

Role of Dexamethasone Therapy in Preventing Transient Hypocalcemia after Total Thyroidectomy

Dexamethasone
in Hypocalcemia
after Total
Thyroidectomy

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ABSTRACT

Objective: To see the effect of dexamethasone therapy in preventing transitory hypocalcemia after total thyroidectomy.

Study Design: Cross sectional analytical study

Place and Duration of Study: This study was conducted at the department of ENT, Bahawal Victoria Hospital, Bahawalpur from March 2020 till April 2021 for a period of one year.

Materials and Methods: Total 62 participants had complete thyroidectomy. Participants were randomly allocated to every one of 2 groups: control (n=32) and dexamethasone group (n=32) in which injected Intravenous dexamethasone 8 mg dose 45 minutes prior to skin incision procedure. All participants were screened for purpose of clinical and laboratory hypocalcaemia next to surgery.

Results: While adjusting of baseline factors, post-operative transitory biochemical hypoparathyroidism as well as hypocalcaemia was not occurred more commonly with in control study group and in those participants in the dexamethasone group. However, the dexamethasone & control groups had a big variation for phosphorus levels (P=0.028). Following surgery, a total of 17 patients (53.1%) had hypocalcemia. Furthermore, the control group 23 (71.9%) had symptomatic hypocalcemia following the operation frequently than the dexamethasone group 9 (28.1%), But statistically this difference was not significant (P=0.592).

Conclusion: Due to Pre-operative dexamethasone treatment, it caused decrease in the frequency of hypocalcemia post-operatively. For improved findings, further research must be conducted using validated approaches.

Key Words: Parathyroid hormone, Hypocalcemia, Dexamethasone

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INTRODUCTION

Complete thyroidectomy has become a widely used surgical procedure for both benign as well as malignant conditions related to thyroid.^{1,2,3} However, perhaps it would increase post-operative problems risks prior to substantial resection.⁴ Thyroidectomy for transitory hypoparathyroidism has a problem related risk of 6.9-46 percent,^{5,6,7} which results hypocalcemia post-operatively with a 1.6-50 percent occurrence rate.^{8,9} After a complete thyroidectomy, hypocalcemia seems to be the most common and occasionally the most severe consequence¹⁰. Hypocalcemia is most commonly caused by devascularization, the unexpected loss with

one or even more parathyroid glands performing the surgery after hypothyroidism, or parathyroid glands can be injured during procedure of lymphadenectomy.^{10,11}

As a result, using the right surgical approach during a complete thyroidectomy might avert problems, especially those involving the parathyroid glands.¹² On the other hand, after few Days to weeks prolonged hospital stay post-operative transitory hypocalcaemia usually responds positively to supplements provides for vitamin D and calcium. When individuals have calcium level at normal range but prophylactic consumption is given to them, it has the potential to cause hypercalcemia,¹¹ which is necessitating alternate treatment method. Prior to operation many potentially essential biological consequences of inflammatory responses are changed by pre-treatment by a glucocorticoid single dose, as found in several clinical investigations during various major and small procedures of surgery. This dose cause reduction in inflammatory response after surgery, as well as the complications numbers plus duration of stay in the hospital.^{13,14} There are some well know actions of glucocorticoids like Antiemetic, immune-modulating, and analgesic effects.¹⁵

Dexamethasone is presented as an effective and safe corticosteroid medicine, when it is administrated in a single dose prior to operation it provides relief from

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post-operative conditions such as nausea, pain and vomiting.^{16,17,18} Post-operative use of dexamethasone was recently found to reduce the prevalence and severity of sore throat when ingesting post thyroidectomy during a double-blind randomized study.¹⁹ Yet in case of hypoparathyroidism there really are limited studies present in literature about the use of dexamethasone in post-operative duration.

Only one research concluded that single dexamethasone prior to thyroidectomy might impact transitory hypoparathyroidism after operation.¹⁶ Therefore, the aim of this study was to see if use of dexamethasone prior to operation may help to prevent transitory hypocalcemia after total thyroidectomy.

MATERIALS AND METHODS

During March 2020 till April 2021, cross sectional analytical study was conducted at Bahawalpur Victoria hospital, after of institutional ethics review committee. A number of 64 individuals were included in the study in which complete thyroidectomy was done. The patients having a history of renal failure, parathyroid illness, or one-sided thyroid lobectomy were not included in the study. All surgical procedures were performed by experienced surgeons (with at least 5 years' experience after post-graduation).

Informed consent was taken from all the participants before data collection. All participants' demographic information was gathered including histological diagnosis, gender, age, plus pathology findings (specimen information about the existence of parathyroid tissues). The capsular dissection method was used to conduct the procedure of total thyroidectomy. The ENT specialist also a competent surgeon established the need for surgery. Clinical results and thyroid operations reference criteria were used to make the decision to have surgery.

The patients in this research were randomly assigned to one of two groups: control (n=32) or treatment (n=32). The participants in groups were matched in relations of gender and age to avoid duplication. Patients were randomly assigned to receive an intravenous 8 mg dexamethasone 45 minutes before going to procedure of skin incision. All of the participants were given general anaesthesia in the same way. The typical procedure lasted about 75 minutes. Vital signs (pulse oximetry, blood pressure, respiration, pulse, and appropriate answering) were checked within every 15 minutes when patients were in post-operative anesthesia care unit by an experienced person. Once vitals became controlled and steady, patients were shifted to ENT ward. Following surgery, all subjects were evaluated for hypocalcaemia during clinical plus analytical condition. Patients were also instructed to begin taking oral supplements for vitamin D analogue and calcium in case of appearance of symptoms or signs regarding hypocalcaemia. Patients who had circumoral numbness,

paresthesia, sense of tingling spreading in fingers plus toes, muscular irritability or a positive Chvostek sign were considered to have symptomatic hypocalcemia. In individuals experiencing clinical hypocalcemia, oral supplements for vitamin D analogues and calcium were started. A minimum one serum calcium reading under 8.1 mg/dL (range for reference is 8.1-10.4 mg/dL) was defined as laboratory related hypocalcemia. If participants had symptomatic hypocalcemia or had a serum level for calcium less from 8.1 mg/dL, oral supplements for calcium were suggested.

For severe hypocalcemic symptoms or till oral treatment was not sufficient, an iv-calcium gluconate with 10% infusion was administered. When the levels of calcium serum were more than 8.1 mg/dL, the participants were discharged from facility. In addition, laboratory measurements including serum calcium, serum phosphorus, plus serum level of parathyroid hormone (PTH) were examined before to surgery, as well as after operation PTH and calcium levels at duration of 1, 6, and at the 24 hours.

Quantitative data was expressed using terms of mean whereas categorical data by frequency (percentage). Between groups quantitative data was compared by the use of independent t-test and for categorical data, Fisher test or Chi-square test was used. SPSS was used to perform all statistical computations (version 22.0).

RESULTS

There was a total of 64 participants included in the study analysis. Our dexamethasone group had 32 patients, whereas control group also had 32 (No dexamethasone treatment was given to these participants). In Table 1 the demographic features of participants in the dexamethasone versus control groups are shown. The only substantial difference between groups was the level of PTH before surgery ($P < 0.003$).

Table No.1: Characteristics of the patients in dexamethasone and control group

Characteristics	Dexamethasone group (n=32)	Control group (n=32)	p-value
Gender			
Male	25 (78.1%)	23 (71.9%)	0.45
Female	07 (21.9%)	09 (28.1%)	
Age (Mean±S.D)	44.83±11.52	44.83±11.52	0.43
PTH pre-operative	35.53±20.51	57.6±24.25	0.003
Phosphor(mg/dL) pre-operative	7.0±0.50	8.23±0.54	0.80
Ca (mg/dL) pre-operative	2.9±0.61	2.50±0.47	0.79

There was a significant difference among two groups when level of PTH plus calcium were compared in pre- and post-operative condition ($P < 0.001$; (Table.2). However, once baseline values were taken into account, there was no significant difference in between the two

groups. The differences for phosphorus levels in between the dexamethasone plus control groups seemed significant. The dexamethasone group and control group exhibited a significant variation in pre-operative

PTH levels, but once correcting for the baseline values, the significant difference between the two groups was not found.

Table No.2: Calcium, phosphorus, and parathyroid hormone levels in the dexamethasone & control groups before and after Operation

Group	Parameter	Pre-operative Mean \pm SD	Post-operative Mean \pm SD	p-value
Dexamethasone group	PTH	37.93 \pm 21.80	16.62 \pm 12.65	<0.001
Control group		56.8 \pm 22.36	17.9 \pm 15.92	<0.001
Dexamethasone group	Calcium (mg/dL)	9.0 \pm 0.52	8.7 \pm 0.69	0.854
Control group		8.20 \pm 0.51	8.50 \pm 0.29	<0.001
Dexamethasone group	Phosphorous (mg/dL)	3.1 \pm 0.61	3.7 \pm 0.6	0.48
Control group		2.93 \pm 0.46	3.0 \pm 0.43	0.089

After surgery, 51% patients had hypocalcaemia. The control group had greater symptomatic hypocalcemia than the dexamethasone group after operation; although, statistically this difference was not the significant (P=0.54). Additionally, dexamethasone treatment further divided into subgroups and analyzed depending on the presence or absence for symptomatic hypocalcemia. There was a significant difference in PTH and calcium levels between prior and after operative procedure levels, for individuals having or not symptomatic hypocalcaemia. The post-operative serum level of calcium fell more often in individuals who had symptomatic hypocalcaemia than in individuals who did not develop symptomatic hypocalcaemia with (P=0.05).

DISCUSSION

When compared to the dexamethasone group, post-operative transitory biochemical hypoparathyroidism as well as hypocalcaemia did not happen more frequently with in control group during this study. Moreover, by comparing control group, the dexamethasone group had a non-significant low rate of post-operative symptomatic hypocalcemia occurring. Clinically evident hypoparathyroidism after operation is a serious consequence following complete thyroidectomy.^{9,10} Although the exact cause of transitory hypoparathyroidism is unknown, the most widely accepted theory is that it is caused by the partial disruption of blood supply for the parathyroid gland, resulting in transitory hypocalcaemia.^{10,12}

A large drop in blood calcium level in post-operative condition is an obviously strong indicator for hypocalcaemia. The prevention of symptomatic hypocalcaemia and a considerable decrease in days of stay in hospital and hospitalization expenditures can be achieved by earlier detection for hypocalcaemia plus prophylactic treatment.¹¹ There is insufficient information to draw definitive results about the drug's efficacy in reducing post-operative transitory hypocalcaemia.

However, it was discovered in one research that preventive therapy by one dose of dexamethasone (8 mg IV) might affect post-operative transitory hypoparathyroidism.¹⁶ To the best of the authors' understanding, this is the first trial to show that dexamethasone is effective in preventing transitory hypoparathyroidism in individuals who have just had a complete thyroidectomy. During surgery, the risk of traumatic edema or vasospasm, which may have produced edema and/or transient hypoparathyroidism, may rise. Steroid treatment may avoid or decrease edema caused by surgical trauma, according to investigational and clinical studies.^{16,17}

In other words, there is a role of Glucocorticoids as physiologic modifiers for response of inflammation after operation by the mean of reducing activity of vessels by constriction and persuaded response of cellular immunity which is controlled by function of cytokine.^{15,18} Cytokines have an important role in post-operative immunological response.¹⁹ In this study, it appears that dexamethasone decreased the induced immune response in parathyroid gland surgery, producing no major decrease there in dexamethasone group's transitory hypocalcaemia ratio. Research by Nasiri et al. showed that the preventive therapy with dexamethasone reduces vocal dysfunction at the day 1st following thyroidectomy and their study was line with the outcomes of this ongoing investigation.²⁰ Dexamethasone can be concluded to impact on results of thyroid surgery temporarily.

PTH and calcium levels were measured many times before and after surgery. The assessment of PTH and calcium levels before and after operation indicated a substantial difference between the dexamethasone and control groups without adjustment for baseline values. PTH levels fell more quickly in hypoparathyroidism patients than blood calcium levels did.²¹ PTH levels changed significantly four hours after complete thyroidectomy, which guiding clinicians as a helpful predictor of hypocalcemia post-operatively for providing treatment to patients at high-risk as well as reduce the danger of hypocalcemia and early hospital release. There is no apparent link between pre-operative

level of blood calcium with post-operative hypocalcemia.^{22,23} A meta-analysis which is recent stated that, there has been no clear link between pre-operative level of blood calcium with post-operative hypocalcemia.²⁴ On the one side, hypocalcemia played an important role in the diagnosis and treatment of hypocalcemia post-operatively. Consequently, measurement of calcium and PTH for appropriate hypocalcemia treatment looked reasonable before and after operation. While the administration time must be taken into account. According to a 2015 meta-analysis, the efficacy of a single dosage of pre-operative dexamethasone and the timing for administration of that dose are yet unclear.²⁵

However, during the majority of trials, this medication was given 20-45 minutes before to anesthetic induction. Because glucocorticoids bound to receptor molecules and administration routes affect the commencement of biological action, its generally action within one or two hours.²⁶

In accordance all of these findings, we gave dexamethasone 45 minutes before to surgery to maximize the treatment's post-operative benefits. In conclusion, we weighed transitory hypoparathyroidism in patients following total thyroidectomy also these findings are based on prior researches and the efficacy and safety of dexamethasone (8 mg IV) for voice dysfunction, vomiting, pain, and tiredness.^{17,27} When we compared the control group, with dexamethasone group and it had a lower rate of non-significant symptomatic hypocalcemia after operation. Dexamethasone dosing appears to be less important than careful surgical care.

CONCLUSION

Pre-operative dexamethasone dose decreased the incidence of hypocalcemia after operation. For better results, it is suggested that the investigation of study be enlarged with analytical methods.

Author's Contribution:

Concept & Design of Study: Nasir Wakeel
 Drafting: Asma Tariq, Iqra Gul
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