

## Reply to: doi:10.1007/s00464-009-0677-y: Re: Natural orifice surgery on thyroid gland—totally transoral video-assisted thyroidectomy (TOVAT)—report of first experimental results of a new surgical method (2009 (23):1119–1120)

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With great pleasure we take the opportunity to answer the comments of Drs. Paolo Miccoli, Gabriele Materazzi, and Piero Berti on our article Natural Orifice Surgery on the Thyroid Gland: Totally Transoral Video-Assisted Thyroidectomy (TOVAT): Report of the First Experimental Results of a New Surgical Method, which appeared in the May 2009 issue of *Surgical Endoscopy* [1]. Because our article is a multimedia report comprising a video and an abstract, it was not possible to mention more details and data dealing with this new technique.

Paolo Miccoli and his colleagues raised the following concerns:

1. Did the authors study with the cadavers the postoperative effects of carbon dioxide (CO<sub>2</sub>) after the operation? It is well known that CO<sub>2</sub> insufflation, due to the absence of a virtual cavity in the neck, may lead to a troublesome postoperative emphysema, besides metabolic problems due to hypercarbia [2]. With minimally invasive video-assisted thyroidectomy (MIVAT), we early abandoned

the CO<sub>2</sub> insufflation, shifting to an external retraction method and aiming to avoid any complication due to gas insufflation and thus any discharge delay.

Mediastinoscopy, retroperitoneoscopy, and totally extraperitoneal inguinal hernia repair (TEP) are established procedures that have been successfully performed for thousands of patients' worldwide. These techniques have familiarized us with ways of creating the operative space needed for removal of the thyroid gland from a remote site, providing a scarless outcome in the neck (e.g., axillary, chest wall/breast, or combined trocar accesses). Carbon dioxide is insufflated at a pressure up to 6 mmHg. In an evidence-based review of published extracervical techniques, no troublesome complications in the wake of CO<sub>2</sub> insufflation were reported [3, 4]. In our own experience with more than 220 patients treated with the axillo-bilateral-breast-approach (ABBA), only a few of the women experienced skin emphysema, which completely resolved spontaneously within the first 12 h postoperatively. We did not observe any case of metabolic problems due to hypercarbia (unpublished data). Such a complication also has not been reported by other authors [3, 5]. Postoperative emphysema should not be considered a complication but rather a "by-product" of all extracervical techniques.

2. Did the authors consider that multiple painful sutures in the mouth mucosa, even if invisible to others, might represent an important obstacle to oral intake after the operation? For how many days should the patients fast and therefore remain in the hospital? That would mean a prolonged hospitalization, with neglect of the risks for infection and possible trauma to sublingual salivary glands.

Only a few reports describe transoral surgery on humans. One such report is that of Shellenberger et al. [6],

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who described transoral excision guided by preoperative ultrasonography for a series of three consecutive patients with differentiated thyroid cancer metastatic to the retropharyngeal space. In all cases, the metastatic lateral retropharyngeal lymph node was removed successfully by transoral retropharyngotomy without complications. All patients resumed an oral diet within 24 h after surgery, with only mild discomfort similar to that of a tonsillectomy. One patient who underwent retropharyngotomy alone was discharged on the first postoperative day. Two patients who underwent the procedure with concurrent neck dissection were discharged on the first and fourth postoperative days [6].

Concerning infection risks, we cite the paper by Hong and Yang [2]. They evaluated the surgical results associated with the intraoral approach in a series of 77 operations for chronic sialadenitis and benign mixed tumors in the submandibular gland. The infection rate for this group was 2.6% (2 patients) compared with 7.3% for 251 patients treated with a transcervical approach. Proper preoperative preparation and continuous suction drainage with the hemovac through the oral cavity after dissection may prevent infections [2].

3. The authors declare they retrieved the specimen through the 5-mm incision in the oral cavity, but they did not report the size of the removed glands. Probably a very normal gland can pass through such a narrow space, but it is undoubtedly difficult to understand how a 2–3 cm or even larger nodule can be retrieved without enlarging the mucosa wound. Consequently, with incisions larger than 5 mm, traumatism to the oral cavity will be increased, which takes us back to concern 2.

On this point, we agree with Paolo Miccoli and his colleagues. The size of the gland may be a limiting factor of transoral thyroidectomy. We actually are performing investigations on cadavers to determine the specimen volume that can be removed without causing damage to the structures of the floor of mouth.

4. A major concern is about laryngeal nerve dissection. Proper identification of the nerve would be the first target to achieve by a safe technique, both traditionally and with minimally invasive technique. With MIVAT and other endoscopic techniques [7, 8], visualization of the nerve and parathyroids is enhanced by optical magnification and represents a fundamental step of the operation. Furthermore, front neck access with MIVAT allows a good overall view of the operative field [9], whereas craniocaudal vision of the thyrotracheal groove obtained by TOVAT may jeopardize the nerve, which usually divides in several branches and therefore must be followed bottom-up and not in the opposite direction.

We routinely prepare the retrothyroidal area including visualization of the recurrent laryngeal and vagus nerves. In ABBA cases, intraoperative neuromonitoring is achieved with the help of a 3-mm/31-cm probe. This also can be used during the transoral approach. Concerning the craniocaudal vision of the thyrotracheal groove obtained by TOVAT, this area can be well visualized with the help of a 45° endoscope.

5. Which endoscope was used, a 30° or a 0° instrument? Finally, the additional 3-mm trocars can allow only very small hemostatic instruments, not any modern “energy” device, let alone vascular clips. No doubt a small bipolar scalpel can achieve hemostasis with a cadaver, but what about a live (and bleeding) patient?

In the first 2 min of the presented video, we used a 3-mm/30° endoscope. Once the subplatysmal working space was large enough, we changed to a 5-mm/45° endoscope. Hemostasis will be achieved with the help of the Harmonic or bipolar scalpel. For this, the right 3-mm trocar should be replaced by a 5-mm trocar. We can reassure Paolo Miccoli and his team that all well-established criteria and standards of traditional thyroidectomy will be fulfilled by the transoral approach. Further feasibility, efficiency, and effectiveness of this new technique should be demonstrated in the future. We mention once again that the presented multimedia publication was dealing only with cadaver studies on the feasibility of this new method for thyroid resection. Further studies on its safety and feasibility in an animal model will be published soon.

**Disclosure** Drs. T. Benhidjeb, T. Wilhelm, J. Harlaar, G.-J. Kleinrensink, T. A. J. Schneider, and M. Stark have no conflicts of interest or financial ties to disclose.

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