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Effectiveness of video assisted diversional therapy and application of local anaesthetic agent on pain, behavioural response and physiological parameters among children during Intravenous (IV) cannulation

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Effectiveness of video assisted diversional therapy and application of local anaesthetic agent on pain, behavioural response and physiological parameters among children during Intravenous (IV) cannulation

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Abstract

Introduction: Intravenous (IV) cannulation is a common procedure done in hospitals. Although it is an essential procedure providing easy access for IV hydration or medication, its insertion leads to pain, anxiety and distress in children. The study was undertaken with the objective of comparing the effectiveness of video assisted diversional (VAD) therapy and application of local anaesthetic (LA) agent on pain relief, behavioural response and physiological parameters among children. **Methods:** The study was done using an experimental post-test only control group design. The participants were randomized to one of the three groups, with 25 subjects in each group: experimental group 1 received video assisted diversional therapy (VAD), experimental group 2 received local anaesthetic agent (LA), and the control group received only standard care. **Results**: The post intervention pain scores in the VAD and LA group were lesser than those of the control group. There was no significant difference between the two intervention groups. In case of behavioural response, the VAD group showed a significant reduction of behavioural distress than the LA and control groups. In case of physiological parameters, a significant difference was seen in the rate of respiration during and post cannulation in the VAD group. Both, VAD and LA groups showed a reduction in the systolic blood pressure post cannulation. **Conclusion**: The study concludes that the VAD therapy and LA during IV cannulation are equally good for pain reduction, with VAD being highly acceptable for reducing behavioural distress and physiological parameters.

Keywords: video assisted diversional therapy, local anaesthetic agent, parent's presence, pain, behavioural response, physiological parameters.

INTRODUCTION

"Child is defined as a human being who is below the age of 18 years unless, under the law applicable to the child, majority is attained earlier" (UNICEF, 2000). Approximately 26 million children are born in India every year. One third of India's total population comprises of children aged 0-14 years.

During the early years, crises of illness and hospitalization have adverse impact on routine activities and rituals of children. The outcome of hospitalization is greatly influenced by children's developmental age, previous experience of illness, type and severity of illness and the support system available to the child during the crisis situation. However, children have limited coping mechanisms to resolve their stressors. The most common stressor found in school age child is the fear of bodily injury and pain.

During childhood, children get admitted to hospital due to various reasons, such as medical and surgical problems or even for simple invasive procedures as a part of treatment in long term illnesses. Intravenous

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(IV) cannulation is a common procedure done in hospitals without anesthetizing a child. Insertion of an IV cannula leads to pain, anxiety and distress in children. Approximately 70% of children feel fear, stress or anxiety prior to a needle prick procedure or venipuncture. Both, pharmacological and non-pharmacological measures are useful for pain management in children. Topical anaesthetics are safe and effective for reducing pain and emotional distress in children by inhibiting the transduction and transmission of nerve impulses. Research also found that distraction is equally effective in reducing the perceived intensity of pain and anxiety, by directing attention away from a painful stimulus (Cleve et al. 2012). The inclusion of family members in the care of a child is needed to improve the child's health outcomes. Therefore, collaborating with parents will reduce stress and anxiety of children. The present study investigates the effectiveness of VAD and LA agent with parental presence on pain, behavioural response and physiological parameters among children undergoing IV cannulation.

MATERIALS AND METHODS

The design adopted for the study was an experimental post-test only control group design. Subjects were block-randomized to either the VAD group, the LA group or the control group, with five samples in each block. The study was conducted at the paediatric wards of two hospitals in Udupi District. The following sampling criteria were used for selecting the children: children aged 5 to 10 years who were undergoing IV cannulation, willing to participate, hospitalized, conscious and mentally alert.

The tools used for data collection were demographic proforma, Wong- Baker FACES Pain Rating Scale (Wong and Hockenberry 2000), a Behavioural Response Checklist and a physiological parameters checklist. Behavioural Response Checklist collects the behavioural response of children during cannulation. It was a modified FLACC scale developed by Merkel, Vopel, Shayevitz and Malviya (1997). The scale enables the assessment of facial expressions, leg movement, activity, cry, consolability, verbal expression and touch. Under each main item, the scale had three sub- items where each sub-item was given a score of 0, 1, 2 and maximum possible score was 14. The Wong-Baker FACES Pain Rating Scale was used to assess the pain in children immediately after the procedure. This is a standardized scale containing six figures of facial expressions describing the intensity of pain. The clients had to point out the figure (corresponding with scores from 0 to 10) which suits them the best according to the level of pain experienced. The physiological parameter checklist developed by the researcher was used to find out any variation of physiological parameters during cannulation. It comprised of four items, such as pulse, blood pressure, respiration and oxygen saturation. Four observations were made for physiological parameters that included a baseline and parameters five minutes before cannulation, during cannulation and five minutes after cannulation.

To establish content validity, the demographic proforma checklist and behavioural response scale were submitted to seven experts. Modifications were done based on their suggestions. The reliability of the behavioural response scale was tested on 20 samples using Cohen's Kappa inter-rater reliability. There was 100 per cent agreement on all areas of the tool. The reliability score obtained was 1.00, hence the tool was found reliable. Pretesting of the behavioural response checklist was done in December 2013 among five children. A pilot study was conducted in January 2014 among 15 children who underwent IV cannulation. The study was found to be feasible and the findings of the pilot study were utilized to estimate the sample size. A total of 75 children were included in the study. The required sample size was calculated at 95% confidence interval. Subjects were randomly assigned to three groups as mentioned earlier, each group comprising of 25 samples.

Ethical clearance was obtained from the Institutional Ethics Committee, Kasturba Hospital, Manipal. Written consent and assent were taken from the parents and the participants.

Experimental group 1 received VAD therapy, experimental group 2 received LA agent and for the control group routine care was given. Five minutes before, during and five minutes after cannulation, blood pressure, respiration, heart rate and oxygen saturation were recorded with the help of a cardiac

monitor for all participants . The behavioural response was monitored by the researcher during the procedure. Immediately after the procedure, the researcher showed the Wong-Baker FACES Pain Rating Scale and the child had to select one face.

RESULTS

Sample characteristics

Among the age group taken under consideration for the study, majority of children, 39 (52%) were eight to ten years old and the majority were males 41(54.7%). The children were hospitalized due to various clinical conditions, the most common condition being appendicitis in 21 (28%) cases. Further, 42 (56%) children had a previous history of hospitalization. Among the children with previous hospitalization, 32 (76.2%) were admitted more than twice and 40 (43.3%) children had a prior experience of IV cannulation. Among the children with prior experience of IV cannulation, 29 (72.5%) of them had the same experience more than once.

Comparison of pain scores between the experimental groups and the control group

Table 1: Mean and standard deviation of pain scores of the experimental and control groups (n=75)

Group	Mean±SD	Standard Error	95% confidence interval	
			Lower bound	Upper bound
VAD	4.24±3.57	.71480	2.7647	5.7153
LA	2.64±3.09	.61882	1.3628	3.9172
Control	7.68±3.09	.61838	6.4037	8.9563

The data presented in Table 1 indicates that the pain scores in the control group was higher (7.68±3.09) compared to VAD group (4.24±3.57) and the LA group (2.64±3.09).

Table 2: Difference in the pain scores between the experimental and the control groups (n=75)

	Sum of squares	df	Mean square	F	p
Between groups	331.6	2	165.8	15.6	0.001
Within groups	765.8	72	10.6		

The data presented in Table 2 show a statistically significant difference in the pain scores between the groups (F = 15.56, p=.001). The F ratio obtained is statistically significant at p =0.001. This suggests that the three groups differed significantly in terms of their pain scores. Since F ratio does not show which groups differ significantly, the three groups were compared with the help of the Post hoc Bonferroni test. The data are presented in Table 3.

Table 3: Post hoc Bonferroni test values of experimental and control groups' pain scores (n=75)

Group I	Group J	Mean difference (I-J)	Std. Error	p value	95% confidence interval	
					Lower bound	Upper bound
VAD	LA	1.6	-92241	0.261	-6610	3.9
VAD	Control	-3.4	.92241	*0.001	-5.7	-1.8
LA	Control	-504	.92241	*0.001	-7.3010	-2.8

**Significant at 0.05 levels*

The results in Table 3 indicate that the Post hoc Bonferroni test computed between the VAD therapy group and the LA agent group was not statistically significant (F=15.6, p = 0.261). However, the mean pain score between the VAD therapy group and control group was statistically significant (F=15.6, p= 0.001). Further, the mean pain score between the application of LA group and the control group was also found to be statistically significant (F=15.6, df= (2, 72), p= 0.001) suggesting that both VAD therapy and the application of LA agent are effective to reduce pain in children during IV cannulation.

Comparison of behavioural response between the experimental groups and the control group

Table 4: Mean and Standard Deviation of behavioural response scores of experimental groups and control group (n =75)

Group	Mean±SD	Standard Error	95% confidence interval	
			Lower bound	Upper bound
VAD	3.8 ± 3.2	0.62	2.5	5.0
LA	7.9 ± 3.2	0.64	6.6	9.2
Control	8.2 ± 4.5	0.89	6.4	10.1

The data presented in Table 4 indicate that there was a significant reduction of the mean of behavioural response score in the VAD therapy group (3.8±3.2) compared to the LA group (7.9± 3.2) and the control group (8.2± 4.5).

Table 5: Comparison of Mean behavioural response scores of the experimental groups and the control group (n=75)

	Sum of squares	df	Mean square	F	p
Between groups	312.3	2	156.2	11.7	0.001
Within groups	956.96	72	13.3		

The data presented in Table 5 show a statistically significant difference in the behavioural response scores of the experimental groups and the control group (F=11.7, p = 0.001). This suggests that the three groups differed significantly in terms of their behavioural response data. Since F ratio does not show which of the groups differ significantly, the three groups were compared with the help of Post hoc Bonferroni test. The data are presented in Table 6.

Table 6: Post hoc Bonferroni test value of the experimental groups and the control group on behavioural response (n=75)

Group I	Group J	Mean difference (I-J)	Std. Error	p value	95%confidence interval	
					Lower bound	Upper bound
VAD	LA	-4.2	1.03	*0.001	-6.7	-1.6
VAD	Control	-4.5	1.03	*0.001	-7.0	-.1.9
LA	Control	-3.2	1.03	1.00	-2.8	-2.2

*Significance at 0.05 level

The results given in Table 6 indicate that the Post hoc Bonferroni test computed between the VAD therapy group and LA group is significant, (F=11.7, p=0.001) which is similar to behavioural response score between the VAD therapy group and the control group (F=11.7, p=0.001). However, the mean behavioural response score between the LA group and the control group was not statistically significant (F=11.7, p=1.00).

Comparison of physiological parameters between the experimental groups and the control group

VAD group showed a significant reduction in respiration during and 5 minutes after cannulation (25.45±6.42, 21.54±4.53), whereas the reduction was less in the LA group (27.76±7.75, 23.48±4.31) and control group (34.16±11.54, 29.52±11.83). VAD also had a greater effect on baseline systolic blood pressure (97.41±9.76) than LA (100.5±9.9) and basic medical care (106.2±11.96) and both VAD and LA had a greater effect on systolic blood pressure 5 minutes after cannulation (99.54±10.7, 101.6±7.5) than the basic medical care provided to the control group (118±12.4).

DISCUSSION

In the present study, children who received either VAD therapy or LA agent during IV cannulation reported less pain and reduced behavioural response score compared to the control group. The findings of the study are consistent with a study conducted by Arts et al. (1994) that assessed the efficacy of local anaesthetic cream and music distraction on pain during IV cannulation among 180 children aged between 4 to 16 years. The study observed that children who received local anaesthetic cream (mean pain score 1.42) reported less pain than those receiving video assisted diversion therapy (mean pain score 2.62) and placebo group (mean pain score 2.58). The findings of the present study are consistent with the study findings of Lee (2012) who found that providing toys to children during IV cannulation correlated with significantly lesser anxiety than showing animated cartoons, or just providing standard medical care.

In the present study, in both the experimental groups the children were accompanied by the parents during IV cannulation. This could be one of the reasons for reduced pain score and behavioural response score in these groups. The study findings are consistent with the findings of Matziou (2013), who reported that children, whose parents were near to them during the painful procedure, showed a reduction in breath rate? (-4.20 to -2.80, p<0.001), mean blood pressure (-4.88 to -2.99, p<0.001) and pulse (-8.76 to -5.68, p<0.001) compared to children whose parents were absent. The rate of pain was comparatively less and they also seemed to have been relatively less distressed.

CONCLUSION

Interventions such as VAD therapy and the application of a local anaesthetic agent, along with parental presence, were found to be effective in pain management during IV cannulation for children. VAD therapy along with parental presence significantly reduced behavioural distress in children during IV cannulation. Therefore, it can be concluded that both VAD therapy and LA agent, along with parental presence, can be used as an effective measure to reduce pain and behavioural distress among children during painful procedures.

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