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EVALUATING THE EFFECTS OF PERITONSILLAR INFILTRATION OF BUPIVACAINE AND DEXAMETHASONE ON POST-TONSILLECTOMY PAIN REDUCTION IN KIDS

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This study aimed to investigate the effect of percutaneous injection of bupivacaine and dexamethasone on pain relief after pediatric tonsillectomy. This clinical trial study was performed on 68 children undergoing tonsillectomy surgery. The intervention group was given topical dexamethasone and topical bupivacaine to reduce postoperative pain but oral paracetamol was administered at a dose of 15 mg/kg when pain score was > 4 in the control group patient. Postoperative pain was recorded by VAS score at 6, 12 and 24 hrs. In the experiment 51.5% of the subjects were male and 48.5% were female and mean age was 7.5 ± 2.99 years. Mean pain at 6 and 12 hrs after surgery was not significantly different between the intervention and control groups, but at 24 hrs after surgery the mean pain in the intervention group was 1.85 ± 0.85 and in the control group was 2.38 ± 1.18 which was statistically significant. There was no significant correlation between mean age, sex, weight, and duration of surgery with mean pain scores in the intervention group and control group at 6, 12 and 24 hrs after surgery.

Keywords: *Pain management, Bupivacaine, Dexamethasone, Post-tonsillectomy pain, Tonsillectomy*

INTRODUCTION

Tonsillectomy is one of the commonest pediatric surgeries around the world[1&2] the main cause of which is the infection (recurrent tonsillitis, chronic tonsillitis and peritonsillar abscesses); another cause may be the upper airway obstruction due to lymphoid hyperplasia (enlargement of the lymphoid tissue) in the Waldeyr's Ring[3&4]. Relevant complications include pain, nausea, vomiting, fever, hemorrhage and dehydration, etc.[5]. Post-tonsillectomy pain involves an average-to-severe type, long-lasting (7 to 14 days) and disturbs the patient because of its critical locus[6-9], which brings about anxiety and further problems for both kids and parents, gravely affecting the patient's cooperation and its future course to full recovery.

The causes of post-tonsillectomy pain may be listed as using mouth retractor, the open sore at the surgical site, and the prolonged wound healing which often takes from 2 to 3 weeks[8,10&11]. Relevant risk factors in post-

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tonsillectomy pain include anxiety, the kid's age, being overweight, and the African-American ethnicity [12-14].

Some of the medications include acetaminophen, NSAIDs and opioids. Acetaminophen is recommended as a safe medication but has inadequate effects by itself. The analgesic effects of NSAIDs are observed and reported together with preventive effects on nausea and vomiting[15&16]. However, some NSAIDs such as aspirin and ketorolac have been reported to cause an increased risk of hemorrhage[17-19]. Despite their effects on pain reduction, opioids or narcotics have side effects such as apnea and lowered oxygen saturation particularly present in patients with sleep obstructive apnea (i.e. the main reason for pediatric tonsillectomy); therefore, they found limited usage and are administered as complementary to the treatment with minimum dosage when other sedatives have inadequate effects[15&16&20].

Few studies have investigated the effect of dexamethasone and bupivacaine for post-tonsillectomy pain management[21&22]. On the one hand, dexamethasone is a synthetic glucocorticoids and causes the activation of the glucocorticoids recipient. Duration of its action ranges from 24 to 36 hrs; its anti-inflammatory power is 30 times that of cortisol, and its local effect and activity are high; it is associated with good analgesic and anti-inflammatory. On the other hand, bupivacaine is a long-acting amide local anesthetic which prevents depolarization of the membrane by blocking voltage-gated Na+ channels, and reducing the influx of sodium ions into cells, and ultimately inhibits conduction of the operation potential[15&16]. Since there is a lack of a comprehensive guideline for reducing the post-tonsillectomy pain, and the present treatments are mostly systemic and have complications and limitations, the present study was designed to investigate the effects of peritonsillar infiltration of bupivacaine and dexamethasone on post-tonsillectomy pain reduction in kids.

METHODS AND MATERIALS

This single blind clinical trial was conducted on 4-to-15-year-old candidates of tonsillectomy at Heshmatyyeh Hospital in Sabzevar, Iran in 2018. The subjects were selected by convenient sampling and random allocation. Similar studies were considered; mean and standard deviation of the recorded pain by visual analog scale in the intervention group was compared to the control group; and sample size was calculated to be 30 subjects in each group (5% significance level and power of 80% to detect an effect size); due to probability of 15% subject attrition in each group, the final sample size increased to 35.

The inclusion criteria were signing the informed consent, lack of predisposing diseases, being a candidate for tonsillectomy, age range of 4 to 15 years of age, no simultaneous surgery, and not taking analgesics 24 hrs before surgery. The exclusion criteria were disinclination to participate in the study, suffering from asthma, having conditions contraindicating anesthesia, coagulation disorders, peritonsillar abscesses, present infection in the upper respiratory tract, prolonged use of analgesics, and inability to communicate. But withdrawal criteria were the patients' emigration to another region, disinclination to participate in the study, and allergy to prescribed medications.

By convenient sampling and considering indications and criteria to join the study, 70 kids and adolescents candidate of tonsillectomy were recruited for the research purposes. Participants were divided into two groups (i.e. control and intervention groups) by random allocation and using table of random allocation, so that even numbers were taken into the intervention group and odd numbers into the control group.

In the intervention group, the patients received bupivacaine 5 mg, together with dexamethasone (0.3 mg/kg) by direct injection into the upper and lower tonsil poles; after 10 min they underwent tonsillectomy. But in the control group, no medication was given prior to tonsillectomy. Since surgical procedure can make a difference in the outcome, the same ENT surgeon consistently conducted the same surgical procedure on all candidates. For further consistency, the same standard method was applied for anesthesia for all candidates.

Throughout the surgery, the patients were thoroughly monitored, and their ECG, blood pressure and O_2 level were controlled. After tonsillectomy was completed and the patients were transferred to the ward, oral

acetaminophen 10 mg/kg was administered every 6 h; they were discharged if no specific complication occurred.

Pain intensity was assessed and recorded by a VAS and physical examination for probable postoperative complications at 6, 12, and 24 h after tonsillectomy. A visual analogue scale was used for assessing and rating pain intensity; it consists of a straight line with the endpoints defining extreme limits such as 0 (no pain) to 10 (the severest pain experienced so far). The patient is asked to mark his pain level on the line between the two endpoints. A self-report measure of pain intensity developed for children was to make easier to score the sensation of pain with a series of faces ranging from a happy face (no hurt) to angry face (worst imaginable pain). In patients under 10 years of age, pain intensity recordings was assigned to their parents, and in patients above 10, the patients themselves declared the pain intensity by the VAS. In case of probable complications or need for extra doses of sedatives, the examiners recorded and reported the requirements.

The present study was approved by the research committee of Sabzevar University of Medical Sciences, Sabzevar, Iran (IR.MEDSAB.REC.1397.126) and was registered as a clinical trial (IRCT20190406043179n1). Proper information was given to patients and their parents to obtain informed consent. The VAS ratings were coded for analysis. Statistical analyses were conducted in SPSS 18 using descriptive and inferential statistics such as t-test and Pearson's correlation coefficient.

RESULTS AND DISCUSSION

Results

There were 51.5% male and 48.5% female patients. Their mean age and weight (± SD) were 7.5±2.99 and 27.66±13.55, respectively. Table 1 below compares pain ratings in the intervention and control groups at 6, 12, 24 hrs after tonsillectomy. No significant difference was found between the mean pain rating of the two groups at 6 and 12 hrs after surgery. But 24hrs after surgery, mean pain intensity in the intervention group (1.85 ± 0.85) was lower than the control group (2.38 ± 1.18), and the difference was statistically significant (p = 0.03).

Table 1: Mean pain score after tonsillectomy in control and experimental groups.

Pain	Group	Frequency	Range (Min –Max)	Mean ± SD	P-value
Pain at 6 hrs	**Intervention**	34	1-6	50.4±30.1	0.14
	Control	34	2-8	00.5±49.1	
	Total	68	1-8	75.4±41.1	
Pain at 12 hrs	**Intervention**	34	1-5	09.3±19.1	0.27
	Control	34	1-6	41.3±23.1	
	Total	68	1-6	25.3±21.1	
Pain at 24 hrs	**Intervention**	34	1-4	85.1±85.0	0.03
	Control	34	1-6	38.2±18.1	
	Total	68	1-6	12.2±05.1	

No significant relationship was found between pain intensity and age in the control group; also, no significant relationships were found at post-tonsillectomy pain rating hours and the patients'' age (Table 2).

Table 2: Relationship between age and pain intensity in the intervention group.

Hour of pain measurement	**Variable**	**Frequency**	**Mean ± SD**	**P-value**
6 hrs	Age	34	7.18 ± 2.76	0.51
	Pain mean	34	4.5-± 1.30	
12 hrs	Age	34	7.18 ± 2.76	0.81
	Pain mean	34	3.09 ± 1.19	
24 hrs	Age	34	7.18 ± 2.76	0.42
	Pain mean	34	1.86 ± 0.85	

Also, Table 3 shows that there is no significant relationship between the patients' mean weight and pain intensity in the intervention group at post-tonsillectomy pain rating hours.

Table 3: Relationship between weight and pain intensity in the intervention group.

Hour of pain measurement	Variable	Frequency	Mean ± SD	P-value
6 hrs	Weight	34	23.85 ± 11.26	0.52
	Pain mean	34	4.5- ± 1.30	
12 hrs	Weight	34	23.85 ± 11.26	0.77
	Pain mean	34	3.09 ± 1.19	
24 hrs	Weight	34	23.85 ± 11.26	0.39
	Pain mean	34	1.86 ± 0.85	

Discussion

The present study was designed to investigate the effects of peritonsillar infiltration of bupivacaine and dexamethasone on post-tonsillectomy pain reduction in kids. At 6 and 12 hrs after surgery, no significant difference was found between the pain intensity in the two groups; however, 24 h after surgery, mean pain intensity in the intervention group was significantly lower than the control group. Other variables such as weight and age did not show any significant relationship with pain in the two groups.

The results indicated that post-tonsillectomy pain was different in the two groups only 24 h after surgery, and pain in the intervention group was significantly lower than the control group These findings are in line with earlier studies[21&22]. In a double blind study on 120 kids of 6-12-year-old candidate of tonsillectomy, Basuni et al. divided them into groups of 60 by random allocation found that peritonsillar infiltration of levobupivacaine and dexamethasone (in the intervention group) reduced postoperative pain more effectively than IV dexamethasone and peritonsillar infiltration of levobupivacaine (in the control group)[22]. In a double blind study on 72 kids of 3-12-year-old candidate of tonsillectomy, Turhan et al. (2015) divided the patients into 3 groups (one control group and two levobupivacaine groups of variant doses); they assessed pain intensity four times in 24 hrs, and found that levobupivacaine was effective for reducing post-tonsillectomy pain and caused no side effects; they also concluded that both doses had equal effect but smaller dose was recommended because its probable toxicity[21].

Previous studies listed relevant risk factors in post-tonsillectomy pain as anxiety, the kid's age, being overweight, and the African-American ethnicity [12-14]. Kids having anxiety after surgery experience more pain. Adolescents experience more severe pain in comparison with young kids, and spend longer time in recovery[12&14]. In a retrospective study on 462 patients, kids with higher BMIs experienced more severe pain after surgery than those having normal BMIs[13]. But the findings of the present study were contrary to previous studies, and no significant relationships were found to exist between age, weight and pain at 6, 12, and 24 hrs after tonsillectomy. Leyla Kilinc (2019) in a study titled, peritonsillar dexamethasone-bupivacaine vs. bupivacaine infiltration for

post-tonsillectomy pain relief in children, preoperative local dexamethasone-bupivacaine infiltration in pediatric patients was shown to be more effective than bupivacaine-only and serum-only infiltration for early and late post-tonsillectomy pain control. In this study, three groups were studied(dexamethasone-bupivacaine, bupivacaine and control group , while in our study there were only two intervention groups (**bupivacaine - dexamethasone and control group)** .nevertheless, the simultaneous use of two drugs **(bupivacaine - dexamethasone)** showed a better effect in both studies(23).

Hosseini et all (2022) in this study Comparing the efficacy of peritonsillar injection of bupivacaine and intravenous acetaminophen on post-tonsillectomy pain in children. The result showed since administration of peritonsillar bupivacaine compared to acetaminophen had a better effect on managing postoperative pain and improving sedation and also since no complications were reported; The results of this study are consistent with our study and show that bupivacaine is effective in reducing pain after tonsillectomy surgery(24).

Conclusion

In short, the results suggest that peritonsillar infiltration of bupivacaine and dexamethasone is effective on post-tonsillectomy pain reduction in kids. Therefore, in preventing post-tonsillectomy pain, treatment plans may exclude the use of systemic analgesics and their side effects.

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نشرة العلوم الصيدلية
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تقييم آثار تسلل الصفاق للبوبيفاكايين وديكساميثازون على الحد من الألم بعد استئصال اللوزتين لدى الأطفال

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تهدف هذه الدراسة إلى التحقيق في تأثير الحقن عن طريق الجلد من بوبيفاكايين وديكساميثازون على تخفيف الألم بعد استئصال اللوزتين لدى الأطفال. أجريت هذه الدراسة التجريبية السريرية على ٦٨ طفلا يخضعون لجراحة استئصال اللوزتين. أعطيت مجموعة التدخل ديكساميثازون موضعي وبوبيفاكايين موضعي لتقليل الألم بعد العملية الجراحية ولكن تم إعطاء الباراسيتامول عن طريق الفم بجرعة ١٥ مجم / كجم عندما كانت درجة الألم > ٤ في مريض المجموعة الضابطة. تم تسجيل ألم ما بعد الجراحة من خلال درجة VAS في ٦ و ١٢ و ٢٤ ساعة. في التجربة ، كان ٥١,٥٪ من الأشخاص من الذكور و ٤٨,٥٪ من الإناث وكان متوسط العمر ٧,٥ ± ٢,٩٩ سنة. لم يكن متوسط الألم في ٦ و ١٢ ساعة بعد الجراحة مختلفا بشكل كبير بين مجموعات التدخل والمجموعة الضابطة ، ولكن في ٢٤ ساعة بعد الجراحة كان متوسط الألم في مجموعة التدخل ١,٨٥ ± ٠,٨٥ وفي المجموعة الضابطة كان ٢,٣٨ ± ١,١٨ والتي كانت ذات دلالة إحصائية. لم يكن هناك ارتباط كبير بين متوسط العمر والجنس والوزن ومدة الجراحة مع متوسط درجات الألم في مجموعة التدخل ومجموعة التحكم في ٦ و ١٢ و ٢٤ ساعة بعد الجراحة.