي عبر الجلد يمكن استخدامهما للتقليل من ضيق الأطفال قبل واثناء تغيير ضمادة الحرق .