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Effect of Prophylactic Steroid Therapy for Post Thyroidectomy Hypocalcemia

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Abstract

Objective: The purpose of this study was to assess the effect of preoperative dexamethasone used to improve post-thyroidectomy hypocalcemia.

Methods: This study was a Prospective clinical trial (Randomized) conducted in the department of Otorhinolaryngology, Tertiary care hospital, Quetta, for twenty-three months, i.e., from January 2023 till November 2024. 92 patients aged 18–60 with benign thyroid conditions and no preoperative hypocalcemia. Exclusion criteria were Graves' disease, prior thyroid or neck surgery, and contraindications to corticosteroid use. Patients were arbitrarily allocated to the placebo (Group A) or dexamethasone (Group B) groups. Group B received 8 mg dexamethasone intravenously 60 minutes before anesthesia, while Group A received normal saline.

Results: Postoperative hypocalcemia was more common in Group A (41% at 06 hours, 24% at 24 hours) compared to Group B (22% at 06 hours, 0% at 24 hours), with symptomatic hypocalcemia reported in 24% of Group A and none in Group B. Dexamethasone significantly reduced the incidence and severity of hypocalcemia, demonstrating its potential to improve early postoperative outcomes.

Conclusion: Preoperative dexamethasone effectively reduces postoperative hypocalcemia and improves surgical outcomes in patients undergoing Total Thyroidectomy.

Keywords: Dexamethasone, Goiter, Hypocalcemia, Postoperative Period, Thyroidectomy, Thyroid Diseases

Introduction

Many benign thyroid conditions might cause symptoms. Multinodular goiter, which is often associated with iodine deficiency, is the most prevalent surgical thyroid condition worldwide. Most patients opt for surgery because it is the most effective therapy option. Lobectomy or total thyroidectomy is a common surgical procedure that is done to eliminate the possibility of thyroid cancer in a thyroid that initially appears benign. However, risks such as hypocalcemia and laryngeal nerve injury are linked to this approach.[1,2] Hypocalcemia is one of the common complications after total thyroidectomy.[3,4] Symptomatic hypocalcaemia occurs in as many as half of all cases.[5-7]. This condition occurs when the parathyroid glands are damaged or removed during surgery. Hypocalcemia can be transient or permanent, and patients typically require calcium & vitamin D3 (cholecalciferol) supplements to restore normal function. One medication that has been studied to prevent such concerns is the use of steroids like dexamethasone during the preoperative phase. These steroids have also been shown to improve postoperative voice function. Additionally, intraoperative neurophysiological monitoring has been employed to prevent recurrent laryngeal nerve injury, with evidence from prior randomized clinical trials (RCTs) supporting the use of dexamethasone, though it remains uncommon in routine practice.[8] The decision to use preoperative dexamethasone or intraoperative neurophysiological monitoring often depends on the surgeon's preference and varies among different surgical centers.

Preventing hypocalcemia after thyroidectomy involves several measures, including preoperative dexamethasone, routine calcium and vitamin D3 supplementation, and parathyroid hormone extracts. However, none of these interventions have demonstrated superiority over others. Regular blood tests for parathyroid hormone and serum calcium are usually performed within 24 hours of thyroidectomy. If hypocalcemia occurs, the patient is prescribed oral calcium and vitamin D3 supplements.[2, 6, 7]

Recently, two randomized controlled trials found that a preoperative single dose of dexamethasone could reduce postoperative nausea, vomiting, hypocalcemia, and voice dysfunction. Patients undergoing thyroidectomies tend to be young, and the operation can have serious consequences for their well-being, such as hypocalcemia & recurrent laryngeal nerve injury leading to the need for prolonged hospital stay and long-term medicine. While these studies suggest potential benefits from preoperative dexamethasone, the findings have not yet led to widespread adoption in clinical practice.[9, 10]

Consequently, the benefits of preoperative dexamethasone in patients having thyroidectomies need more investigation. Research into the potential reduction of adverse effects such as hypocalcemia and voice impairment with a single preoperative dose of dexamethasone might lead to an improvement in patient care. We hypothesized that a single injection of dexamethasone before surgery could lower the risk of postoperative

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hypocalcemia. In this Prospective clinical trial, we looked at how preoperative dexamethasone affected hypocalcemia following thyroidectomy to see if this theory held water.

Materials And Methods

This study received approval from the Hospital's Ethical Committee and was conducted by the Consolidated Standards of Reporting Trials Extension (CONSORT Extension) reporting guideline (Figure). A total of 103 individuals were enrolled in our study, out of which 92 patients met the inclusion criteria and underwent total thyroidectomy at our facility between January 2023 and November 2024.

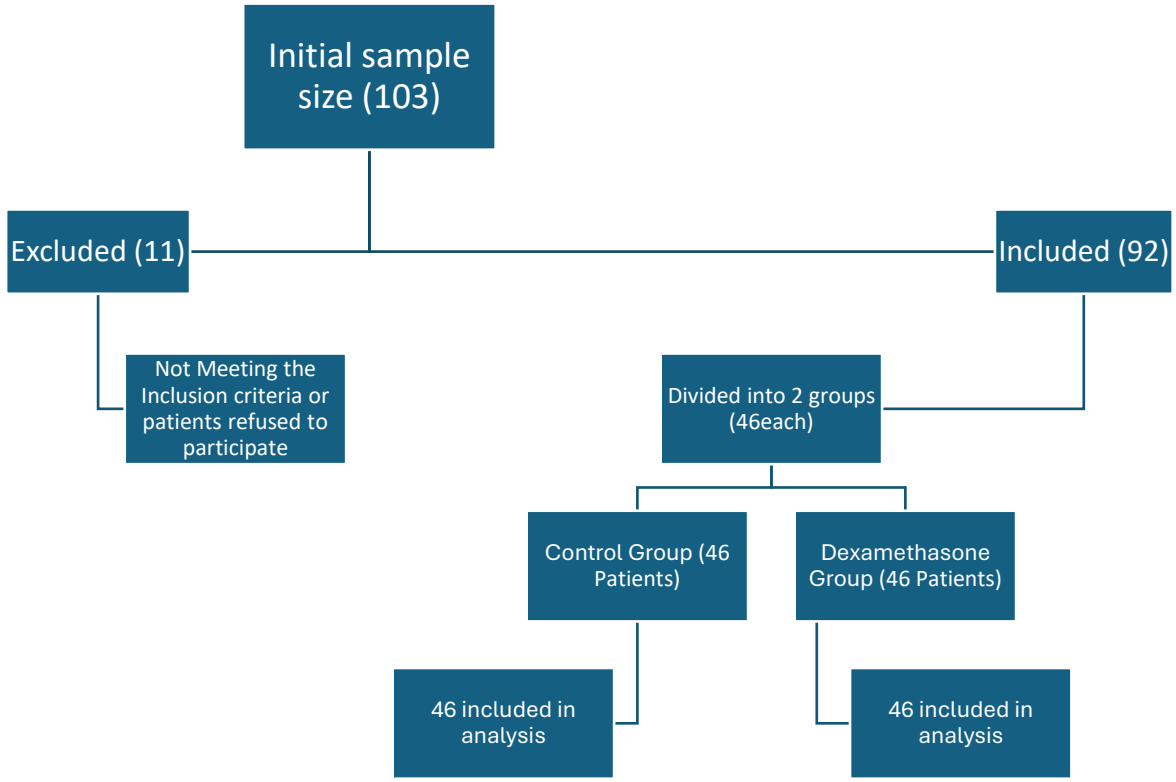
The patients, whose ages varied from eighteen to sixty, were all considered for inclusion since they had benign thyroid problems and had no hypocalcemia that had been addressed before surgery. We did not include patients who had a history of thyroid or neck surgery, Graves' disease, vocal cord dysfunction as detected by laryngoscopy, Gastroesophageal reflux disease, Acid peptic disease, or any other condition that would prevent the administration of corticosteroids.

Two parallel groups, i.e., Group A (placebo group) and Group B (dexamethasone group), were formed. All the patients were allotted numbers randomly as per study design; those with odd numbers were placed in group A, while those with even numbers were placed in group B. Sixty minutes before the administration of anesthesia, group B received an injection of 2 mL of 8 mg dexamethasone, and group A received 2 mL of normal saline (0.9%) intravenously. Before surgery, the researchers evaluated each patient's serum calcium levels.

Each thyroidectomy in this study was carried out at a single station. All patients were given the usual pre- and post-operative treatment. No operations made use of intraoperative neurophysiological monitoring. Time points 0 was defined as the completion of skin closure. Serial measurements of corrected blood calcium levels were utilized to assess hypocalcemia after 06 hours of surgery.

The primary goal of the study was to assess clinical and serum evidence of hypocalcaemia, as stated in the trial protocol. The cutoff for a low adjusted serum calcium level was 8 mg/dL, or 2 mmol/L. Patients whose corrected calcium level was below 8 mg/dL were deemed to have hypocalcemia and treated accordingly. A corrected calcium level follow-up measurement was obtained 24 hours after surgery.

There was no official estimation of sample size or power. The study participants' normal distribution was validated by the Shapiro-Wilk test. For the results in categorical variables, the difference in rates was computed. The estimates' precision and the likely location of the point estimate's true value were depicted by the 95% CI surrounding the effect size. IBM Corp.'s SPSS version 26 was used for all analyses.



Results

A total of 92 participants were included in the study, divided equally between the placebo group (Group A) and the dexamethasone group (Group B). The baseline characteristics were similar between the groups, with no statistically significant difference observed in gender distribution or

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age. Group A consisted of 19 males (41.0%) and 27 females (59.0%), while Group B included 12 males (26.0%) and 34 females (74.3%) (p=0.186). The mean age was comparable between the two groups, with 37.39 ± 10.27 years in Group A and 36.67 ± 11 years in Group B (p=0.747), as shown in Table 1.

Table 1: Patient Characteristics Pre-Treatment

Variable	Group A (Placebo)	Group B (Dexamethasone)	*p*-value
Gender			
Male	19(41.0%)	12(26.0%)	0.186
Female	27(59.0%)	34(74.3%)	
Age (years)	37.39±10.27	36.67±11	0.747

Postoperative outcomes demonstrated notable differences between the two groups. The incidence of hypocalcemia within 06 hours post-surgery was higher in the placebo group (41%) compared to the dexamethasone group (22%), with a difference of 19.6% (95% CI: 1.0% to 38.1%). At 24 hours postoperatively, hypocalcemia persisted in 24% of patients in the placebo group, while no case was observed in the dexamethasone group. The difference in proportion was 23.9% (95% CI: 11.6% to 36.2%), as shown in Table 2.

Table 2. Comparison of Outcomes Between the 2 Groups.

Outcome	Group No. (%)		Difference in proportion, % (95% CI)
	Placebo (group A)	Dexamethasone (group B)	
Hypocalcemia, postoperative			
06 h	19 (41%)	10(22%)	19.6% (1.0% to 38.1%)
24 h	11(24%)	0(%)	23.9% (11.6% to 36.2%)
Symptomatic hypocalcemia (24 h post-surgery)	11(24%)	0 (%)	23.9% (11.6% to 36.2%)

Symptomatic hypocalcemia within 24 hours post-surgery was reported in 24% of patients in the placebo group, whereas no case was documented in the dexamethasone group, reflecting a difference of 23.9% (95% CI: 11.6% to 36.2%) (Table 2). Overall, dexamethasone significantly reduced both the incidence and severity of hypocalcemia compared to placebo, particularly in the early postoperative period, highlighting its potential benefit in improving postoperative outcomes.

Discussion

In this study, we wished to determine whether preoperative dexamethasone would reduce the rate of hypocalcemia that develops postoperatively in patients with benign thyroid disorders requiring thyroidectomy. These results support the idea that one dose of preoperative dexamethasone substantially reduces overall postoperative incidence of hypocalcemia and ameliorates its early post-operative effects compared to placebo and by previous research.[11] This implies that dexamethasone may be useful in mitigating the adverse effects linked with thyroidectomy and enhance postoperative outcomes.

Persistent hypocalcemia in the setting of thyroid surgery is a frequent and complex problem, which results from perioperative injury or ischemia of the parathyroid glands.[12] The incidence of hypocalcemia as observed in the placebo group is consistent with data reported by previous studies that address thyroidectomy-induced transient hypocalcemia – ranging between 20% and 50%. Nonetheless, the dramatic decrease of hypocalcemia seen in the dexamethasone group underlines its capability to prevent this side effect sufficiently.[13]

Here is a bit more information regarding how dexamethasone lowers hypocalcemia. This is because a potent anti-inflammatory drug such as dexamethasone may decrease inflammation of the parathyroid gland and resulting vascular obstruction during thyroidectomy. In addition, immunomodulatory activity might contribute to the stabilization of the functional status of the parathyroid glands and calcium balance. This is supported by prior observations about the effectiveness of perioperative steroids in the prevention of postoperative problems, including voice problems and nausea.[14-16]

The dexamethasone group demonstrated significantly fewer occurrences of other complications of hypocalcaemia, including symptomatic hypocalcaemia, which was not present at all.[17] The placebo group patients also developed symptomatic hypocalcemia at frequencies that have been noted in previous investigations, thus reinforcing the rationale for the use of dexamethasone in the prevention of such side effects. This finding can be significant in enhancing the postoperative quality of life since patients diagnosed with symptomatic hypocalcemia would require long-term use of calcium and vitamin D, thus applying an economic and psychological burden on the patient.

The result of the study is the emerging number of publications emphasizing the benefits of using preoperative steroids in thyroid surgery. Another recent randomized controlled trial showed the effectiveness of dexamethasone regarding voice dysfunction and hypocalcemia rates.[18] However, the use of dexamethasone in a standardized individual daily oral dose fashion is still not common at present, possibly due to differences in surgical practice and the absence of adequate guidelines and policies. In addition, our findings support expanding the approach of using preoperative dexamethasone as a non-expensive and feasible solution for improving postoperative outcomes.

However, there are some limitations in this study, which are worthwhile to be discussed. First, though there was an adequate sample size to determine statistical significance, this study would be of value if extended to larger multi-center trials for more generalizable outcomes. Second, there is no regular control of parathyroid hormone level that makes it impossible to evaluate the state of parathyroid and its connection with serum calcium properly. Third, the exclusion of patients with Graves' disease or prior thyroid surgery reduces the generalizability of these findings to more emergent surgical cases.

However, the conclusion achieved in this study offers strong empirical evidence that the use of preoperative dexamethasone dose helps to reduce hypocalcemia among patients who have undergone thyroidectomy. Further studies should analyze its effects on patients' quality of life over the years. In the same manner, more studies on dosage and timings of dexamethasone can enhance understanding of the role of this drug in clinical practice settings.

Conclusions

Preoperative dexamethasone effectively reduces postoperative hypocalcemia and improves surgical outcomes in thyroidectomy patients.

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