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Can a surgeon predict the risk of postoperative hypoparathyroidism during thyroid surgery? A prospective study on self-assessment by experts

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Individual surgeon

Abstract

BACKGROUND: Thyroid surgery can cause postoperative hypocalcemia (POH) and permanent hypoparathyroidism (PEH). Surgeons implicitly assess the risk and adapt their surgical strategy accordingly.

METHODS: The outcome of this intraoperative decision-making process (the surgeons' ability to predict the risk of POH and PEH on a numerical rating scale and their actual incidence) was studied prospectively in 2,558 consecutive thyroid operations.

RESULTS: POH and PEH occurred in 723 and 64 patients, respectively. In multivariate analysis, the surgeons' risk assessment score was an independent predictive factor for both complications ($P < .05$). Surgeons' differed significantly ($P = .015$) in their rates of POH but not of PEH ($P = .062$). Six and 3 (of 9) surgeons correctly predicted an increased risk of PEH and POH (adjusted odds ratios 1.67 to 2.21 and 1.47 to 12.73), respectively.

CONCLUSION: The risk for hypoparathyroidism can be estimated, but surgeons differ substantially in this ability and in the extent to which this implicit knowledge is translated into lower complication rates.

In spite of continuous improvements and refinements in the surgical techniques, parathyroid insufficiency remains an unsolved problem in thyroid surgery. The Scandinavian quality registry, which included an unselected study population, revealed an incidence of postoperative hypocalcemia (POH) and permanent hypoparathyroidism (PEH) after bilateral operations of 9.9% and 4.4%, respectively.[1] Even higher rates have been reported, especially after extensive resections.[2]

So far, a highly reliable method has not yet been developed to predict PEH. Recently, Pradeep et al[3] used multivariate analysis to identify and rank risk factors for

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clinically relevant POH after total thyroidectomy. Several studies have described postoperative measurement of parathyroid hormone (PTH) as a predictive factor for both POH and PEH.[4–6] Both the composite score of Pradeep et al and postoperative measurements of PTH rely on a combination of factors, several of which are to be assessed after the operation. They only identify patients who are risk, but do not provide intraoperative guidance. When focusing in particular on PEH, it would be desirable to have a predictive tool that identifies potential intraoperative risk factors and thus assist in reassessing the surgical strategy. It has already been demonstrated that during bilateral thyroid surgery, PTH decreases 10 minutes after resection of the 1st lobe in patients with PEH.[5] Thus, by using this information, the surgeon can adapt the surgical procedure to reduce the risk of persistent hypocalcemia. It has been argued that an individualized surgical approach is optimal, in particular in areas with a high percentage of benign euthyroid goiter including the German-speaking countries.[7] However, intraoperative PTH monitoring is not easily applicable during routine surgery, because it is cost-intensive. In fact, this specialized test may be unavailable even in centers of tertiary care.

In potentially dangerous situations, people assess the risk in an implicit way: the computational steps carried out by the brain are not accessible, but the overall output emerges into the conscious mind as the perception of the overall hazard.[8] Clinical guidelines aim at replacing these implicit judgments by explicit criteria. In the absence of reliable or readily applicable predictive tools, it is nevertheless of interest to explore the implicit judgment of an experienced thyroid surgeon, that is, whether she or he can predict the risk for complications, in particular, persistent damage to the parathyroid gland during surgery.

Quality control and continuous quality improvement have become important aspects of modern medicine within the last decades. Studies on thyroid surgery demonstrated significant differences in complication rates, namely postoperative hemorrhage, between various departments.[9] In previous reports of our study group, we demonstrated that the rates for recurrent nerve palsy and postoperative hemorrhage differed widely between individual surgeons although all of them were highly experienced in thyroid surgery.[10,11] We hypothesized that the risk factor that could be changed was the surgeon. Continuous quality improvement in global outcome may be achieved by monitoring and retraining. From our experience, surgeons do not only differ in terms of their individual complication rates but also concerning their self-assessment. It would, thus, also be of high interest to evaluate the individual surgeons' quality of risk assessment and to compare these with the actual results. To the best of our knowledge, this has never been addressed before.

Hence, we aimed to evaluate in a prospective study (1) the risk for POH and PEH per surgeon, (2) whether the surgeons' predicted risk for POH and PEH assessed on a numerical rating scale would provide useful information and would correlate with the actual rates of the above-mentioned complications, and (3) whether the quality of risk assessment would differ between the surgeons.

Patients and Methods

Study design and patient population

In a prospective study, 2,558 patients who underwent thyroid surgery at the Department of Surgery, Kaiserin Elisabeth Hospital, Vienna, Austria, from February 2009 to January 2012 and who were willing to participate were included. Moreover, surgeons had to agree to the study; not all surgeons were willing to participate. Patients who suffered from concomitant hyperparathyroidism, preoperative hypocalcemia, or preoperative hypoparathyroidism were excluded.

Immediately after the operation, surgeons had to fill out the study protocol and assess the risk for POH and PEH separately on a numerical rating scale ranging from 0 (no risk at all) to 5 (highest imaginable risk). Notably, apart from 4 inexperienced surgeons who were analyzed in a separate group (see below), only highly experienced surgeons, who had performed several hundred thyroid operations, participated in the study.

Hypocalcemia was defined as serum Ca^{2+} levels below the normal range or calcium and/or vitamin D supplementation necessary to treat hypocalcemia-related symptoms (tingling sensations and muscle cramps). The diagnosis of PEH required that this situation persisted for more than 12 months. We did not rely on the levels of PTH for the diagnosis of PEH. In fact, patients may have low serum calcium levels and symptoms of hypocalcemia, although their PTH levels are within the normal range because of parathyroid insufficiency.[12] Routine discharge was on day 2 to day 4. Routine follow-up was on day 14; if necessary (patients with thyroid hormone deficiencies, recurrent nerve palsy, hypocalcemia), follow-up examinations were performed after 2, 6, and 12 months and subsequently at yearly intervals in our clinic.

The study design did not need approval by an ethics committee, because it was a purely observational study. Only clinical trials that examine interventions (medications and new procedures) are subject to institutional review by an ethics committee within the Vienna Hospital Association. Patients gave written informed consent and all procedures were carried out in accordance with the Good Scientific Practice Standards of the Medical University of Vienna, which are based on the ethical standards of the Helsinki Declaration.

Laboratory determinations

Serum PTH was measured using the "DPC 6607070 PTH (M/P) I.2000" assay on the Immulite 2000 systeme (Siemens Healthcare Diagnostics GmbH, Eschborn,