Role of Pre-Operative Single Dose Dexamethasone on Post Tonsillectomy Morbidities

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Abstract

Objective: The purpose of this study is to evaluate the efficacy and safety of preoperative single-dose dexamethasone versus tonsillectomy without dexamethasone. Methods: After the ethical approval from institutional review board, this randomized controlled trail was conducted at Department of Anesthesia, KTH, Peshawar, from 1st April 2020 to 1st October 2020. A total of 108 patients of both gender undergoing tonsillectomy were included in the study. 54 patients were in dexamethasone group (Group A) while 54 patients were in without dexamethasone group (Group B). Efficacy and safety was noted as per operational definition from both groups. Results: Efficacy was observed in 48 (88.9%) patients in group A as compare to 22 (40.7%) patients in group B (P= 0.000). Safety was observed in 51 (94.4%) patients in group A as compare to 47 (87%) patients in group B (P= 0.000). Conclusion: We conclude that a single intravenous dosage of dexamethasone administered after induction of anesthesia resulted in effective and durable pain relief.

Keywords: Tonsillectomy, dexamethasone, Pain, Nausea.

1. Introduction

Tonsillectomy is the second most frequent operation on children, according to the American Society of Otolaryngology. While analgesic and surgical techniques have advanced, postoperative pain remains a major therapeutic issue1. Between 40% and 73% of surgical patients get PONV, or postoperative nausea and vomiting 2. The most frequent ENT surgical operation is a tonsillectomy. Surgery is the most common method, although it often results in complications that need further medical attention. Patients' quality of life is negatively impacted and their length of stay in the hospital is prolonged most often due to severe pain after tonsillectomy3, 4. It alters eating habits and contributes to an increase in mortality. Moreover, a high rate of postoperative bleeding is associated with an increased death risk5, 6. Postoperative inflammation, nausea, and vomiting have all been treated with dexamethasone7. By blocking phospholipase, steroids reduce the production of pain-inducing byproducts of the cyclooxygenase and lipoxygenase pathways. Pain is made worse by corticosteroids because they prevent the release of proinflammatory enzymes, bradykinin, and neuropeptides from wounded nerve terminals8. Moreover, interleukins 1, 6, and 8, tumor necrosis factor, C-reactive protein, and leukocyte adhesion molecules are all reduced by corticosteroids throughout the perioperative period. Many of corticosteroids' effects have a delayed start since they depend on gene expression and protein creation, unlike other analgesics9. The results seemed better with preoperative dose than with intraoperative delivery. Because of its lasting benefits, dexamethasone has become the drug of choice. The use of dexamethasone as a pain reliever during tooth extraction has been documented10. The analgesic impact of dexamethasone in post-tonsillectomy patients has been the subject of a number of studies, with varying conclusions11. The purpose of this study is to evaluate the efficacy and safety of preoperative single-dose dexamethasone versus tonsillectomy without dexamethasone.

2. Methodology

After the ethical approval from institutional review board, this randomized controlled trail was conducted at Department of Anesthesia, KTH, Peshawar, from 1st April 2020 to 1st October 2020. Sample size was calculated with 95% Confidence

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Level and alpha = 5% with power = 80%, Estimated sample size n = 108, recruited thorough non-probability consecutive sampling. Patients between age group 18-50 years, of either gender, undergoing tonsillectomy , with ASA grade I / II were included in the present study, Patients with the history of peritonsillar abscesses, malignancy, sleep apnea, renal disease or diabetes were excluded from the present study. Patients' baseline characteristics were recorded, including their ages, sexes, and weights. Each participant signed an informed consent form attesting to the study's lack of risk and to the participants' right to privacy. Blind balloting was used to randomly divide the subjects into two groups of 54 people. Group A consisted of 54 patients given dexamethasone, while Group B had no such treatment. Intra-muscular injections of 0.004 mgkg-1 of glycopyrrolate were given to all patients 30 minutes prior to induction. Pentazocine (0.3 mg/kg) and midazolam (0.04 mg/kg) were administered intravenously. The trachea was intubated after intravenous (iv) thiopentone (5 mgkg-1) and intravenous (iv) suxamethonium (2 mgkg-1) were used for induction. Controlled ventilation and inj. vecuronium 0.08 mgkg-1 or inj. atracurium 0.5 mgkg-1 were utilized to keep the patient under anesthetic sedation for the duration of the procedure. Group B received 5 ml of saline and Group A received dexamethasone 0.15 mgkg-1 diluted in 5 ml of saline IV before surgery. The tonsils were removed using a snare and a sharp dissection. Tie ligation was used to stop bleeding. Curettes were used to remove adenoids where medically necessary. Packs and sutures were used to stop the bleeding. In other words, no electrocautery was employed. A rate of 5 ml/kg/hour was used to infuse lactated ringer's solution with dextrose intraoperatively. Supplemental fluids at a rate of 2 mlkg-1hr-1 during the starvation period were also given. Blood loss was replaced with three times the volume by crystalloid. After surgery, residual secretions and blood was removed with gentle suction. Neuromuscular blockade was reversed with inj. neostigmine and inj. atropine. Patients were extubated when they had satisfactory motor recovery and when they were fully awake. Second anesthesiologist, who was unaware about the drug administered, monitored the patient in post anaesthesia care unit (PACU) for first six hours and in the ward from 6-24 hours. Efficacy and safety was noted as per operational definition and recorded on especially designed proforma. Data was analyzed with statistical analysis program (IBM-SPSS V22). Frequency and percentage was computed for qualitative variables like gender, ASA grade, efficacy and safety. Mean ±SD was presented for quantitative variables like age, duration of procedure and weight. Chi-square test was applied to compare efficacy and safety of both groups, taken $p \leq 0.05$ as significant. Stratification was done with regard to age, ASA grade, gender, duration of procedure and weight to see the effect of these variables on efficacy and safety. Post stratification chi-square test for both groups was applied, $p \leq 0.05$ was considered statistically significant.

3. Results

Table 1 shows the demographic and clinical parameters of the study participants in both groups. Mean age of 24.870±5.85 years, mean duration of procedure 46.851±3.88 minutes and mean weight was 65.518±6.10 Kg in Group A and mean age of 23.944±6.23 years, mean duration of procedure 44.851±3.82 minutes and mean weight was 66.907±6.54 Kg in Group B. Male gender was dominant in both study groups. Majority of the participants in both the study groups belonged to ASA grade I. Efficacy was observed in 48 (88.9%) patients in group A as compare to 22 (40.7%) patients in group B (P= 0.000) (Table 2). Safety was observed in 51 (94.4%) patients in group A as compare to 47 (87%) patients in group B (P= 0.000). Stratification of efficacy and safety in both groups with regard to age, gender, ASA grade, duration of procedure and weight is shown in the table 3 and 4.

Table 1: Demographic and clinical parameters of the study participants in both groups

Parameters	Group A (n=54)	Group B (n=54)
Age (years)	24.870±5.85	23.944±6.23
Gender (Male/Female)	41/13	35/19
ASA Grade (I/II)	52/2	51/3
Surgery Duration (minutes)	46.851±3.88	44.851±3.82
Weight (kg)	65.518±6.10	66.907±6.54

Table 2: Comparison of efficacy and safety in both groups

Efficacy	Group A (n=54)	Group B (n=54)	P Value
Yes	48 (88.9%)	22 (40.7%)	0.000
No	6 (11.1%)	32 (59.3%)	
Safety	Group A (n=54)	Group B (n=54)	P Value
Yes	51 (94.4%)	47 (87%)	0.184
No	3 (5.6%)	7 (13%)	

Table 3: Stratification of efficacy in both groups				
Age- wise	Study Groups	Efficacy		P Value
		Yes	No	
Age 18-35 years	A	47(97.9%)	1(2.1%)	0.000
	B	22(44%)	28(56%)	
Age 36- 50 years	A	1(16.7%)	5(83.3%)	0.389
	B	0(0%)	4(100%)	
Gender wise				
Female	A	12(92.3%)	1(7.7%)	0.000
	B	5(26.3%)	14(73.7%)	
Male	A	36(87.8%)	5(12.2%)	0.000
	B	17(48.6%)	18(51.4%)	
ASA Grade-wise				
ASA I	A	48(92.3%)	4(7.7%)	0.000
	B	22(43.1%)	29(56.9%)	
ASA II	A	0(0%)	2(100%)	1.00
	B	0(0%)	3(100%)	
Procedure duration-wise				
≤ 45minutes	A	14(93.3%)	1(6.7%)	0.003
	B	14(48.3%)	15(51.7%)	
>45minutes	A	34(87.2%)	5(12.8%)	0.000
	B	8(32%)	17(68%)	
Weight wise				
≤70kg	A	47(100%)	0(0%)	0.000
	B	21(50%)	21(50%)	
>70kg	A	1(14.3%)	6(85.7%)	0.683
	B	1(8.3%)	11(91.7%)	

Table 4: Stratification of safety in both groups				
Age- wise	Study Groups	Safety		P Value
		Yes	No	
Age 18-35 years	A	45(93.8%)	3(6.2%)	0.324
	B	44(88%)	6(12%)	
Age 36- 50 years	A	6(100%)	0(0%)	0.196
	B	3(75%)	1(25%)	
Gender wise				
Female	A	10(76.9%)	3(23.1%)	0.337
	B	17(89.5%)	2(10.5%)	
Male	A	41(100%)	0(0%)	0.012
	B	30(85.7%)	5(14.3%)	
ASA Grade-wise				
ASA I	A	49(94.2%)	3(5.8%)	0.281
	B	45(88.2%)	6(11.8%)	
ASA II	A	2(100%)	0(0%)	0.361
	B	2(66.7%)	1(33.3%)	
Procedure duration-wise				
≤ 45minutes	A	14(93.3%)	1(6.7%)	0.159
	B	29(100%)	0(0%)	
>45minutes	A	37(94.9%)	2(5.1%)	0.010
	B	18(72%)	7(28%)	
Weight wise				
≤70kg	A	44(93.6%)	3(6.4%)	0.886
	B	39(92.9%)	3(7.1%)	
>70kg	A	7(100%)	0(0%)	0.085
	B	8(66.7%)	4(33.3%)	

4. Discussion

Post-tonsillectomy discomfort has been linked to factors including tissue injury-induced rapid inflammation, nerve irritation, and spasm of exposed pharyngeal muscle. The increased prevalence of PONV after tonsillectomy is due in large part to oropharyngeal discomfort and the irritation of stomach mucosa by ingested blood. Corticosteroids relieve pain by halting the generation of painful prostaglandins by blocking the cyclooxygenase and lipooxygenase pathway. Significant analgesia with corticosteroids has been documented after third molar extraction, hallux valgus correction, and haemorrhoidectomy12, 13. Two investigations have shown a link between low levels of cortisol (whether endogenous or exogenously supplied) and nausea and vomiting, albeit the specific mechanism by which corticosteroids work as anti-emetic is unknown 14, 15. Studies have indicated that corticosteroids are helpful for treating nausea and vomiting caused by chemotherapy, gynecological procedures, thyroid removal, and narcotic overdose 16-18. Henzi et al. 19 conducted a meta-analysis of 17 studies investigating the efficacy of dexamethasone for the prophylaxis of postoperative nausea and vomiting. For adults, the ENT was 7.1 (95% CI 4.5-18) and for children, it was 3.8 (2.9-5), both when compared to the placebo group. There was no indication of clinically meaningful harm in these otherwise healthy individuals after receiving a single preventive dose of dexamethasone when there was a high chance of PONV. The impact seems to be greatest late on. Both local steroid infiltration and a 4-day course of oral steroid therapy have demonstrated promise in tonsillectomy patients 20-22.The research on the use of intravenous corticosteroids after tonsillectomy, however, is contradictory 21-26. Most studies either don't include a control group or lack uniformity in anesthetic and surgical procedures. There are debates regarding the best corticosteroid to use, how often to provide it, and whether it should be used alone or as an adjuvant to other medications. For pediatric patients undergoing tonsillectomy or adenotonsillectomy, Steward et al. 26 conducted a meta-analysis of randomized, double-blind, placebo-controlled studies using a single dose of intravenous intraoperative steroid. The researchers were able to include eight studies. They came to the conclusion that giving children steroids on a regular basis would eliminate vomiting in one out of four cases. Furthermore, people would start eating solid food or soft food sooner 27. Nevertheless, meaningful analysis of pain as a separate end point was not possible due to lack of data and differences in outcome measures. Just two out of the three studies 21, 28 that looked at pain ratings as an outcome actually published sufficient data for analysis. Just three out of the eight studies that looked at analgesic usage published sufficient data for analysis 21, 23, 28, and those three studies all used different outcome measures. Similar findings were reported by Goldman AC et al. 29. Our primary objective was to evaluate the safety and effectiveness of single-dose dexamethasone before and after tonsillectomy. Because of its high potency and lengthy half life (36-72 hours) for glucocorticoid action, we decided to use dexamethasone to ensure that the impact would last even after the patient was sent home. Due to its lack of adverse effects including gastritis, adrenal suppression, etc., a single IV dosage was employed 30. Preoperative intravenous medication administration was performed for optimum postoperative benefit. There was uniformity in the use of anesthesia and in surgical procedures. We decided on 0.15 mgkg-1 of dexamethasone because... Originally, children have received dosages between 0.15 and 1 mgkg-1, with maximal levels between 8 and 25 mg 26.Close to half of participants in these investigations were given a lower dosage than what was estimated per kilogram of body weight. For instance, the dosage employed in Vosdoganis's study 28 was 0.4 mgkg-1 (maximum dose 8 mg). They ranged in size from 21.8 to 8.1 kg. Half of the patients got a dosage that was less than per kilogram. Second, Splinter and Roberts 24 successfully employed 0.15 mgkg-1 dexamethasone in a major research including 133 individuals. Third, an adult dosage of 8 or 10 mg is often administered; this is equivalent to a pediatric dose of 0.15 mgkg-1. Fourth, a research comparing different doses (1.25 mg to 10 mg) in women having thyroidectomy indicated that a dosage of 5 mg was the bare minimum effective. This is also equivalent to a dosage of 0.10 mgkg-1. We had a broad variety of body weights, therefore it was better to utilize per kg dosages rather than a set amount. This was done to ensure that a sufficient number of patients were included for statistical significance. To further rule out confounding variables, 15 minutes were given for the patient to react to tender loving care or for the pain to lessen before the administration of rescue analgesic 31. The VAS ratings of the dexamethasone group were consistently lower than those of the placebo group after surgery. The gap between the two groups' VAS values widened as time passed following surgery. Patients who were given dexamethasone reported feeling better within 6-24 hours. That dexamethasone's analgesic effects last for a while is seen here. Dexamethasone reduced both the frequency with which patients required rescue analgesics and the intensity of those dosages. In our investigation, the overall incidence of PONV was lower than in others (40-70%), maybe because we did not use strong opioids or electrocautery 19. Electrocautery is associated with increased pain and postoperative nausea and vomiting 32. Dexamethasone doses of 8-10 mg have been demonstrated to reduce the risk of postoperative nausea and vomiting by 50 percent in previous trials. There was no significant difference in the occurrence of PONV between the two groups in our investigation, other than the frequency of vomiting episodes. The incidence of PONV was reduced from 62% to 40%, as shown by Pappas et al 33. For adenotonsillectomy, 1 mgkg-1 of dexamethasone is used. Splinter et al. found that the incidence of PONV was reduced from 72% to 40% when treated with 0.15 mgkg-1 dexamethasone 24. Maybe because of the overall low incidence of PONV in our trial, a dosage of 0.15 mgkg-1 did not exhibit such benefit in our investigation. With dexamethasone, we saw a significant improvement in the quality of oral intake. It may have helped with oral intake by making it more tolerable. Children who were given dexamethasone were more likely to progress to a soft or solid diet by post-tonsillectomy day 1 (RR= 1.69; 95% CI, 1.02-2.79; p =0.04), according to a meta-analysis conducted by Steward et al. 26. Recovery following tonsillectomy in children was examined by Catlin and Grimes100, who looked at the impact of a single postinduction dosage of 8 mgm-2. On day 3, 50% of those receiving steroids had a healthy appetite, but only 12% of those receiving the placebo did, and 60% of those receiving dexamethasone were able to consume a normal diet, while only 13% of those receiving placebo did. In 1970, Papangelou administered 0.5 mg betamethasone tablets four times a day for four days to treat 323 patients 22. The dosage increased by 0.5 mg every six hours on the first day, to 0.5 mg every eight hours on the second day, to 0.5 mg every 12 hours on the third day, and to 0.5 mg once on the fourth day. Oral consumption was higher in the steroid group compared to the control group. Our study's single IV dosage of dexamethasone may have contributed to the lack of a significant difference in the mean days to start solid meals between the dexamethasone and control groups. Oral dexamethasone given the day after may have prompted earlier solid food consumption. To determine the effectiveness and safety of repeated dosing, however, randomized controlled trials are required.

5. Conclusion

In conclusion, we found that a single intravenous dosage of 0.15 mgkg-1 dexamethasone administered after induction of anesthesia produced excellent and lasting analgesia, decreased oedema, and led to faster and higher quality oral intake without adverse effects. Unfortunately, the safety profile of the dosage was too low to be effective as an antiemetic.

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