

The use of dexamethasone for early postoperative pain relief in tonsillectomized children

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ABSTRACT

Pain is an important morbidity of tonsillectomy in children. Dexamethasone may lessen inflammatory response in the operative field, then decreasing the leakage of inflammatory mediators into the circulation and reducing the associated symptoms and signs including pain. To evaluate the role of a single intraoperative intravenous dose of dexamethasone (0.15 mg/kg) in controlling of early postoperative pain in tonsillectomized children. This work is a prospective double blinded, randomized case-control study of one hundred children aged 4 to 15 years who admitted for tonsillectomy from April 2017 to June 2019 at Alshifaa General Hospital, 50 of them were given dexamethasone 0.15 mg/kg intraoperatively as a case (dexamethasone) group, compared with an age-matched control group of 50 children, which consisted of children who received an equivalent volume of saline to evaluate the role of a single intraoperative intravenous dose of dexamethasone (0.15 mg/kg) in controlling of immediate postoperative pain in tonsillectomized children. the assessment of postoperative pain was done by using objective pain scale (OPS). Pain scores were significantly lowered in dexamethasone group (18%) in comparison to control group (40%) throughout the first 6 hours. Dexamethasone (0.15 mg/kg) provided significant reduction of immediate postoperative pain in tonsillectomized patients.



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1. INTRODUCTION

One of the most surgical modalities that carried on children especially those under fifteen year old is tonsillectomy and it seems to be in increment [1- 3]. To decide to do tonsillectomy, there are two main indications either recurrent throat infections or obstructive sleep disorder [4]. In spite of the development of recent surgical and anesthetic skills, post-tonsillectomy pain is still in the first rank of types of surgeries that lead to a significant pain even in comparison with other major operations [5]. Nowadays many surgeons prefer to do tonsillectomy on bases of day clinic surgery so the postoperative morbidity especially pain management provided by the caregivers [6]. Using steroids is one of the recommended methods to relief post-tonsillectomy pain [7]. As there is a significant oedema and inflammation occurred in the tonsillar bed, dexamethasone may decrease inflammatory response in the operative field by inhibiting both inflammatory

cells mediators and lysosome enzymes production, resulting in decreased both of leucocytes extravasation and vascular permeability in the operative tonsillar bed, which consequences in a reduced inflammation and lowering of the associated symptoms and signs including pain [8]. The antiemetic properties of dexamethasone play an additional factor that allowing its use in management of post tonsillectomy morbidity [9]. One of the benefits for using dexamethasone is its minimal side effects in comparison with others types of steroids also dexamethasone is inexpensive [10].

2. Patients and methods

One hundred patients aged 4-15 years underwent tonsillectomy from April 2017 to June 2019 at Alshifaa General Hospital; they were enrolled in a prospective study. Exclusion criteria are patients who underwent accompanied procedures other than tonsillectomy or adenotonsillectomy and those on therapy with corticosteroids or aspirin or those with diabetes, coagulopathy, renal disease or cardiovascular diseases. Patients were randomly divided by the anesthetist into control or case (dexamethasone) group.

Following induction with 1.5 to 3% inhalational isoflurane, trachea was intubated. Anaesthesia was maintained with 1.5 to 3.5% isoflurane with oxygen and continued with spontaneous breathing. Before commencement of surgery, the anesthetist administered either dexamethasone 0.15 mg/kg or a same volume of saline randomly.

Cold steel dissection method was used for tonsillectomy and associated adenoidectomy was done, in case of need, by curettes. Haemostasis was achieved using packs or sutures.

Intraoperatively, glucose saline solution (0.45 % normal saline with 2.5 % dextrose) was used at a rate of 5 ml per kilogram per hour infusion.

After surgery, remaining blood were suctioned gently. Extubation was done when the patients had adequate motor recovery, return of cough reflex and when they were fully awake.

Monitoring of the patients was done in the ward by one of the researchers for first six hours who hadn't any idea about the drug administered during the procedures. Objective pain scale (OPS) was used to assess pain (as shown in the following appendix).

2.1 Objective pain scale [11], [12]

Observation	Criteria	Points
Blood pressure	±10% of preoperative	0
	>20% of preoperative	1
	>30% of preoperative	2
Crying	Not crying	0
	Crying but responding to tender loving care	1
	Crying and does not respond to tender loving care	2
Movement	None	0
	Restless	1
	Thrashing	2
Agitation	Patient asleep or calm	0
	Mild	1
	Hysterical	2

Verbalizes pain	Asleep or no verbalization of pain	0
	Cannot localize pain	1
	Localizes pain	2

Recordings were done hourly. For analytic purposes, patients of each group were distributed into three categories of pain: pain free = OPS 0-3; mild pain = OPS 4-5 and significant pain= OPS 6 or more. Chi square (X^2) analysis was used to analyze data. Probability (P) value < 0.05 was considered as significant.

3. Results

Table 1 shows all demographic data which were comparable for both groups. The difference was not significant between those data where X^2 was 0.407 and P value was more than 0.05 for age, X^2 was 0.66 and P value was more than 0.05 for sex and lastly X^2 was 0.39 and P value was more than 0.05 for surgery types. Assessment of post-tonsillectomy pain was done using OPS. Except in fifth and sixth postoperative hours, the scores were significantly higher in control group (P value was less than 0.05); but they were not significantly higher in group in the fifth and sixth postoperative hours (P value was more than 0.05) as shown in table 2 and the figure below. Data are analyzed using Chi square (X^2) analysis. In first six postoperative hours, the significant pain incidence was 18% in dexamethasone group versus 40% in control group (P < 0.05) and throughout those hours as shown in table 3.

Table 1: demographic data distribution of patients.

Parameters	Dexamethasone	Control
Number of patients	50	50
Mean age (years)	7.6	7.36
Mean weight (kg)	24.52	26.44
Male/Female	31/19	27/23
Tonsillectomy/ adenotonsillectomy	20/30	17/33

Table 2: objective pain scores distribution.

Time	Dexamethasone	Control	P value
1 st hour	1.8	2.98	< 0.05
2 nd hour	1.62	2.68	< 0.05
3 rd hour	1.2	1.94	< 0.05
4 th hour	0.76	1.32	< 0.05
5 th hour	0.62	0.86	> 0.05
6 th hour	0.44	0.52	> 0.05

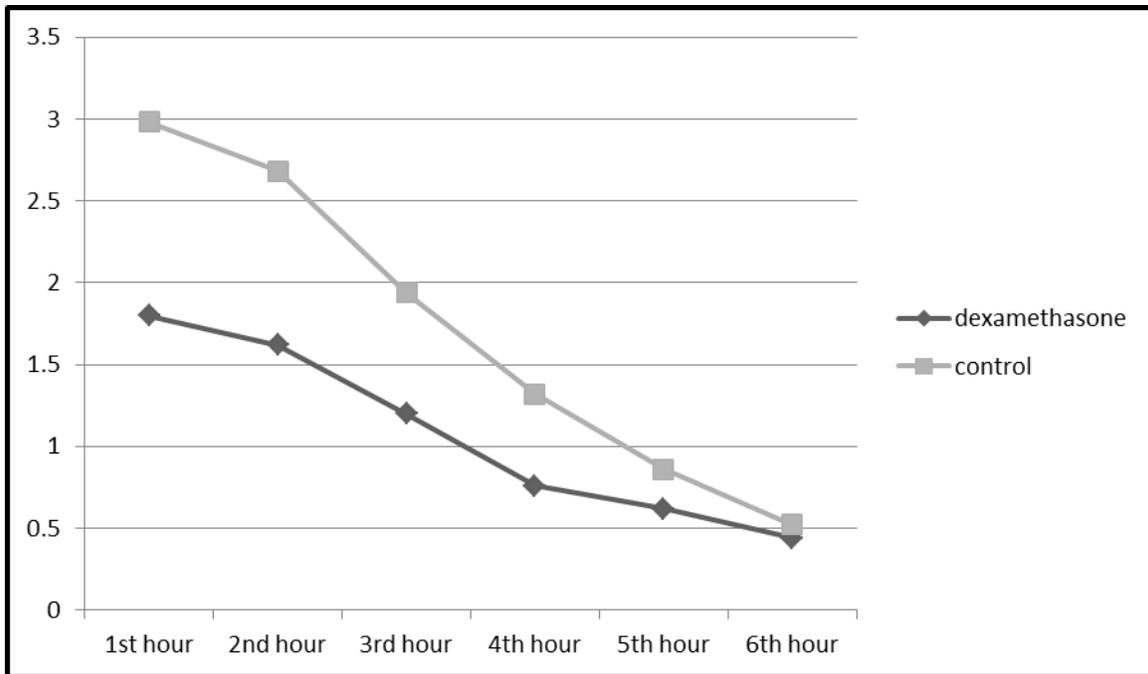


Figure. Objective pain scores distribution.

Table 3: Objective Pain Scale.

Pain = OPS	Dexamethasone	Control
Pain free = 0-3	12 (24%)	7 (14%)
Mild = 4-5	29 (58%)	23 (46%)
Significant = 6-10	9 (18%)	20 (40%)

4. Discussion

Post-tonsillectomy pain is a real comorbidity problem that results from tissue trauma which initiated by acute inflammatory response, irritation of nerve fibers and the spasm of exposed muscles of pharyngeal wall [13]. A randomized double blind placebo controlled trials of a single dose of intravenous intraoperative steroid was done by [14] for children who submitted to tonsillectomy with or without adenoidectomy. Due to the different outcome measures (pain, vomiting and early oral intake) and lost data, pain could not be profoundly assessed as a separate clear topic.

In our study, the main aim was to found out the influence of a preoperative dose of dexamethasone on early pain results following tonsillectomy. We used a single dose of dexamethasone because it is lacking of adverse effects including gastritis, adrenal insufficiency and other mineralocorticoid side effects [15].

Dexamethasone was given intravenously before operation to reach its peak effect in the early postoperative period. Standardization of the anaesthetic and surgical procedures were done for both the studied and controlled groups as stated previously.

We designated the dexamethasone dose as 0.15 mg/kg because doses fluctuating from 8 to 25 mg as maximum ones have been used in paediatric patients in other studies [16], and regarding our work, half of the included patients received less than the recommended per kg dose. Their mean weight was 24.52 kg (dexamethasone group). This means that half of the patients received a dose of 3.7 mg which was off course less than that

lowest maximum per kg dose (8 mg). Also we found that the differences were not significant among the different doses of dexamethasone on the incidences of pain scores that are comparable to [17] study who used a doses between 0.0625 mg/kg (the lowest dose) and 1mg/kg (the highest dose).

Pain is frequently considered as the fifth vital sign in healthcare because it is an 'objective' sensation rather than subjective one, and that is resemble other vital signs [18]. Objective pain score of 4 could occur due to causes differ from pain but OPS of 6 would better indicate pain [19]. So we chose OPS of 6 and more as significant pain level.

Post-tonsillectomy pain has two constituents: constant and swallow-induced pain [20]. Its strength considerably affected the transmission of patients from a liquid to a soft diet [21], and thus severe pain can result in decreasing in oral eating, dehydration and delayed recovery after surgery [22].

The difference was not significant between the involved age and sex for both case and control groups and this is obvious in table 1; beside the standardization of anaesthesia and surgical techniques.

Patients were followed for six hours postoperatively. Except in fifth and sixth postoperative hours, the scores were significantly higher in control group; whereas they were not significantly higher in the same group in the fifth and sixth postoperative hours as shown in table 2. The significant pain had the incidence of 18% in dexamethasone group versus 40% in control group in the first six postoperative hours as shown in table 3. Those findings are corresponding to those in [23], [24].

We found that an IV dose of 0.15 mg/kg dexamethasone, given after the induction of anaesthesia, produced good analgesia in the early postoperative period, and this is corresponding to the results of most of studies like [25- 28] and all of those studies had been used cold steel dissection tonsillectomy as the reference technique. Although, a small number of studies like [29- 31] which have been revealed that dexamethasone was ineffective in reducing post-tonsillectomy pain; but that might be due to non-standardization of anaesthesia and/or surgical technique.

5. Conclusion

The use of preoperative dexamethasone significantly decreases early postoperative pain tonsillectomized children while using standard anaesthesia method and cold steel sharp dissection tonsillectomy.

6. Ethical Approval

This study was approved by the Ethical Committee. Written informed consent was obtained from the parents.

7. Conflicts of interest

The authors declare that they have no competent interest.

8. References

- [1] Yogesh B. and Ian H., Diseases of Tonsils, Tonsillectomy and Tonsillotomy. John C Watkinson, Scott-Brown's Otorhinolaryngology, Head and Neck Surgery, 8th edition, 2018, Taylor & Francis Group; 38: 437-9.
- [2] Hansen J, Shah R, Benzon H, Management of pediatric tonsillectomy pain: a review of the literature. Ambulatory Anesthesia, 2016;3 23–26

- [3] Ari J and Richard M, Tonsillectomy, Adenoidectomy and UPPP. *Surgical Atlas of Pediatric Otolaryngology* 2002; 17: 379.
- [4] Patel HH, Straight CE, Lehman EB, et al. Indications for tonsillectomy: a 10-year retrospective review. *Int J Pediatr Otorhinolaryngol.* 2014; 78:2151-2155.
- [5] Gerbershagen HJ, Aduckathil S, van Wijck AJ, et al. Pain intensity on the first day after surgery: a prospective cohort study comparing 179 surgical procedures. *Anesthesiology* 2013; 118:934–44.
- [6] Walton J, Ebner Y, Stewart MG, April MM: Systematic review of randomized controlled trials comparing intracapsular tonsillectomy with total tonsillectomy in a pediatric population. *Arch Otolaryngol Head Neck Surgery.*2012; 138(3):243–249. doi:10.1001/ archoto.2012.16
- [7] Ericsson E, Brattwall, M, Lundeberg, S. Swedish guidelines for the treatment of pain in tonsil surgery in pediatric patients up to 18 years. *International Journal of Pediatric Otorhinolaryngology*, 2015; 79: 443-450.
- [8] Kang Y, Ku EJ, Jung IG, Kang MH, Choi YS, Jung HJ. Dexamethasone and post adenotonsillectomy pain in children: double-blind, randomized controlled trial. *Medicine.*Oct.22 ,2021;100(42):1-6
- [9] V. Hermans, F. De Pooter, F. De Groote et.al. Effect of dexamethasone on nausea, vomiting, and pain in paediatric tonsillectomy. *British Journal of Anesthesia* 2012 109 (3): 427–31
- [10] Steward DL, Grisel J, Meizen-Derr J. Steroids for improving recovery following tonsillectomy in children. *Cochrane Database Syst Rev.* 2011(8): 1-35. CD003997
- [11] Brian JW and Audie LW, Pharyngitis and Adenotonsillar Disease. Paul W. Flint, Cummings *Otolaryngology Head and Neck Surgery*, Fourth Edition, 2005, Elsevier Mosby publishers; 181:4135-6
- [12] Yelizaveta S, Kelvin C, Joseph M, Management of Adenotonsillar Disease. *Current Diagnosis and Treatment in Otolaryngology, Head and Neck Surgery*, 2005; 20: 340-1
- [13] Robinson S R, Purdie G L. Reducing post-tonsillectomy pain with cryoanalgesia: a randomized controlled trial. *Laryngoscope.* 2000;110(7):1128–1131.
- [14] Steward DL, Welge JA, Myer CM. Do steroids reduce morbidity of tonsillectomy? Meta-analysis of randomized trials. *Laryngoscope.* 2001 Oct; 111(10):1712-8.
- [15] Schimmer BP, Funder JW. ACTH, Adrenal Steroids, and Pharmacology of the Adrenal Cortex. In: Goodman & Gilman's: *The Pharmacological Basis of Therapeutics*, 12th ed, Brunton LL, Chabner BA, Knollmann BC (Eds), McGraw-Hill Education 2011.
- [16] Afman CE, Welge JA, Steward DL. Steroids for post tonsillectomy pain reduction: meta-analysis of randomized controlled trials. *Otolaryngol Head Neck Surg* 2006; 134:181-186
- [17] Lin Chung EB, Yan Hou T. Effect of dexamethasone on post tonsillectomy pain: randomized controlled trail. 2009 Oct;23(20):936-8.

- [18] Hannallah RS. Postoperative analgesia in the paediatric patient. *Can J Anesth* 1992;39:649-54.
- [19] Verghese ST, Hannallah RS. Postoperative pain management in children. *Anesthesiol Clin North America* 2005;23:163-84.
- [20] Qian L, Li X, Chen H, Chi X. Recent advances in post-tonsillectomy analgesia. *Dig Med Res* 2020;3:20-38.
- [21] Isaacson, G . Tonsillectomy healing. *Ann Otol Rhinol Laryngol.* 2012;121(10):645–649
- [22] Moir MS, Bair E, Shinnick P, Messner A. Acetaminophen versus acetaminophen with codeine after pediatric tonsillectomy. *Wiley Online Library*; 2000; 1824–27.
- [23] Kaan MN, Odabasi O, Gezer E, Daldal A. The effect of preoperative dexamethasone on early oral intake, vomiting and pain after tonsillectomy. *International Journal of Pediatric Otorhinolaryngology.* 2006 Jan; 70(1): 73-9.
- [24] Khani A and Jaafarpour M. The effect of dexamethasone on morbidity related to vomiting, pain and oral intake in children after tonsillectomy. *Journal of Clinical and Diagnostic Research.* 2009; 3: 1641- 46.
- [25] Vosdoganis F and Baines DB. The effect of single dose intravenous dexamethasone in tonsillectomy in children. *Anesth Intensive Care* 1999; 27: 489-92.
- [26] Volk MS, Martin P, Brodsky L, Stanievich JF, Ballou M. The effects of preoperative steroids on tonsillectomy patients. *Archive of Otolaryngology Head and Neck Surgery* 1993; 109: 726-30.
- [27] Catlin FI and Grimes WJ. The effect of steroid therapy on recovery from tonsillectomy in children. *Archive of Otolaryngology Head and Neck Surgery* 1991; 117: 649-52.
- [28] Ohlms LA, Wilder RT, Weston B. Use of intraoperative corticosteroids in pediatric tonsillectomy. *Archive of Otolaryngology Head and Neck Surgery* 1995; 121: 737-42
- [29] April MM, Callan ND, Nowak DM, Hausdorff MA. The effect of intravenous dexamethasone in pediatric adenotonsillectomy. *Archive of Otolaryngology Head and Neck Surgery* 1996; 122: 117-20.
- [30] Pappas ALS, Sukhani R, Hotaling AJ, Mikat-Stevens M, Javorski JJ, Donzelli J. The effect of preoperative dexamethasone on the immediate and delayed postoperative morbidity in children undergoing adenotonsillectomy. *Anesth Analg* 1998; 87: 57-61.
- [31] Tom LW, Templeton JJ, Thompson ME, Marsh RR. Dexamethasone in adenotonsillectomy. *International Journal of Pediatric* 1996; 37:115-20.