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Original Research Article

A study to assess the effects of a single preoperative dose of steroid on thyroidectomy

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ABSTRACT

Background: On thyroidectomy, incidence of postoperative nausea and vomiting, severe pain with local inflammation and voice impairment was very common. These effects can be manipulated by the use of steroids. Hence the present study, was conducted with the objective to evaluate the effects of a single preoperative dose of dexamethasone on thyroidectomy in terms of postoperative nausea and vomiting (PONV), pain and voice improvement.
Methods: The present study was conducted between October 2010 and March 2011 at the Department of General Surgery, Government Medical College, Kottayam, Kerala, India. A total of 72 patients were included in the study after meeting requirements of inclusion criteria. They were divided into two groups. 37 were under Group C and received normal saline and remaining 35 served as Group D and received 8 mg/2 mL of dexamethasone preoperatively. Post-operative incidences of nausea and vomiting, pain scores, and the improvement of vocal function were compared in both groups.
Results: Out of 72 patients, most of the patients participated were under the age group of 40-50 years (30.6%). Of them 9 were males and 63 were females. The incidence and severity of PONV and pain was significantly reduced in Group D compared to Group C with P values of 0.001 and 0.056 respectively. Significant protection of dexamethasone towards vocal function was not observed in the study (p =0.245).
Conclusions: From the results obtained in the study, it was concluded that preoperative single dose administration of dexamethasone seemed to be safe in healthy patients undergoing thyroidectomy.

Keywords: Dexamethasone, PONV, Single preoperative dose, Thyroidectomy

INTRODUCTION

Thyroidectomies are one of the most common elective surgical procedures worldwide.[1] Unlike other surgical interventions, where the incidence of postoperative nausea and vomiting is less than 30%, after thyroidectomy the incidence of postoperative nausea and vomiting (PONV) is 70% to 80% when no prophylactic antiemetic therapy is given.[2-5] PONV is not only uncomfortable for the patient but repeated or vigorous vomiting can lead to postoperative bleeding with subsequent airway obstruction and potential reparative surgery.[6] The importance of avoiding PONV events was substantiated by the work of Apfel et al who found in preoperative interviews that patients were more afraid of PONV than postoperative pain.[7]

The exact mechanism of thyroidectomy-related nausea and vomiting is not clearly understood. It is assumed that significant edema and inflammation around the neck tissues may persistently evoke parasympathetic impulses through the vagus, recurrent laryngeal, and

glossopharyngeal nerves to the vomiting center, thus initiating vomiting responses.[3,8] Another potential mechanism involves the chemical stimuli released during surgery, which may activate the chemoreceptor trigger zone near the area postrema.[9]

Dexamethasone, an adrenocortical steroid, is regularly used against chemotherapy-induced nausea, and has shown efficacy against postoperative nausea in several studies.[10-12] Preoperative application of dexamethasone has reduces postoperative swelling and pain after oral surgery, orthopaedic surgery, spinal surgery, and laparoscopic surgery.[13,14] The reduction of pain by steroids has been attributed to the suppression of the release of inflammatory mediators that induce hyperalgesia like TNF a, IL-IA, and IL-6.[15]

Even in the absence of injury to the recurrent laryngeal nerve, patients often experience postoperative voice dysfunction and hoarseness. These symptoms may be related to swelling around the vocal cords or inflammatory reactions near the laryngeal musculature.[16] Hence, the study was aimed to assess the effects of a preoperative single dose of dexamethasone on the PONV, vocal function and pain that characteristically follow a thyroidectomy in patients bearing surgery for benign disease.

METHODS

This 2-armed study was conducted between October 2010 and March 2011 at the Department of General Surgery, Government Medical College, Kottayam. Patients undergoing thyroid surgery were eligible, with the following exclusion criteria:

- Patients with depression, chronic pain disorder, insulin-dependent diabetes mellitus
- History of severe and/or repeated PONV after previous minor surgery, pregnancy
- Age <18 years, and patients who had known malignant disease or had undergone previous thyroid or neck surgery
- Patients who did not receive standard anaesthesia or received intraoperative additional steroids were also excluded.

The study was approved by the regional ethics committee and 90 patients were enrolled after taking written informed consent. The 2 treatment arms consisted of the treatment group D: 8 mg/2 mL of dexamethasone (Vivek Pharmachem Ltd.) and the control group C: received no drug. The amount of dexamethasone was chosen based on work by Lee et al that showed 8 mg was the minimum effective dose for the reduction of postoperative nausea and vomiting.[17] The infusions were given over 15 minutes by a nursing staff, 45 minutes before the initiation of anesthesia. In case the designated procedure was not performed, patients remained in the intention-to-treat group and an explanation for the nonadherence was recorded.

Patients were evaluated preoperatively and 8 hours after the operation. The termination of skin closure was defined as time point 0. At all-time points, the patient was evaluated for nausea, pain, and voice function. Anesthesia was performed with routine medications including glycopyrolate 0.2 mg i.v. (Neon laboratories), midazolam 1 mg i.v. (Neon laboratories), ondanseteron 4 mg i.v. (Cipla laboratories), morphine 4.5 mg i.v. (Hospital Pharmaceuticals), vecuronium 1 mg i.v. (Neon laboratories), thiopentone 250 mg i.v. (Ciron Drugs), lignocaine 80 mg i.v. (Neon laboratories) succinylcholine l00 mg i. v. (Neon laboratories), vecuronium 4 mg i.v. (Neon laboratories). No local anesthesia was used. Thyroid surgery was performed by staff surgeons.

Nausea and vomiting were assessed on a 100-point scale using visual analogue scale (0 = no nausea, 100 = vomiting). Antiemetic therapy was given according to patient needs. The first-line antiemetic was 12.5 mg promethazine i.v. (IND SWIFR LTD.) Pain was assessed with a standardized visual analogue scale that ranged from 0 (no pain) to 100 (worst pain imaginable) at the above-mentioned time point. All patients were familiarized with the visual analogue scale, preoperatively. After surgery, all patients received basic analgesic therapy with acetaminophen 1.5 g/d. Additionally, some patients received 100 mg/2 ml tramadol i.v. (Ind Swifr Ltd.) Subjective voice function was assessed by the voice visual analogue scale (0 = normal voice, 100 = worst voice imaginable).

Statistical analysis

For statistical analyses the Chi square test and students independent 't' test was used. Significance levels were set at $P < 0.05$. A power analysis indicated that n = 35 patients per group would be needed to detect a 50% reduction of PONV. With the assumption that 15% of the study patients would be excluded because of unsuspected malignancy, violation of the protocol, or loss to follow-up, this study aimed to include 80 patients.

RESULTS

A total of 90 patients were included in the study. Of them eighteen patients were excluded (10 patients were excepted because of intraoperative detected malignancy and additional lymphadenectomy; 3 patients did not receive timely dexamethasone, 3 patients received additional steroids intraoperatively, and 2 patients received postoperative analgesic/antiemetic regimens that did not follow the protocol).

Baseline data of 72 patients were collected and summarized in Table 1. Most of the patients participated in the study were under the age group of 40-50 years

(30.6%). Of the 72 patients 9 were males and 63 were females.

Table 1: Demographic data.

Characteristics	Frequency (n=72)	Percent
Age (in years)		
<30	8	11.1
30-40	15	20.8
40-50	22	30.6
50-60	15	20.8
60-70	10	13.9
>70	2	2.8
Sex		
Male	9	12.5
Female	63	87.5

Out of 72, 37 patients received normal saline and served as normal control group (Group C) and 35 patients received dexamethasone preoperatively and served as Group D as shown in Figure 1.

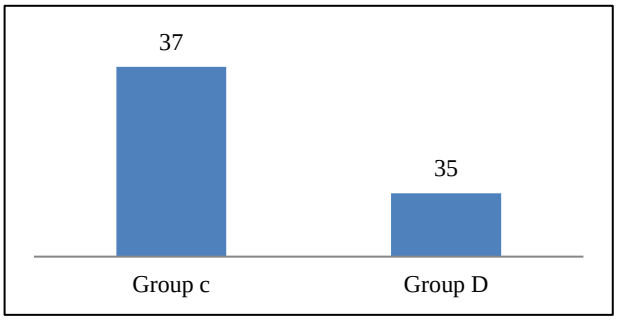

Figure 1: Grouping of patients.

Table 2: Effect of dexamethasone on incidence and severity of PONV.

Nausea and vomiting	Group C		Group D		Total	
	No.	%	No.	%	No.	%
Mild	0	0.0	31	88.6	31	43.1
Moderate	36	97.3	4	11.4	40	55.6
Severe	1	2.7	0	0.0	1	1.4
Total	37	100.0	35	100.0	72	100.0

$\chi 2 = 57.589$; df =2; p=0.001.

Table 2 presents the effect of dexamethasone on incidence and severity of early postoperative nausea. In Group D patients (received dexamethasone preoperatively) the incidence and severity of PONV was significantly reduced compared to Group C (received normal saline). 31 patients from Group D suffered with mild nausea and 4 patients get affected moderately. From about 37 patients experienced moderate and severe nausea.

Table 3: Effect of dexamethasone on postoperative pain.

Postoperative pain	Group C		Group D		Total	
	No.	%	No.	%	No.	%
Mild	31	83.8	34	97.1	65	90.3
Moderate	6	16.2	1	2.9	7	9.7
Total	37	100.0	35	100.0	72	100.0

$\chi 2 = 3.657$; df=1; p=0.056.

Table 4: Effect of dexamethasone on vocal function.

Postoperative pain	Group C		Group D		Total	
	No.	%	No.	%	No.	%
Mild	37	100	35	100	72	100
Total	37	100.0	35	100.0	72	100.0

Postoperative pain was analysed by visual analogue scale. On comparison, the patients in Group D experienced significantly less pain postoperatively compared to patients in Group C as given in Table 3.

From the Table 4, it is evident that dexamethasone failed to significantly protect the vocal function after thyroid surgery. By comparing the two groups with mean visual analogue scale values, it was found that group that received normal saline (Group C) had a mean score of 31.9 and the group that received dexamethasone (Group D) had mean score of 29.4 and the p value was found to be insignificant (p =0.245).

DISCUSSION

This study showed that a single dose of dexamethasone given preoperatively reduced the incidence and severity of nausea. These findings corroborated with the studies of Worni et al.[18] In his study, he found that single preoperative dose of dexamethasone significantly reduced the incidence of PONV, pain and improved the voice function after 48 hours of thyroid resection. In another study of Fujji et al, dexamethasone found to be effective in reducing the incidence of PONV and use of analgesics in patients undergoing middle ear surgery.[19]

Pain after thyroidectomy is often the cause of major discomfort within the first 8 postoperative hours. Because patients usually recover quickly, the discomfort caused by this intervention may be underappreciated. In a recent study, patients ranked pain after thyroidectomy on a VAS (0-100). The mean VAS score was 50, but 48% of the patients indicated pain scores above 60.[20] Previous studies on prophylactic steroid administration for the reduction of postoperative pain yielded contrasting results. Baxendale et al showed that 8 mg dexamethasone given before extraction of the third molar significantly reduced pain and eliminated the need for opioid analgesia in the postoperative period.[21] However, other studies involving minor routine interventions reported that preoperative dexamethasone provided no benefit on postoperative pain and opioid requirements.[22] These findings could be explained by the baseline analgesic therapy given to all patients. Thus, relatively low pain scores were noted in the control arms and the pain potentially relieved by corticosteroid prophylaxis was reduced to statistical insignificance. In this study, we used acetaminophen as a baseline therapy in a multimodal analgesic regimen and analyzed the additional need for opioids. Patients receiving dexamethasone rated postoperative pain on the VAS score significantly lower than controls.

The exact mechanism of dexamethasone in management of PONV was not fully understood, however it is believed that the anti-emetic and analgesic action of dexamethasone may be due to inhibition of prostaglandin synthesis centrally, a decrease in serotonin turnover in the central nervous system and/or changes in the permeability of the blood CSF barrier to serum protein. In addition, with analgesic and antiemetic effects, dexamethasone also acts as antiinflammatory at the operative site, decreasing the discharge of inflammatory mediators into the circulation. This possibly lead to reduced stimulation of the chemoreceptor trigger zone in the brain. Dexamethasone also inhibits inflammatory response by hindering the mediators such as bradykinin, prostaglandin, and leukotrienes, that results in a reduced level of inflammation and signs and symptoms including pain.[23,24]

Apart from recurrent laryngeal nerve injury, the cause of post thyroidectomy voice alteration has been attributed to a lesion of the strap muscles, which contribute to the length of the vocal folds and are important in phonation.[25] These muscles, in the absence of the thyroid, are the sole support of the laryngotracheal unit. Only resection of very large thyroid glands demands the dissection of these muscles; however, their retraction for proper exposure could cause a temporary dysfunction. Because the thyroid sizes and extent of resection were similar in both groups, these factors did'nt account for the observed differences in vocal function. However, vocal dysfunction after thyroidectomy is still not completely understood and we must allow that other aspects, yet unknown, could underlie improved speech and intonation after prophylactic dexamethasone administration.

A major concern to the routine use of prophylactic steroid administration is an increased risk of postoperative infections, impaired wound healing, and glucose intolerance as observed after prolonged corticosteroid therapy.[26] However, to date, no adverse side-effects after a single dose steroid application have been reported. Similar observation was reported in our study also.

CONCLUSION

Unlike other interventions, the incidence of nausea and vomiting after thyroidectomy is high and contributes, together with pain and hoarseness, to most of the postoperative discomfort. Based on findings and previous reports a simple, inexpensive, and safe way to alleviate the discomfort of pain and nausea for our patients is to advocate the routine use of dexamethasone as a single dose prophylaxis before thyroidectomy.

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