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Letter to the Editor regarding "Carbon dioxide embolism during transoral robotic thyroidectomy: A case report"

Jonathon O. Russell, MD[1], **Elya Vasiliou, MD**[1], **Christopher R. Razavi, MD**[1], **Jason D. Prescott, MD, PhD**[2], and **Ralph P. Tufano, MD**[1]

[1]Division of Head and Neck Endocrine Surgery, Department of Otolaryngology—Head and Neck Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland [2]Endocrine Surgery, Department of Surgery, The Johns Hopkins University School of Medicine, Baltimore, Maryland

Dear Editor,

We applaud the rapid publication of the recent case report by Dr. Kim and colleagues describing carbon dioxide embolism during transoral vestibular thyroidectomy.[1] As the authors cite, the transoral endoscopic thyroidectomy vestibular approach (TOETVA) first reported by Anuwong has found some success and is rapidly gaining popularity among high-volume endocrine surgeons seeking the complete absence of cutaneous incisions. With any new approach, it is imperative that any complication or adverse event be immediately publicized so that patients and surgeons can determine the relative value of each approach to all stakeholders and especially to our patients.[2]

As the authors state, CO_2 embolus is a rare but accepted risk of any procedure where insufflation is used to maintain a working space.[3–6] Although it has been described in abdominal surgery for some time, the absolute risk is negligible and laparoscopy is now the standard of care for a majority of abdominal procedures.[7,8] To our knowledge, this is the only case of carbon dioxide embolism during transoral vestibular thyroid surgery reported to date. Of note, anesthesia was maintained with sevoflurane in the above case report as per communication with the authors. Prior animal models have demonstrated that inhaled anesthetics increase the severity of venous air embolisms.[9] Furthermore, a recent clinical trial demonstrated that patients undergoing laparoscopic hepatectomies maintained with sevoflurane had a longer duration of carbon dioxide embolism than those maintained with propofol. The longer duration of embolism was found to result in lower mean arterial pressures, PO_2/ FiO_2, and pH in the sevoflurane group in comparison to the propofol group. [10] Although this has not been studied in the TOETVA patient population, it raises the question as to whether we should be urging our anesthesia colleagues to avoid inhaled anesthetic agents during these cases.

In cases of carbon dioxide embolus, the standard of care is to stop insufflation, stop persistent gas transfer (eg, manual pressure to the neck), place the patient in Trendelenburg

Correspondence: Jonathon O. Russell, Department of Otolaryngology—Head and Neck Surgery, The Johns Hopkins School of Medicine, Johns Hopkins Outpatient Center, 601 N. Caroline Street, 6th Floor, Baltimore,MD 21287 jrusse41@jhmi.edu.

and roll to the left lateral decubitus position. Anesthetic gas should be discontinued and ventilation with 100% oxygen should be initiated. Positioning in conjunction with hyperventilation aid in dissolution of the embolus and increased cardiac output.[11] Aggressive volume expansion elevates central venous pressure and reduces further gas entry into the circulation. In the case of cardiovascular collapse, vasopressors and/or inotropes may be administered as needed by the anesthesia team in addition to cardiopulmonary resuscitation. In severe cases, aspiration of gas from the right heart may be required to relive the "gas lock" from the right atrium or ventricle.[3] Each surgeon and anesthesiology team must decide if the case should continue following such an event.

The transcervical incision has been demonstrated to be a safe and effective incision for more than a century. To justify the added risk of carbon dioxide embolus or any other complication, patients and surgeons must feel that some value is added. Because wound healing and patient opinions are variable, it is imperative that this very personal decision for the surgical technique be accomplished through frank disclosure of all possible risks, benefits, and alternatives, especially as they relate to surgeon experience with this technique.[12]

To begin to know the safety profile of the transoral vestibular approach, as well as the standard transcervical approach, the medical community must be communicating frankly on all outcomes. We are grateful to the editors and authors who promptly published a report that may serve to help keep other patients safe. We encourage all authors who perform novel techniques to promptly report complications and to share them with the medical community so that solutions can be investigated quickly for optimal patient safety.

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