

Anesthetic techniques and parathyroid hormone levels: Predictor of surgical decisions

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ABSTRACT

Endocrine surgeries have always been challenging and throw numerous challenges to the surgeons, anesthesiologists, and the endocrinologists. A thorough knowledge of the pathophysiological aspects associated with endocrinopathies is mandatory for the attending anesthesiologist. Parathyroid surgery is a very delicate procedure that requires immense and meticulous preparation during the perioperative period for achieving a clinical outcome. Parathyroid hormone (PTH) levels during intra-operative period can influence the decision making in surgery. Anesthetic techniques also play a significant role in the secretion of PTH during perioperative period, which can be decisive in re-assessment of surgical procedure on operation table. The present communication briefly outlines the various anesthetic techniques, which influence the secretion of PTH and also influence surgical decision making.

Key words: Anesthetic techniques, parathyroid hormone, parathyroidectomy, stress response

INTRODUCTION

A relation between two medicine specialties is always complicated when it comes to analysis of possible clinical decisions and consequences. Similar inferences can be drawn for endocrinology and anesthesiology, which are almost completely different functional therapeutic sciences.^[1] However, technical and medical advancements have paved the way for a possible relation between different clinical fields. A thorough knowledge of these interactive medical sciences is crucial in improving the patient outcome. Surgical interventions for the treatment of parathyroid disease and its associated anesthetic and surgical implications are a matter of concern in modern day anesthesiology practice.^[2] The extent of surgical excision in multigland disease and day care parathyroid surgery are greatly impacted by post-induction parathyroid hormone (PTH) levels. The

current brief communication aims to deliver an important message that surgical decisions are affected by PTH status after induction of anesthesia and discovery of multigland parathyroid pathology on surgical exposure.

PARATHYROID SURGERY AND ANESTHESIA TECHNIQUES

Parathyroid surgery is increasingly being carried out on a day care basis, which has not only reduced total operative time however, is proving to be economical as well.^[3,4] Advancements in surgical techniques of parathyroidectomy have propelled similar advancements in anesthetic techniques. The collaboration of surgical and anesthesia specialty has led to a revolution in restoring endocrinological milieu during intra-operative and post-operative period. Administration of anesthesia is associated with a stress response during induction and intubation.^[5] Apart from various catecholamines, PTH is also secreted during such stressful times.^[6] Though secretion of PTH is influenced by current ionic calcium levels, it is also affected to a good extent by adrenergic stimulation.^[6] Among various techniques such as epidural anesthesia, monitored anesthesia care (MAC) with sedation, general anesthesia (GA) with laryngeal mask airway, and General anaesthesia with endotracheal intubation (GETA), the

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latter is associated with highest incidence of catecholamine secretion.^[6] Routinely, at majority of health institutes, GETA is the preferred anesthetic technique. PTH secretion is also increased perioperatively during administration of like anesthetic technique, which can have significant impact on the surgical outcome. Though MAC with sedation causes minimal direct reflexogenic stress response, sedative agents can cause respiratory depression, which can lead to respiratory acidosis and enhanced adrenergic stimulation thereby increasing the levels of PTH.

PTH LEVELS DURING SURGERY

One of the landmark studies compared three different techniques of anesthesia in-patients undergoing surgery for primary hyper-parathyroidism. During the course of the study, it was observed that during intra-operative period increase in PTH levels were associated with all types of anesthetic technique. However, GETA was associated with maximum increase in post-induction PTH levels at 3 min interval as compared to other techniques.^[6]

The significance of measuring post-induction PTH lies in the fact that perioperative fluid management becomes easier and a suitable decision can be taken regarding, which patients to be offered minimal parathyroidectomy on day care basis. In other words, the decision to perform day care surgery can be predicted to a good extent by anesthetic technique.^[7] PTH levels can significantly impact the intra-operative surgical decision making specifically in multiple gland disease. Normally, the activity of parathyroid glands is measured with imaging techniques and intra-operative hormonal assay further helps in resection of hyper-functional part of the glands thus, resorting to minimal resection of the glands. Pre-operatively, it is not possible at times to diagnose the multiple gland disease as the localization of the diseased parathyroid is difficult to diagnose.^[8]

However, post-induction measurement of PTH levels can present variable results due to the difference in timing, laboratory interpretations, site of venepuncture and incorrect technique of venepuncture, which may cause hemolysis of blood sample.^[9] Total intravenous anesthesia with propofol has become increasingly popular in modern day anesthesiology practice and can also be used for achieving a variable degree of sedation, which is dose-dependent.^[10] Concerns have been raised in the past about the harmful effects of propofol during the parathyroidectomy but all have been dismayed by observations of various randomized controlled trials.^[11] In one of the study, it was observed that propofol administration does not influence the PTH

concentration during intra-operative period and as such this drug can be safely used for anaesthetizing patients with parathyroid pathologies.^[12] Unfortunately, respiratory depression caused by higher doses of propofol may increase plasma catecholamines and PTH levels.^[13]

The pre-induction levels of PTH sometimes may not corroborate the real extent of parathyroid pathology. This can significantly impact surgical decisions if pre-induction PTH levels are below 100 pg/ml but during surgical exploration the multiple gland disease is diagnosed accidentally. If the gland is not completely resected, there are chances of hyper-parathyroid disease to recur and if the gland is completely resected, there are potential chances of developing hypocalcemic symptomatology. Such patients may not be assessed adequately with post-induction measurement of PTH levels. The change of surgical decision during the perioperative period can possibly lead to a number of post-op complications such as metabolic abnormalities (hypophosphatemia, hypomagnesemia, and hypokalemia), hypocalcemic tetany, recurrent laryngeal nerve paralysis, respiratory obstruction, and renal complications.^[2] It has also been observed that intra-operative PTH levels greater than 40 pg/ml is associated with an increase incidence of persistent hyperparathyroidism post-operatively and a continuous need to follow such patients for an indefinite period.^[14] The association of PTH levels with anesthetic technique and its consequent impact on the surgical decisions has not been explored completely in scientific literature. This mandates a close co-ordination between anesthesiologists, surgeons, endocrinologists, and the laboratory personals. More and more of randomized clinical trials are needed to arrive at consensus for safe and minimal parathyroidectomy based on post-induction PTH levels. Similarly, new studies should be undertaken to identify the baseline and various timeline values so as to make a correct diagnosis of secondary PTH levels.

REFERENCES

1. Bajwa SJ, Kalra S. Diabeto-anaesthesia: A subspecialty needing endocrine introspection. *Indian J Anaesth* 2012;56:513-7.
2. Bajwa SS, Sehgal V. Anesthetic management of primary hyperparathyroidism: A role rarely noticed and appreciated so far. *Indian J Endocrinol Metab* 2013;17:(in press).
3. Beyer TD, Chen E, Ata A, DeCresce R, Prinz RA, Solorzano CC. A prospective evaluation of the effect of sample collection site on intraoperative parathormone monitoring during parathyroidectomy. *Surgery* 2008;144:504-9.
4. Riss P, Kaczirek K, Heinz G, Bieglmayer C, Niederle B. A defined baseline in PTH monitoring increases surgical success in patients with multiple gland disease. *Surgery* 2007;142:398-404.
5. Bajwa SJ, Kaur J, Singh A, Parmar S, Singh G, Kulshrestha A, et al. Attenuation of pressor response and dose sparing of opioids and

- anaesthetics with pre-operative dexmedetomidine. *Indian J Anaesth* 2012;56:123-8.
6. Hong JC, Morris LF, Park EJ, Ituarte PH, Lee CH, Yeh MW. Transient increases in intraoperative parathyroid levels related to anesthetic technique. *Surgery* 2011;150:1069-75.
 7. Hwang RS, Morris LF, Ro K, Park S, Ituarte PH, Hong JC, *et al.* A selective, Bayesian approach to intraoperative PTH monitoring. *Ann Surg* 2010;251:1122-6.
 8. Irvin GL 3rd, Solorzano CC, Carneiro DM. Quick intraoperative parathyroid hormone assay: Surgical adjunct to allow limited parathyroidectomy, improve success rate, and predict outcome. *World J Surg* 2004;28:1287-92.
 9. Miller BS, England BG, Nehs M, Burney RE, Doherty GM, Gauger PG. Interpretation of intraoperative parathyroid hormone monitoring in patients with baseline parathyroid hormone levels of <100 pg/mL. *Surgery* 2006;140:883-9.
 10. Bajwa SJ, Bajwa SK, Kaur J. Comparison of two drug combinations in total intravenous anesthesia: Propofol-ketamine and propofol-fentanyl. *Saudi J Anaesth* 2010;4:72-9.
 11. Sippel RS, Becker YT, Odorico JS, Springman SR, Chen H. Does propofol anesthesia affect intraoperative parathyroid hormone levels? A randomized, prospective trial. *Surgery* 2004;136:1138-42.
 12. Kivela JE, Sprung J, Richards ML, Karon BS, Hofer RE, Liedl LM, *et al.* Effects of propofol on intraoperative parathyroid hormone monitoring in patients with primary hyperparathyroidism undergoing parathyroidectomy: A randomized control trial. *Can J Anaesth* 2011;58:525-31.
 13. Low JM, Gin T, Lee TW, Fung K. Effect of respiratory acidosis and alkalosis on plasma catecholamine concentrations in anesthetized man. *Clin Sci (Lond)* 1993;84:69-72.
 14. Heller KS, Blumberg SN. Relation of final intraoperative parathyroid hormone level and outcome following parathyroidectomy. *Arch Otolaryngol Head Neck Surg* 2009;135:1103-7.

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