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# Current Data about the Development of Hypoparathyroidism after Thyroid Surgery

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## Editorial

Hypoparathyroidism and the resulting hypocalcemia is a common iatrogenic complication following surgical procedures to the neck, and commonly, to the thyroid gland [1,2]. In spite of many improvements in surgical techniques to avoid hitting and damaging the parathyroid glands, hypoparathyroidism remains a significant postoperative morbidity after total thyroidectomy. This specific complication, as well as recurrent laryngeal nerve injury, is feared, because it may give rise to significant and sometimes permanent, disability for the patient [3]. Postoperative hypocalcemia negatively impacts a patient's quality of life, not only with a prolonged hospitalization, the need for life-long calcium supplementation, but also increasing the risk of medical disputes. Considerable efforts have been spent preventing post-operative hypoparathyroidism after thyroidectomy, but its consequences remain widely undervalued [4]. The amount of publications on post-surgical hypoparathyroidism suggests that the problem has a high impact on health and social life either for patients and surgeons. Costs to society in terms of medical treatment, follow-up, including frequent and repeated laboratory testing and treatment and sick leave, are considerable [5]. Many factors may be involved in the onset of hypocalcemia and hypoparathyroidism after thyroid surgery, including total thyroidectomy, reoperation, neck dissection, preoperative hyperthyroidism, autoimmune and inflammatory thyroid disease and surgical procedure performed by inexperienced surgeons [6]. However not all patients with these factors will develop such complication, probably because in order for it to happen, concur other causes, whose identification seems fundamental to its prevention. The incidence of post-surgical hypoparathyroidism is difficult to define and the literature review shows a considerable variation in the reported data. Hypocalcaemia after thyroidectomy ranges in fact between 1 to above 50% [7,8]. Separately considering, transient and permanent, hypoparathyroidism are reported to be 6.9 to 38 % for the former, and 4 to 10.6% for the latter but at the worst, these rates were as high as >60 and 33 %, respectively [9]. The definition of hypoparathyroidism varies widely in literature in terms of calcium level, need for supplementation of calcium and/or vitamin D [10,11]. Furthermore, different time points have been used to determine when postoperative hypoparathyroidism should be classified as transient or permanent. Some consider postoperative parathyroid glands injury to be permanent if recovery of function has not occurred within 6 month, whereas others define permanence at 1 year after surgery. However it should be remembered that using an earlier time point could result in classifying some patients as permanently hypocalcemic when they could still show resolution of their condition [7,12]. All this is reflected on a wide incidence of hypoparathyroidism reported in different series where transient and permanent hypocalcaemia ranges from 1.6–60% to 0.9–33% respectively. The problem of early and accurate prediction of postoperative hypocalcaemia has also been discussed in great detail. Early prediction also helps in identifying "at risk patients" requiring early calcium and vitamin D supplementation. Many efforts have been done to early assess the postoperative parathyroid function, and there are several reports that postoperative PTH level is a useful tool for predicting hypocalcemia [13,14]. Particular attention has been paid to lowering PTH level immediately or several hours postoperatively. The rapid PTH assay can virtually reflect real time parathyroid function because the short half-life of PTH [15]. However, intraoperative PTH assay is not available in all centers for its cost. Furthermore, operation time can be prolonged, because it needs time. Usually post-operative serum calcium levels are used to predict hypoparathyroidism and other authors reported that a gradual increase of calcium level within 24 hours postoperatively predicts normal calcium levels [16]. Regarding the correlation between postoperative hypocalcemia and the number or the viability of in situ preserved parathyroid glands many reports are available in literature [17]. Although physical preservation of the parathyroid glands in situ is necessary, it does not ensure normal parathyroid function owing to vascular injury of the glands. A wide consensus exists about the transplant of the parathyroid gland that seems to be nonviable [18]. Moreover some surgeons, in

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order to prevent permanent hypoparathyroidism, advocated routine parathyroid autotransplantation [18,19]. Although a color change from the normal brownish-red to blue-black has traditionally been thought to be a sign of vascular involvement and impaired function, recent studies have questioned this method [7,20]. Others Authors have shown that bleeding from an incision of a parathyroid gland, so-called "knife" test, is an important finding suggesting intact vascularity [21].

Wishing to proceed to a discussion about the most common risk factors we can certainly affirmed that the risk of hypoparathyroidism increases with extent of thyroidectomy, malignant disease, concomitant central and/or lateral neck dissection, autoimmune or Graves' disease and re-operation. Particularly it is reported that the transient hypocalcemia after thyroidectomy for cancer ranges from 13.6% to 75% and permanent hypoparathyroidism ranges from 3.3% to 5.8% by placing the cancer as the main predictive factor for the development of these complications. Moreover the eventually associated lymphadenectomy increases the risk of hypoparathyroidism. This conclusion is supported by the findings of many Authors [22]. A significantly higher incidence of permanent hypoparathyroidism was observed in patients with hyperthyroidism but it is unclear exactly why in these patients thyroidectomies have an increased rate of hypocalcaemia. Thyrotoxicosis was also found to be a significant factor in several other studies exploring hypocalcaemia and many authors indicate that Grave's disease and Hashimoto's disease are to be considered a risk factor for postoperative hypoparathyroidism. Reoperation may increase the risk of iatrogenic injury to the parathyroid glands. The incidence of transient and permanent hypocalcemia is reported up to 44.1 and 11% respectively. Given the high incidence of hypoparathyroidism resulting from re-operation, surgeons should not be encouraged to adopt hemi-thyroidectomy for unilateral benign disease. According to the results of our study, the safety of the energy-based devices is proved and their use in patients with thyroid diseases could be appropriate [23]. Attention should be paid to using it at an appropriate distance from vital anatomic structures such as recurrent laryngeal nerves and parathyroid glands. Close to this important structures, while performing thyroidectomy is highly recommended to use conventional suture ligation technique in order to prevent damage to the parathyroid glands [24].

Preservation of the parathyroid glands during total thyroidectomy is the best prophylaxis to avoid postoperative hypocalcemia after total thyroidectomy for an endocrine surgeon. Not always is necessary to visually identify all parathyroid glands to accomplish this. Parathyroid glands lying a slight distance from the thyroid are more difficult to identify but easier to maintain functionally intact. Dissection at the sub-capsular plane of the thyroid during total thyroidectomy ensures preservation of most of the parathyroid, thereby lowering the incidence of postoperative hypocalcaemia. Understanding the complex vascular structures surrounding the parathyroid gland is crucial to prevent post-thyroidectomy hypoparathyroidism because there is no guarantee of normal postoperative parathyroid function, even if the procedure is performed for benign disease. In our opinion it is important for surgeons to think about second surgery that may be performed in future for various reasons when they perform hemi-thyroidectomy as an initial surgery. A careful examination of the surgical specimen intraoperatively decreased the incidence of inadvertent parathyroidectomy during thyroid surgery. Any parathyroid gland that looks likely to be totally devascularized can be removed during the operation and autotransplanted into well-vascularized muscles such as the sternocleidomastoid muscle. Evaluation and management of central neck surgical patients for postoperative hypoparathyroidism may present challenges. Although the dissection of central compartment is a safe procedure, it is difficult to keep the parathyroid glands intact in case of a tumor is large, infiltrative or if there is extensive lymph node metastasis. In this case, a careful staging should be performed in order to avoid possible morbidity related to reoperation for recurrence involving lymph node. Resolution of hypoparathyroidism is likely to be related to recovery of the parathyroid glands function. Nowadays is it difficult to predict which patients will recover and it is also unclear as to whether any specific intervention will facilitate recovery. Furthermore, 12 months may be the most appropriate time point to define hypoparathyroidism as a permanent condition because patients with transient postoperative failure of parathyroid glands usually resolved within a year after surgery. A low PTH level early after total thyroidectomy is associated with a high risk of permanent hypoparathyroidism and normal levels usually exclude long-term parathyroid glands dysfunction. However, the cost of the PTH assay may limit its widespread application. Finally, hypoparathyroidism following thyroidectomy is a documented source of complaints and medical disputes. Appropriate informed consent remains a priority to emphasize particularly the importance of some primary factors responsible for the increased risk of unintended injury of parathyroid glands after thyroid surgery.

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