Effect of Massage on Sleep Disturbances of Children after Abdominal Surgeries

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Abstract: After abdominal surgery, sleep patterns are usually disturbed. Eighty-four post-operative pediatric patients were randomized into two groups; intervention and control. Children in the study group received massage intervention for 3 days postoperatively. The study concluded that the children in the study group improved and experienced more relief of sleep disturbances after surgery. The differences were statistically significant ($p < .001$) for the massage intervention group and showed a non-significant trend for control group. The findings reported that the sleep disturbances of abdominal postoperative children were improved and the sleep/wake cycle was regulated with sessions of massage, although the results are based on a study with a relatively small number of patients. However, this should be confirmed in future studies.
[Safy S. Al-Rafay and Eman A. Ali. **Effect of Massage on Sleep Disturbances of Children after Abdominal Surgeries.** *J Am Sci* 2013;9(12):626-632]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 81

Keywords: sleep disturbances; massage; abdominal surgeries

Introduction

Post-operative sleep disturbances represent an important research field, since it may have a significant negative effect on post-operative health outcomes (Rosenberg, 2001).

Sleep disturbances are common problems among pediatric patients in hospitals; however, there is still a lack of knowledge in nursing about the effectiveness of sleep-promoting interventions (Hellstrom et al., 2011).

Studies based on observations by staff have shown that profound alterations in sleep pattern occur during the 1-6 nights after abdominal surgery, such sleep changes may be expected to influence restoration of body organ dysfunction (Rosenberg-Adamsen et al., 1996).

Massage therapy as an ancient nursing technique is now gaining popularity; it has been shown improvement in sleep (Richards, 1998). Accordingly, there have been more recent studies on utility of massage for postoperative patients (McRee et al., 2003).

Moreover, control of the patient's sleeping environmental factors during hospitalization and management of physiological, psychological symptoms are improving the sleep quality and early recovery in post-operative pediatric patients (Huang et al., 2011).

In this regard, a recent interest to study the role of massage intervention as a part of the complementary nursing care (Cutshall et al., 2010) for abdominal post-operative children, to manage their sleep disturbances.

Hypothesis

This study hypothesized that massage intervention might improve the disturbed sleeping patterns, associated with post-operative pediatric abdominal surgery.

Aim of the study

This study aimed to determine the effectiveness of massage intervention on sleep disturbances of children after abdominal surgeries.

Methods

Design

A randomized controlled trial research design is used, in which the patients were assigned to a massage or control group; to measure the effect of implementing massage on the pediatric post-operative sleeping disturbances.

Setting

The study was conducted in the Surgical Unit at Children's Hospital, Ain Shams University Hospital in Cairo, Egypt. During the study there were 3 to 7 patients scheduled each day as pediatric surgery patients.

Subjects

A purposive sample of 84 children after abdominal surgery was recruited in this study according to the inclusion and exclusion criteria. Using a simple random method to select children from the booking schedules of the surgical unit into two equal (experimental and control) groups of 42 participants each, to ensure that every object has the same probability of being chosen. Power analysis was utilized to define sample size.

Exclusion criteria were children with enlarged lymph nodes, irritant skin, or febrile children.

Moreover, patients who had a body mass index (BMI) ≥ 35 kg/m^2, or had connective devices such as a thoracic drain or endotracheal tube, the presence of a urinary catheter and a gastric tube, were excluded from the study.

Furthermore, more than three quarters of mothers in both groups aged between 26 and 43 years old, and almost two third of them can read and write.

Data Collection

Interview Administered Questionnaire Sheet

Socio-demographic data.

Characteristics of the children such as age, gender, level of education.

Data about type and date of surgery, Body Mass Index (BMI) and diagnosis were taken. Moreover, characteristics of mothers such as age and level of education were assessed.

Sleep diaries.

Sleep/wake rhythms of the children was monitored. The total sleep duration was the sum of night time and day time sleeping (sleeping hours in bed per 24 hours), and how long after going to bed does the child usually fall asleep in minutes.

Sleep diaries included "How many hours sleep does your child get on most nights?" (1=9-11 hr, 2=8-9 hr, 3=7-8 hr, 4=5-7 hr, and 5=<5 hr); and "How long after going to bed does your child usually fall asleep?" (1=<15 min, 2=15-30 min, 3=30-45 min, 4=45-60 min, and 5=>60 min).

Sleep diaries have been probably filled out for 72 hours after surgery.

Observation checklists

Sleep Disturbance Scale for Children (SDSC).

SDSC indicates disturbances in the sleep behavior of the child (Bruni et al., 1996). The researchers completed the scale by rating each item from 1 to 5 on a five point intensity scale. Total score of the six sleep disturbance subscales were calculated, including: Disorders of Initiating and Maintaining Sleep (DIMS), Sleep Breathing Disorders (SBD), Disorders of Arousal (DA), Sleep/Wake Transition Disorders (SWTD), Disorders of Excessive Somnolence (DES) and Sleep Hyperhidrosis (SHY) (night sweating). After summing the different subscale scores of SDSC, the values were combined into percentiles to obtain the total score indicating a sleep profile of each child.

Physiological assessment.

The heart rate (HR), respiratory rate (RR), and saturation of oxygen (SaO_2) were measured on each participant.

Implementation of the Study

The study was implemented in a series of three sessions of massage intervention; theses were 3 days a week in the morning and evening shifts, according to the booking schedules of the surgical unit, followed by evaluation of the sleep characteristics and SDSC of participant children after study intervention. The study was applied in the period from May to October 2011.

Validity and Reliability.

During the study construction phase, the content of the massage intervention protocol was based on reviewing related literature (e.g., Field, 2006; Field, 2005; Rosenberg-Adamsen, 1996). In addition, a group of experts reviewed the study intervention protocol and evaluated for inter-rater reliability content; they were Consultant Surgeons and the Head Nurse of the Surgical Unit.

Protocol of the Study Intervention.

Massage intervention is applied initially by instructing children to lay comfortably on their hospital beds next to their mothers and relax as fully as possible and then covered and turned gently according to the part of intervention. The child's privacy is appreciated to choice of which part of the body to start massage.

Massage intervention was usually conducted by touching gently the child's legs; the strokes for the legs were preceded by firm pressure to the bottom of the foot slowly working up to combine the toes and squeezing each toe. Then, the foot was stabilized with one hand, to stroke the front of the lower leg. Moreover, the bony area of the ankles was involved a continuous encircling motion, and rolling from ankle to the knee then the hip, without breaking contact.

At that time, we would stroke the top of the hands and circle around the wrist, moving towards the shoulders; then lightly stroking back in a circular motion under the bed clothes, ending by the head and face with one hand. The strokes were the same whether children were clothed or partially unclothed for 30 minutes in a rhythm, almost 4 movements per minute and require no specialized equipment. Strokes were guided by the child's feedback and tolerance of stimulation without adverse effect in behavior.

Children in the control group performed their usual bedtime activity, and post-operative data collection was conducted in the same manner for 3 days after surgery, but without the massage intervention.

Sessions of massage were usually tailored by two assistant researchers; they acted massage and had a role of close monitoring of sleep patterns as blind assistants, and were not aware of the goal of the study. Assistant researchers were trained by the main researchers to take over them in the time when they were not available.

The postoperative attempts were made to schedule all sessions of massage for each child at the same time of the day, and the massage was scheduled at a time without procedures to avoid interruptions

and a sign of "keep quiet, massage in progress" was posted on the bed side.

The physiological indicators were used to measure the response of children to pain by measuring HR, RR, and SaO_2. These were assessed for both the intervention and control groups.

Evaluation phase.

According to monitored sleep characteristics of children, the total scores were divided into three clinical categories: (1) "normal" sleeping behaviors when the total score obtained was less than 50%, (2) "borderline" for scores between 50 and 70% or (3) "clinically significant" when scores were more than 70%. The higher values indicated a worse case of sleep disorder.

Means of HR, RR, and SaO_2 were measured to compare the physiological patterns of children between the two groups after massage intervention.

Pilot Study

Five post-operative children and their mothers were interviewed. Accordingly, some modifications of the questionnaire such as the exclusion criteria of children were added.

Ethical Considerations

Ethical issues in this study involved the assurance of confidentiality and anonymity for the participating children and their mothers. A clear explanation about the purpose and mechanism of the study was offered one day before a surgery, and then a verbal assent was obtained. Patients were allowed to withdraw from the study whenever they wished. Official approvals to conduct the study were addressed with the Hospital Ethical and Research Committees as well as the Chairperson of the Children's Surgical Unit. They approved the protocol and recommended that the study should not include pediatric intensive care unit (PICU) patients.

Statistical Analysis

Data entry and statistical analysis was done using SPSS 16.0 statistical software package. Quantitative continuous data was compared using the non- parametric t-test for equality of means since normal distribution of the data could not be assumed. Quantitative categorical variables were compared using Chi-square test, whenever the expected values in one or more of the cells in a 2x2. Statistical significance was considered at p value <.001.

Results

Values of means and standard deviation of the demographic characteristics in table1 indicates no significant differences existing between characteristics of children in both control and study groups. Their mean ages were (8.5±1.99 and 9.02±2.15) respectively in the control and study groups. Moreover, all children were at the stage of elementary school. This sums up that more homogeneity between the two involved groups.

Table 2 illustrates that the massaged children achieved more favorable adjustment of their sleeping versus the control group. There is a statistically significant difference (p < .001) that the study group had more hours of night sleeping than the control group. Moreover, children of massage group needed less minutes to fall asleep rather than children of the control group.

The mean of SDSC total scores of sleeping disturbances was indicated in table (3) that statistically significant improvements (p < .001) among children of the study group, it was (51.52±3.31), as well as the mean of SDSC total scores was (68.98±5.82) among control group in the first night. Continuing application of massage expressed best results in the third night of massage intervention; when 92.9% of participant children had "normal sleeping" compared to 11.9% of the control group. Moreover, scores of sleeping disturbances was (69.95±5.96) among control group in comparison to participant children of the study group who showed only (29.05±2.34) scores after massage intervention.

Concerning physiological measures, table 4 shows improving of the heart rate (75.90 beats/minute) as a response to massage intervention among children of the study group compared to (87.69 beats/minute) in the control group. Similarly, the respiratory rates were (20.93 and 15.93 breaths/minute) respectively, in the control group compared to the study group. While as, SaO_2 was higher (96.07%) in the study group rather than (98.14%) in the control group.

Table 1. Demographic and characteristics of children in the control and massage groups (n = 84)

Characteristics of Children	Control Group (n=42)		Massage Group (n=42)		t-test
Age					
Mean±SD	8.5±1.99		9.02±2.15		1.16$^{\infty}$
BMI					
Mean±SD	21.42±4.50		20.14±4.50		1.31$^{\infty}$
Gender	Boys	Girls	Boys	Girls	χ^2
Frequency	25	17	23	19	0.194$^{\infty}$
Percent	59.5	40.5	54.8	45.2	

$^{\infty}$Correlation is insignificant

Table 2. Characteristics of sleeping in the control and the massage groups

Characteristics of Sleeping		Control Group (n=42)	Massage Group (n=42)	t-test
		Mean±SD	Mean±SD	
Night sleep/ (hours)	night.1	5.01±0.45	4.97±0.50	0.38
	night.2	5.15±0.80	5.75±1.13	2.80*
	night.3	5.17±0.72	6.29±1.16	5.33*
Child fall asleep/ (minutes)	asleep.1	86.07±11.56	63.69±9.37	9.75*
	asleep.2	69.64±17.96	47.98±9.82	6.86*
	asleep.3	60.12±16.17	27.14±10.48	11.09*

*Statistically Significant at $p < .001$

Table 3. Comparison of SDSC total Scores between children of the control and massage groups

Categories of SDSC scoring		Control Group (n=42)						Massage Group (n=42)						t-test
		Normal (<50%)		Border line (50 - 70%)		Clinically significant (>70%)		Normal (<50%)		Border line (50 - 70%)		Clinically significant (>70%)		
		N	%	n	%	n	%	n	%	n	%	n	%	
SDSC Total Scores	Night1	2	4.7	23	54.8	17	40.5	19	45.2	22	52.4	1	2.4	16.89*
	Mean±SD	**68.98±5.82**						**51.52±3.31**						
	Night2	1	2.4	18	42.8	23	54.8	34	81	8	19	0	0	35.60*
	Mean±SD	**70.79±4.80**						**40.29±2.80**						
	Night3	5	11.9	17	40.5	20	47.6	39	92.9	3	7.1	0	0	41.39*
	Mean±SD	**69.95±5.96**						**29.05±2.34**						

* Statistically Significant at $p < .001$

Table 4. Comparison of physiological measures between children of the control and massage groups

Physiological Measures	Control Group (n=42)		Massage Group (n=42)		t-test
	Mean	SD±	Mean	SD±	
Heart Rate (beats/ minute)	87.69	4.38	75.90	7.33	8.949*
Respiratory Rate (breaths /minute)	20.93	1.49	15.93	1.39	15.933*
Saturation Oxygen (% SaO2)	96.07	0.71	98.14	1.34	8.869*

*Statistically Significant at $p < .001$

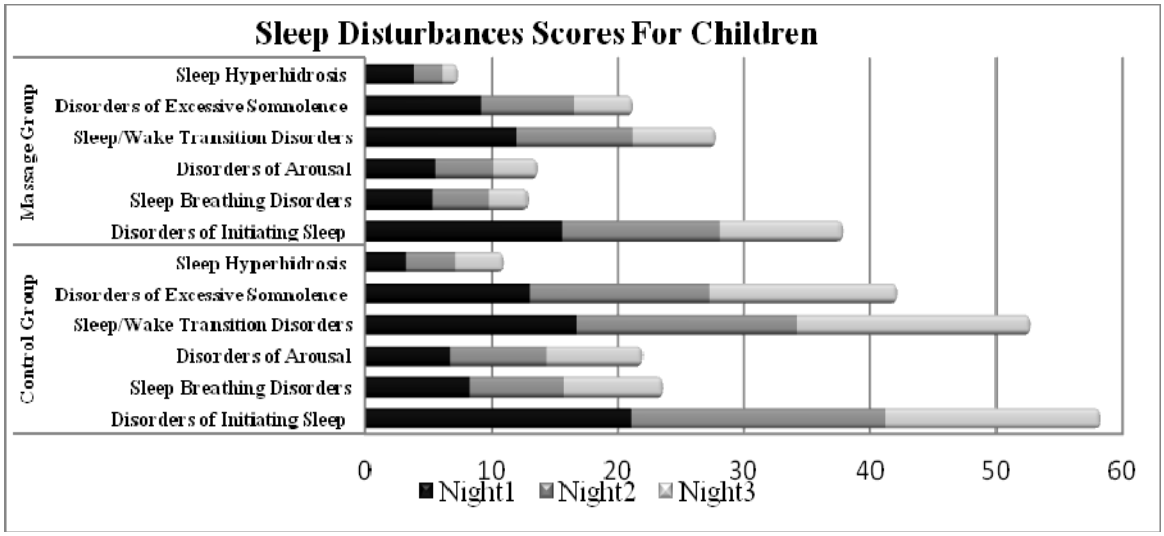

Figure 1. Comparison between the 6 subscales of sleeping disturbances in children of the control and massage groups

Overall, summing the scores of the items for the 6 different subscales of SDSC along three nights was showed in figure (1) that decreasing in mean scores of all values of the 6 subscales sleep disturbances after applying massage in the study children including Disorders of Initiating and Maintaining Sleep, Sleep Breathing Disorders, Disorders of Arousal, Sleep/Wake Transition Disorders, Disorders of Excessive Somnolence, and Sleep Hyperhidrosis, indicating statistical significant differences in the sleeping behaviors of the study group after massage intervention better than the control group.

Discussion

After abdominal surgery all patients were sleep deprived, as shown by total sleep time on the first and second postoperative nights (Knill et al., 1990). This might explain the benefits derived from massage intervention to improve sleep quality which reduce the sensitivity to pain and anxiety levels (Castro-Sanchez et al., 2011).

Nurses taking care of children commented about useful role of massage, as a universally favorable procedure impeded the flow of patient care. Despite the relatively short duration of the massage therapy, nurses' availability should be scheduling to massage their children patients, for minimal conflicts with other postoperative patient- care activities (Cutshall et al., 2010).

At the beginning of this study, socio-demographic characteristics of children were identified. Massage intervention is applied initially after instructing children about the intention of the study briefly. Children were conducted gently and privacy was considered.

The study findings indicated that age of participant children in both group were in the school stage. They could understand the nature of sleep disturbances, and the rationale and strategy of massage therapy. Children were often involved in decisions about acceptance of the procedure and where they would and would not like to be touched, also the possibility of stopping the massage at any time (Beider et al., 2010).

On the other hand, Meltzer et al. (2010) revealed that obesity is associated not only with SDB but also with short sleep duration. The BMI was a risk factor for all sleep disorder diagnoses in older children. Accordingly, children who had a body mass index (BMI) $\geq$ 35 kg/m^2 were excluded from the study.

Massage intervention was conducted, and then Sleep Disturbance Scale for Children in addition to data collection and the use of sleep diaries were the first steps in the nursing evaluation for identifying the types and the categories of the sleeping disturbances and scores of sleep improvement and deteriorations among post-operative children. (Mindell, & Owens, 2003).

Overall, summing the scores of SDSC indicated less sleeping disturbances among children in the study group along three nights after massage intervention. Massage intervention expressed best results in the third night when the majority of participant children of the study group had "normal sleeping" and improving in the total scores of SDSC compared to children of the control group.

Moreover, massage intervention helped children of the study group to overcome their sleep disturbances. They got more hours of night sleep and needed fewer minutes to fall asleep. This was emphasized by Ackerman et al. (2012) who observed significant improvements of relaxation and night sleep hours along 3 nights of the study among pediatric hematopoietic cell transplantation patients. Furthermore, Tsay et al. (2003) supported positive effectiveness of massage therapy in improving the quality of sleep, indicating that it had a positive influence on sleep promotion. In this context, (Field et al., 2005) discussed the positive effects of massage therapy on biochemistry as it increased levels of serotonin and dopamine and decreased levels of cortisol.

Best outcomes of this study were related to the positive physiological measurements. Findings indicated better heart rate, respiratory rate and higher percent of SaO_2 in the study group rather in the control group. Accordingly, Diego, & Field (2005) confirmed that participants who received even moderate pressure massage exhibited a parasympathetic nervous system response characterized by an increase in heart rate, suggesting a shift from sympathetic to parasympathetic activity that peaked during the first half of the massage period. In this regards, (Moyer et al., 2004) added that even single applications massage intervention reduced state anxiety, blood pressure and heart rate were noticed. Explicitly, massage intervention promoted parasympathetic activation, which causes reductions in heart rate, blood pressure, and breathing.

Limitations of the Study

Some conditions such as room temperature and noise were uncontrollable although an effort was made to conduct the study in a consistent environmental condition. Surgical site was an obstacle for abdominal massage, so the researchers avoided these sites and applied massage intervention on the free sites.

Moreover, duration of each massage session for 3 days may have been too short of a period and it

might not be enough until the child's discharge. The sample size recruited may have been small to detect a significant effect.

Conclusion

This study concludes that the children in the study group experienced more relief of sleep disturbances after receiving massage intervention for 3 days postoperatively. The differences were statistically significant ($p < .001$) for the massage intervention group and showed a non-significant trend for control group. The findings reported that the sleep disturbances of abdominal postoperative children were improved and the sleep/wake cycle was regulated with sessions of massage, although the results are based on a study with a relatively small number of patients.

Recommendations

Future studies are suggested with increased sample sizes, a longer interventional period duration, and an objective measure of sleep. Interventions including symptoms management, environment control, and mental healthcare, are vital to improve sleep quality and recovery during hospitalization and after hospital discharge.

Implications for Nursing Practice

Massage intervention is one of the non-invasive, attainable and non-costly modalities that can be used to convey nursing care of sleeping for children after abdominal surgeries. It can be done in the child's bed, and requires no special equipment. Evaluated 3 days after surgery exhibited levels of SDCS in massaged children were better than the control group.

Implications for Research

The positive findings of this study support a growing body of evidence that massage is an effective nursing intervention for sleep disturbances of children after abdominal surgeries. This information encourages future nursing researchers to examine the correlation between massage intervention in relation to other behavioral and physiological responses.

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11/12/2013