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International Journal of Current Research
Vol. 6, Issue, 08, pp.8127-8131, August, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

EFFECT OF FACILITATED TUCKING ON LEVEL OF HEEL LANCE PROCEDURAL PAIN AMONG PRETERM NEONATES

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ARTICLE INFO

Article History:
Received 10th May, 2014
Received in revised form
25th June, 2014
Accepted 07th July, 2014
Published online 31st August, 2014

Key words:

Facilitated tucking,
Heel lance procedure,
Preterm neonates,
Pain,
Neonatal Unit.

ABSTRACT

Introduction and Need: The prevention of pain is important because repeated painful exposures can have deleterious consequences on preterm neonates. Facilitated tucking is a non-pharmacological comfort measure that can relieve procedural pain in very low birth weight (VLBW) infants. The nurse or care givers can effectively implement facilitated tucking for reduction of pain in any setting as it is a very simple technique. Therefore, the investigator taken up the study.

Objective: To assess the effect of facilitated tucking on level of heel lance procedural pain among preterm neonates admitted in Neonatal Unit.

Material and Methods: The study sample comprised of preterm neonates with gestational age less than 37 completed weeks selected by convenience sampling technique and admitted in Neonatal Unit of DMC & H, Ludhiana. The study sample comprised of total 60 preterm neonates with equal number (30 each) of preterm neonates included in control and experimental group. Structured pain scale was used to collect the data. The experimental group was provided with facilitated tucking intervention during heel lance procedure and the control group received only routine hospital care. Video recording of preterm neonates was done from two minutes before, during and till three minutes after heel lance procedure to assess the level of pain.

Major Findings: The mean pain score of control group was 7.17±2.73 whereas the mean pain score of experimental group was 8.27±2.67 during heel lance procedure ($p=0.121^{NS}$). At one minute after heel lance procedure the mean pain score of control group was 3.30±2.18 and in experimental group it was 4.17±3.15 ($p=0.221^{NS}$), at two minutes after heel lance procedure the mean pain score of control group was 2.23±2.18 while the mean pain score of experimental group was 2.53±2.78 ($p=0.643^{NS}$). In the control group the mean pain score was 1.73±2.45 whereas in experimental group it was 1.44±1.69 at three minutes after heel lance procedure($p=0.583^{NS}$). This difference was found statistically non significant ($p>0.05$).

Conclusion: The findings of the study concluded that facilitated tucking was not statistically effective in reducing the level of pain among experimental group during heel lance procedure and at one, two and three minutes after heel lance procedure, when provided just prior to the heel lance procedure.

INTRODUCTION

Preterm neonates admitted in neonatal units may undergo more than 10 painful procedures daily during the first two weeks of hospitalization to maintain survival (Carbajal *et al.,* 2008). Many scientific evidences support that the human fetus can experience pain from 20 weeks of gestation and possibly as early as 16 weeks of gestation (Anand 1987). Preterm and acutely ill term neonates hospitalized in a neonatal intensive care unit are subjected to multiple frequent invasive and painful procedures aimed at improving their outcome (Gibbens *et al.,* 2006). There are a variety of non-pharmacologic pain-prevention and relief techniques that have been shown to effectively reduce pain due to minor procedures in neonates. Facilitated tucking is a developmentally sensitive, non-pharmacological comfort measure that can relieve procedural pain in very low birth weight (VLBW) infants. Facilitated tucking involves holding a newborn in flexed position with warm hands to offer tactile and thermal sensory stimulation to modulate pain during invasive procedures. The research studies has given the evidence of long-term improvement in pain sensitivity following pain reduction programmes (Modrcin *et al.,* 2003). The aim of the present study was to assess the effect of facilitated tucking on level of heel lance procedural pain among preterm neonates admitted in Neonatal Unit of DMC & Hospital, Ludhiana.

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MATERIALS AND METHODS

Quasi experimental research design was used. The present study was conducted on 60 preterm neonates of less than 37 completed weeks of gestation admitted in Neonatal Unit of DMC & Hospital, Ludhiana, Punjab selected by convenience sampling technique. Structured pain scale and interview questionnaire was used to collect data. Facilitated tucking was provided immediately prior to the heel lance procedure. Video recording of preterm neonates was done before, during and after heel lance procedure. The level of pain in preterm neonates was assessed by observing four variables i.e. maximum increase in heart rate (beats/min) from baseline, maximum percentage decrease in oxygen saturation from baseline, facial expressions and cry due to heel lance procedure. For each variable, a score from 0 to 3 was assigned. The minimum total score was zero and maximum total score was 12. The observation was made during, at one, two and three minutes after heel lance procedure. The inter-rator reliability of the tool was checked and it was found to be reliable (i.e. 0.7) and tool was validated by experts from the field of paediatrics. A written permission from the Principal, College of Nursing and from the HOD, neonatal unit was taken to conduct the study and ethical clearance was obtained from institutional ethical committee. An informed written consent was taken from the parents of the preterm neonates for video recording. The study was conducted after approval from the ethical committee of DMC & Hospital, Ludhiana.

RESULTS

Table 1 depicts that less than half of preterm neonates (40.0%) in the control group and more than half of preterm neonates in experimental group (56.7%) had birth weight between 500-1500 grams. More than half of preterm neonates (56.6%) in control group belonged to the gestational age group of ≤35 weeks and maximum number of preterm neonates (93.3%) in experimental group belonged to the gestational age group of >35 weeks at the time of birth. The percentage of males in control and experimental group were 66.7% and 56.7% respectively.

Assessment of level of heel lance procedural pain in experimental and control group

Fig. 1 shows that more than one third of preterm neonates in control group (36.7%) and more than half of preterm neonates in experimental group (53.4%) experienced severe pain during heel lance procedure. Fig. 2 depicts that less than two third of preterm neonates 19 (63.3%) both in control and experimental group experienced mild pain at one minute after heel lance procedure. Only 04 (13.3%) preterm neonates in experimental group and no preterm neonate in control group experienced severe pain at one minute after heel lance procedure. Fig. 3 shows that less than two third of preterm neonates in control group18 (60%) and one fourth of preterm neonates in

Table 1. Distribution of preterm neonates as per their birth weight, gestational age, gender and birth order N=60

Sociodemographic characteristics	Control group *(n=30)*	Experimental group *(n=30)*	Total *(N=60)*	
	f (%)	f (%)	f (%)	χ^2 value
Birth weight (in grams)				
500-1500	12 (40.0)	17 (56.7)	29 (48.3)	1.668
>1500	18 (60.0)	13 (43.3)	31 (51.7)	p=0.196^{NS}
Gestational age at the time of birth (weeks)				
≤35				
>35	17 (56.6)	28 (93.3)	45 (75.0)	10.755
	13 (43.4)	02 (06.7)	15 (25.0)	p=0.001*
Gender				0.636
Male	20 (66.7)	17 (56.7)	37 (61.7)	df=1
Female	10 (33.3)	13 (43.3)	23 (38.3)	p=0.425^{NS}
Birth order				0.067
1st	16 (53.3)	15 (50.0)	31 (51.7)	df=1
≥2nd	14 (46.7)	15 (50.0)	29 (48.3)	p=0.796^{NS}

Table 2. Distribution of preterm neonates as per their clinical profile N=60

Clinical Profile	Control group *(n=30)*	Experimental group *(n=30)*	Total *(N=60)*	Chi square value
	f (%)	f (%)	f (%)	
Number of previous heel pricks on the same day				
Zero				0.350
One	28 (93.3)	29 (96.7)	57 (95.0)	df=1
	02 (06.7)	01 (03.3)	03 (05.0)	p=0.55^{NS}
Any painful procedure within one hour prior to heel prick				
Yes				0.00
No	01 (03.3)	01 (03.3)	02 (03.3)	df=1
	29 (96.7)	29 (96.7)	58 (96.7)	p=1.00^{NS}
History of breast feeding within one hour prior to heel lance procedure				
Yes				
No				
	--	--	--	NA
	30 (100)	30 (100)	60 (100)	
Duration of hospitalization (in days)				
01-10				4.043
>10	29 (96.7)	24 (80.0)	53 (88.3)	df=2
	01 (03.3)	06 (20.0)	07 (11.7)	p=0.12^{NS}

Table 3. Distribution of preterm neonates among experimental and control group as per their heart rate.

Variables		Groups	Maximum increase in heart rate (beats per minute) from baseline				
			0-4	5-14	15-24	≥25	Chi square value
			f (%)	f (%)	f (%)	f (%)	
During heel lance procedure		Experimental	07 (03.3)	10 (33.3)	08 (26.7)	05 (16.7)	0.400
		Control	08 (26.7)	11 (36.8)	06 (20.0)	05 (16.7)	$p=0.94^{NS}$
After heel lance procedure	At 1 minute	Experimental	09 (30.0)	08 (26.7)	11 (36.8)	02 (06.7)	6.731
		Control	16 (53.3)	08 (26.7)	03 (10.0)	03 (10.0)	$p=0.08^{NS}$
	At 2 minutes	Experimental	14 (46.7)	12 (40.0)	01 (03.3)	03 (10.0)	4.500
		Control	18 (06.0)	06 (20.0)	04 (13.3)	02 (06.7)	$p=0.21^{NS}$
	At 3 minutes	Experimental	23 (76.7)	04 (13.3)	01 (3.3)	02 (6.7)	3.230
		Control	17 (56.6)	08 (26.7)	03 (10.0)	02 (06.7)	$p=0.36^{NS}$

Table 4. Distribution of preterm neonates among experimental and control group as per their oxygen saturation. N=60

Variables		Groups	Maximum percentage decrease in oxygen saturation from baseline				
			0-2	3-5	6-7	≥8	Chi square value
			f (%)	f (%)	f (%)	f (%)	
During heel lance procedure							
		Experimental	07 (03.3)	05 (16.7)	05 (16.7)	13 (43.3)	8.060 $p=0.05^{*}$
		Control	17 (56.7)	03 (10.0)	01 (03.3)	09 (30.0)	
After heel lance procedure	At 1 minute						
		Experimental	16 (53.3)	03 (10.0)	05 (16.7)	06 (20.0)	10.671 $p=0.01^{*}$
		Control	24 (80.0)	05 (16.7)	--	01 (03.3)	
	At 2 minutes						
		Experimental	16 (53.3)	08 (26.7)	02 (06.7)	04 (13.3)	10.747 $p=0.01^{*}$
		Control	27 (90.0)	02 (06.7)	01 (03.3)	--	
	At 3 minutes						
		Experimental	19 (63.3)	04 (13.3)	02 (06.7)	05 (16.7)	8.1901 $p=0.04^{*}$
		Control	28 (93.3)	01 (03.3)	--	01 (03.3)	

*= Significant; df=3, n=30 in each group.

Table 5. Comparison of mean pain scores among experimental and control group

Heel lance procedural pain		Groups	Mean±SD	t- value	p- value
During heel lance procedure		Experimental	8.27±2.67	1.5756	0.121^{NS}
		Control	7.17±2.73		
After heel lance	At 1 minute	Experimental	4.17±3.15	1.2379	0.221^{NS}
		Control	3.30±2.18		
	At 2 minutes	Experimental	2.53±2.78	0.4658	0.643^{NS}
		Control	2.23±2.18		
	At 3 minutes	Experimental	1.44±1.69	0.5517	0.583^{NS}
		Control	1.73±2.45		

NS= Non significant; df=58; Maximum pain score=12; Minimum pain score=0, n=30 in each group

experimental group 23 (76.6%) experienced mild pain at two minutes after heel lance procedure. Fig. 4 shows that more than half of preterm neonates both in control 16 (53.4%) and experimental group 17 (56.6) experienced mild pain at three minutes after heel lance procedure. There was no significant difference between the level of heel lance procedural pain in experimental group and control group during and after the heel lance procedure ($p>0.05$).

Effect of facilitated tucking on level of heel lance procedural pain in experimental group

Table 5 depicts the mean pain score of experimental and control group during and after heel lance procedure. The mean pain score of control group was 7.17±2.73 whereas the mean pain score of experimental group was 8.27±2.67 during heel lance procedure ($p=0.121^{NS}$). At one minute after heel lance procedure the mean pain score of control group was 3.30±2.18 and in experimental group it was 4.17±3.15($p=0.221^{NS}$). At two minutes after heel lance procedure the mean pain score of control group was 2.23±2.18 while the mean pain score of experimental group was 2.53±2.78($p=0.643^{NS}$). In the control group the mean pain score was 1.73±2.45 whereas in experimental group it was 1.44±1.69 at three minutes after heel lance procedure ($p=0.583^{NS}$). This difference was found statistically non significant ($p>0.05$). Therefore facilitated tucking was statistically not effective in reducing the level of pain among experimental group during heel lance procedure, at first, second and third minute after heel lance procedure.

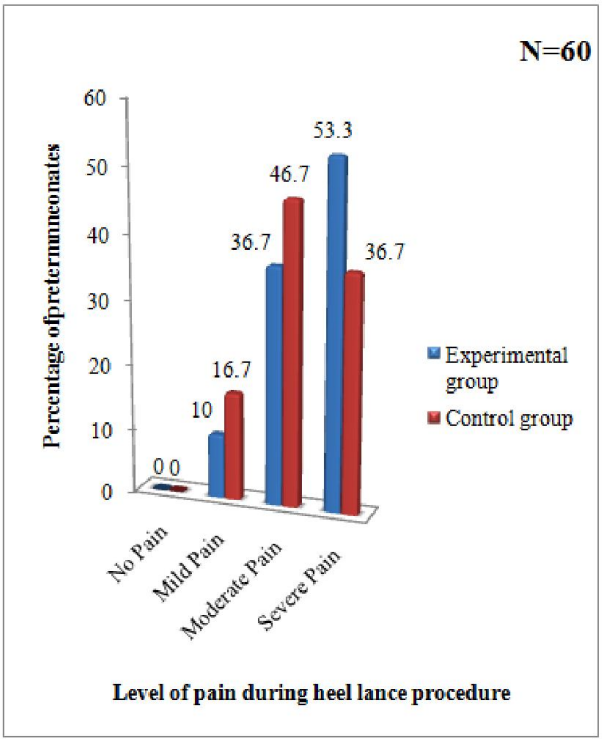

Fig. 1. Distribution of level of pain among preterm neonates during heel lance procedure in experimental and control group

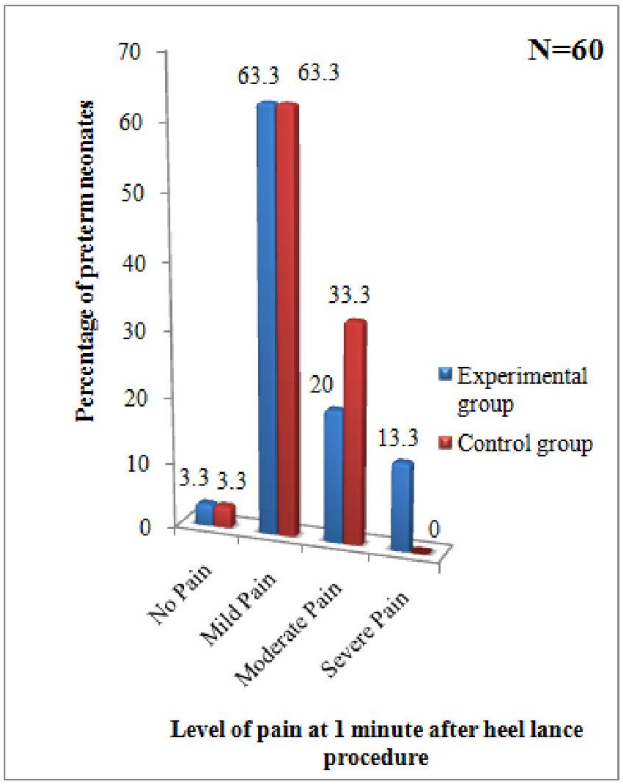

Fig. 2. Distribution of level of pain among preterm neonates at 1 minute after heel lance procedure in experimental and Control group

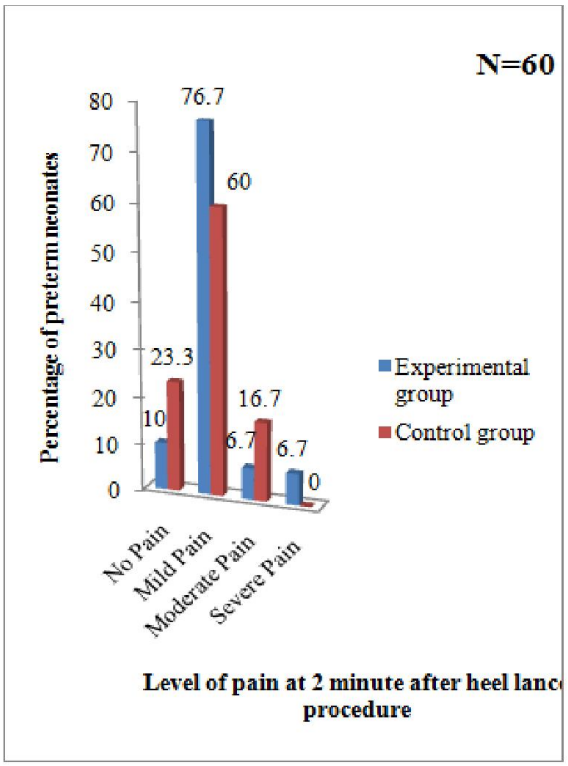

Fig. 3. Distribution of level of pain among preterm neonates at 2 minutes after heel lance procedure in experimental and Control group

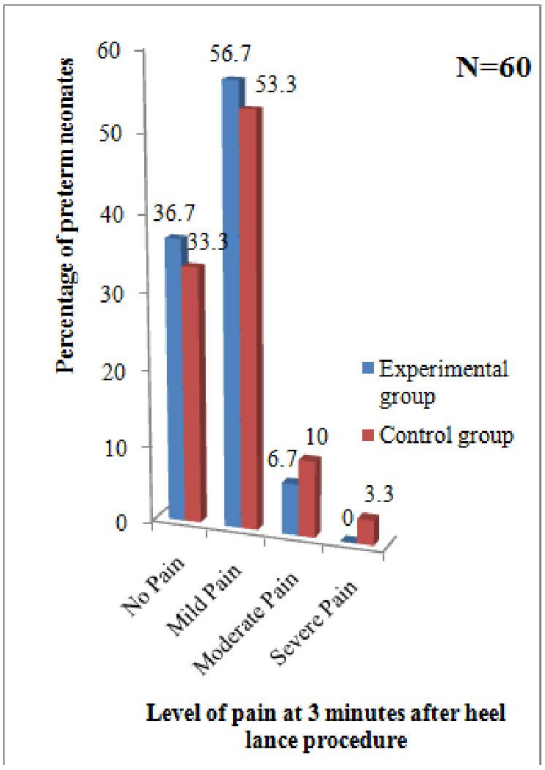

Fig. 4. Distribution of level of pain among preterm neonates at 3 minutes after heel lance procedure in experimental and control group

DISCUSSION

The findings revealed that facilitated tucking was not effective ($p>0.05$) in reducing the level of pain among experimental group during heel lance procedure, at one, existing literature, there is not sufficient evidence to the benefits of facilitated tucking. Facilitated tucking and non-nutritive sucking seem to have some evidence for pain relief, but more RCTs with larger samples are needed. Similarly Gitto *et al.* (2012) also conducted a prospective randomized controlled trial on 150 preterm neonates (gestational age 27-32 weeks) to evaluate the reduction of procedural pain in preterm newborns with three different treatment [administration of fentanyl (FE, 1-2 μg/kg), facilitated tucking (FT), sensorial saturation (SS)]. CRIES score and measurement of the levels of cytokines as markers of stress was used to evaluate the procedural pain. The findings suggested that FT was not as effective as the other two interventions and cytokines levels, which are markers of stress, were significantly higher in the FT group. In contrast Hill *et al.* (2005) did a comparative study on effects of facilitated tucking during routine care of infants born preterm. A convenience sample of 12 infants born preterm, ages 25 to 34 weeks post-conceptual age on the day of testing, were evaluated using the Premature Infant Pain Profile (PIPP), during the two care giving conditions. One condition incorporated a second caregiver supporting the infant in a facilitated tucked position whereas the second condition did not. The results concluded that 9 out of the 12 infants received a lower PIPP score with facilitated tucking during routine care assessments. two and three minutes after heel lance procedure.

Similarly, Badr (2012) published an article that focuses on current pharmacologic and non- pharmacologic interventions to decrease pain related to common procedures in the neonatal intensive care unit. In this article the author reviewed and discussed the results of 19 research studies related to the effect of facilitated tucking. Despite the number of studies providing support to the benefits of non-pharmacologic interventions in reducing pain in preterm infants, only two interventions (sucrose and KC) provide conclusive evidence and should be implemented by all nurses working in the NICUs for moderate pain. Based on the sufficient review of The findings of the study concluded that facilitated tucking was not statistically effective in reducing the level of pain among experimental group during heel lance procedure and at one, two & three minutes after heel lance procedure, when provided just prior to the heel lance procedure.

Acknowledgement

We thank the staff of NICU and the parents of preterm neonates for help in carrying out the study.

Each authors contribution

All authors contributed equally to the study.

Conflict of interest

The study was conducted and prepared for publication without any conflict of interest.

Funding sources

No funding was received for the study.

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