

# ACCUVEIN® AS A TOOL TO IDENTIFY BLOOD VESSELS OF THE TONGUE DURING SMILE PROCEDURE

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## ABSTRACT

**Introduction:** To propose the use of AccuVein®AV400 as an alternative to determine the lingual vessels' path, before lingual surgery in order to avoid surgical complications.

**Methods:** We report 3 consecutive patients who underwent SMILE. In every case, the path of the lingual vessels' was mapped out on the lingual surface using AccuVein®, allowing to draw it on the tongue mucosa.

**Results:** The lingual vein anatomy was clearly determined in all of the patients.

**Conclusions:** We conclude that AccuVein® is a cheap and easy to find device that may decrease complications during SMILE or some other lingual surgical procedures, and its routine use should be considered.

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## 1. INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is a highly prevalent disorder associated to a number of complications such as stroke, hypertension, and hypersomnolence. Surgery, especially in a multilevel approach, has proved to be an effective treatment modality in selected cases. There are different criteria to determine which procedure must be done, but the involved anatomical areas should be thoroughly addressed in every case, and a polysomnography (PSG) should be performed as well.<sup>1</sup>

Once a patient fails positive pressure therapy, if the tongue base is one of the involved areas, we have many

surgical and non surgical therapeutic alternatives that might be used. Mandibular Advancement Devices (MAD),<sup>2</sup> genioglossus muscle advancement, and tongue base somnoplasty are some of the most commonly used options.<sup>3</sup> Maturo and Mair, published a novel technique called submucosal minimally invasive lingual excision (SMILE),<sup>4</sup> designed to reduce enlarged tongues in children with obstructive macroglossia. SMILE is performed using Coblator® (ArthroCare Corporation, Austin, Texas) and it is effective and easy to perform,<sup>5, 6</sup> but given it is performed submucosally, the possibility of hidden vascular anatomical variants of the lingual blood vessels or vascular malformations is always present, leading to the risk of

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Figure 1: Location of the Accuvein device during the procedure, about 25 cm from the surgical area.

significant bleeding of the deep lingual vein, leading to necrosis of the tongue. Maturo and Mair proposed the use of Color Doppler Ultrasonography on the tongue to map out the course of the lingual vessels allowing the surgeon to avoid them during surgery. Nevertheless, in some Countries it is not easy to have the color doppler at hand, so we need to work based on anatomic knowledge,<sup>7</sup> but the risk of bleeding remains high.

AccuVein® AV400 (Accuvein Inc, Huntington, NY) is an infrared augmented reality device which is used to generate real-time images of venous structures beneath the skin.<sup>8</sup> It is frequently used in emergency rooms, to avoid bruising in cosmetic medicine and in vascular medicine to visualize veins while using sclerosants. When applied to the skin, the blood hemoglobin absorbs infrared light helping to clearly see the vein course.<sup>9, 10</sup> It is a non-invasive device and it is easily found in most medical facilities.

We report a case series of patients undergoing lingual veins mapping via AccuVein technology prior to surgery as an alternative to reduce the risk of profuse bleeding due to accidental damage to lingual vascular malformations or anatomical variants.

## METHODS

3 consecutive cases were included. All of them underwent a SMILE procedure, with approval of the IMMIS ethics and research committee number IMMIS 2021/03. AccuVein® device was located approximately 25 cm above the tongue to optimize visualization of the lingual vessels (Figure 1 and 2). Once located, we mapped them out with a surgical pen (figure 3).

SMILE was performed according to the technique described by Maturo and Mair,<sup>[4]</sup> but using AccuVein® instead of color doppler ultrasound in order to find the path of the lingual vein. An EVAC-70 adenotonsillectomy coblator wand was used.

## RESULTS

Case series: One of the patients was an OSAS adult. SMILE was performed as a part of a multilevel approach. The other 2 patients were children, both of them carriers of macroglossia due to Down Syndrome. No stitches were placed in the incision at the tongue.

*Case 1:* 4 years old female patient, with macroglossia associated to Down Syndrome. PSG showed no evidence of OSAS, but intense snoring was present. The patient underwent the SMILE procedure along with tonsillectomy using the Coblator device.

*Case 2:* 44 years old male, with moderate OSAS confirmed at PSG. SMILE was performed as a part of a multilevel surgical approach that included: Septoplasty, turbinoplasty, Uvulopalatopharyngoplasty with uvulopalatal flap and SMILE. The tongue involvement was confirmed by physical examination and pharyngeal endoscopy.

*Case 3:* A 3 years old male patient also with Down Syndrome. PSG showed an Apnea-Hypopnea Index (AHI)=18. SMILE was performed as a single procedure.

In all cases, the path of the lingual veins was easily and quickly found and mapped out in the surface of the tongue by using AccuVein®, allowing us to avoid them during the surgery. We had no significant bleeding in any of the patients, neither during surgery nor postoperatively.



*Figure 2:* The 2 arrows show the path of lingual vessels on both sides of the midline. The Accuvein infrared energy allows to clearly watch the path of the lingual vessels.



*Figure 3:* Once the vessels' path is located, it is mapped out on the surface of the tongue using a common surgical pen.

## DISCUSSION

The main limitation of this study is its design. Case series lack of a good level of evidence, and given that it is a descriptive study, we can not make further analysis. We decided to report it as a case series because there are no previous studies addressing alternatives to the use of color doppler ultrasonography. To rely only on anatomical bases may increase the risk of undetected vascular anomalies of the lingual vessels, with the consequent risk of profuse bleeding during the surgery. AccuVein seems to be a reliable and cheaper alternative to doppler.

The objective of this study is to propose the use of AccuVein instead of doppler ultrasound to find the lingual vessels course before the SMILE procedure, given that AccuVein may be found in most hospital settings. This is why we do not deepen about surgical results and follow up. The aim of AccuVein on this patients is to decrease the risk of profuse bleeding during surgery due to lingual vascular malformations of anatomical variants, by finding the locations of these vessels.

Another weakness is the small sample. 3 cases may seem as very few patients, but this is true only when we are trying to make an analytical study, comparing results between groups. The objective of our study is to show the usefulness of a new tool, one that had never been used for this purpose. On the other hand, the AccuVein has the advantage of being easily found in most of medical facilities. SMILE is one of the most effective surgical procedures aimed to treat the base of the tongue in patients with macroglossia, and AccuVein may decrease its risk of complications. However, further studies, with larger populations and even with an analytical design are mandatory.

## REFERENCES

1. Labra A. Classification and Surgical Prognosis in a Sleep-disordered Breathing Patient. In: Lugo-Saldaña R. *Surgical Management in Snoring and Sleep-disordered Breathing*. 1st ed, Jaypee Brothers Medical Publishers Ltd, New Delhi, India, 2015, pp:35-40.

2. García-Campos E, Labra A, Galicia-Polo L, Sánchez-Narváez L, Haro-Valencia R, Jiménez U, Poblano A. Decrease of respiratory events in patients with obstructive sleep apnea-hypopnea syndrome using a mandibular advancement device assessed with split night polysomnography. *Sleep Sci*. 2016 Jul-Sep; 9(3): 221–224.

3. Labra A, Huerta-Delgado AD, Gutierrez-Sanchez C, Haro-Valencia R, Cordero-Chacon SA. Complications of tongue base somnoplasty. *J Otolaryngol Head Neck Surg*. 2008 Apr;37(2):260-2.

4. Maturó SC, Mair EA. Submucosal minimally invasive lingual excision: an effective, novel surgery for pediatric tongue base reduction. *Ann Otol Rhinol Laryngol*. 2006 Aug;115(8):624-30.

5. Propst EJ, Amin R, Talwar N, Zaman M, Zweerink A, Blaser S, Zaarour C, Luginbuehl I, Karsli C, Aziza A, Forrest C, Drake J, Narang I. Midline posterior glossectomy and lingual tonsillectomy in obese and nonobese children with down syndrome: Biomarkers for success. *Laryngoscope* 2017 Mar;127(3):757-763.

6. Murphey AW, Kandl JA, Nguyen SA, Weber AC, Gillespie MB. The Effect of Glossectomy for Obstructive Sleep Apnea: A Systematic Review and Meta-analysis. *Otolaryngol Head Neck Surg*. 2015 Sep;153(3):334-42.

7. Sommerz-Best D, Romero-García LA, Cruz-Hernández J. Características y variaciones anatómicas de la arteria lingual en población mexicana y su correlación quirúrgica con la radiofrecuencia de la base de la lengua en el tratamiento del síndrome de apnea obstructiva del sueño. *AN ORL MEX* Vol. 55, Núm. 4, 2010, pp:127-132

8. Law KW, Ajib K, Couture F, Tholomier C, Bondarenko HD, Preisser F, Karakiewicz PI, Zorn KC. Use of the AccuVein AV400 during RARP: an infrared augmented reality device to help reduce abdominal wall hematoma. *Can J Urol*. 2018 Aug;25(4):9384-9388.

9. Aulagnier J, Hoc C, Mathieu E, Dreyfus JF, Fischler M, Le Guen M. Efficacy of AccuVein to facilitate peripheral intravenous placement in adults presenting to an emergency department: a randomized clinical trial. *Acad Emerg Med*. 2014 Aug;21(8):858-63.

10. Yaprak E, Kayaalti-Yukse S. Preliminary evaluation of near-infrared vein visualization technology in the screening of palatal blood vessels. *Med Oral Patol Oral Cir Bucal*. 2018 Jan 1;23(1):e98-e104.