

## Case Report

# Treatment of Residual Palatal Collapse in Hypoglossal Nerve Stimulation Using a Palatal Device

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Hypoglossal nerve stimulation (HNS) has increasingly become an alternative therapy for obstructive sleep apnea patients with CPAP intolerance. Stimulation of the hypoglossal nerve during sleep enhances airway patency and alleviates collapse. Sub-optimal responses to HNS often stem from insufficient palatal coupling and residual velar collapse. Combining palatal devices, such as Velumount<sup>®</sup>, with HNS represents a simple and cost-effective strategy to treat residual palatal collapse. Patients desiring conservative treatment for residual palatal obstruction under HNS may consider this combined approach.

**Key Words:** hypoglossal nerve stimulator, implant, Inspire implant, nonresponder, obstructive sleep apnea (OSA), palatal device, upper airway stimulation, Velumount.

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## INTRODUCTION

Hypoglossal nerve stimulation (HNS) has increasingly become an alternative therapy for obstructive sleep apnea (OSA) in patients with CPAP intolerance. In well-selected patients, HNS proves highly effective and maintains a good safety profile.<sup>1</sup> A contraindication to HNS is a concentric collapse of the velum. By stimulating the hypoglossal nerve during sleep, HNS enhances airway patency and alleviates collapse. The main effect is a stiffening and protrusion of the tongue. The effect at the level of the palate is only indirect by a forward movement of the palatoglossal muscle, also known as “palatal coupling,” which opens the soft palate.<sup>2</sup> However, certain patients exhibit insufficient palatal coupling, resulting in residual snoring or obstructive events despite appropriately titrated HNS. We report on a patient with an incomplete response to HNS who has successfully used a palatal device, Velumount<sup>®</sup> (Bern, Switzerland), to complement his HNS therapy.

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## THE PALATAL DEVICE

The palatal device (Fig. 1) comprises a small, plastic-coated wire customized to the individual anatomy. The middle section lies in the retropalatal region, applying traction to the soft palate. Its main effect is stenting the lateral pharyngeal wall to prevent velar collapse. The wire's ends are passed through the retromolar and alveolar regions, securing it with the lips.<sup>3</sup> Arthur Wyss of Berne invented the Velumount<sup>®</sup> palatal device (Fig. 1), with subsequent design modifications by several companies. To date, over 40,000 patients have been treated with palatal devices, predominantly for habitual snoring and mild obstructive sleep apnea.

## CASE REPORT

A 43-year-old patient presented with severe OSA and daytime sleepiness, reporting intolerance to continuous positive airway pressure therapy. The patient's body mass index is slightly elevated at 28 kg/m<sup>2</sup> (103 kg, 192 cm). Aside from a septal deviation, the ENT examination was unremarkable. The tonsils had been removed during childhood. Polysomnography demonstrated an apnea-hypopnea index (AHI) of 51 events per hour, while the Epworth Sleepiness Score was 15 out of 24. Snoring was rated 10 on a visual analog scale from 0 to 10. Drug-induced sleep endoscopy showed multilevel collapse featuring a complete antero-posterior palatal collapse with good palatal coupling upon chin lift and Esmarch maneuver. On January 12, 2021, the patient underwent HNS implantation (Inspire Medical, Minnesota, USA). Although daytime sleepiness improved markedly, heavy snoring with witnessed apneas persisted. Six months postoperatively, the AHI remained elevated at 38/h with HNS.

Wake titration enhanced the synchronization of stimulation and respiration but failed to yield substantial gains

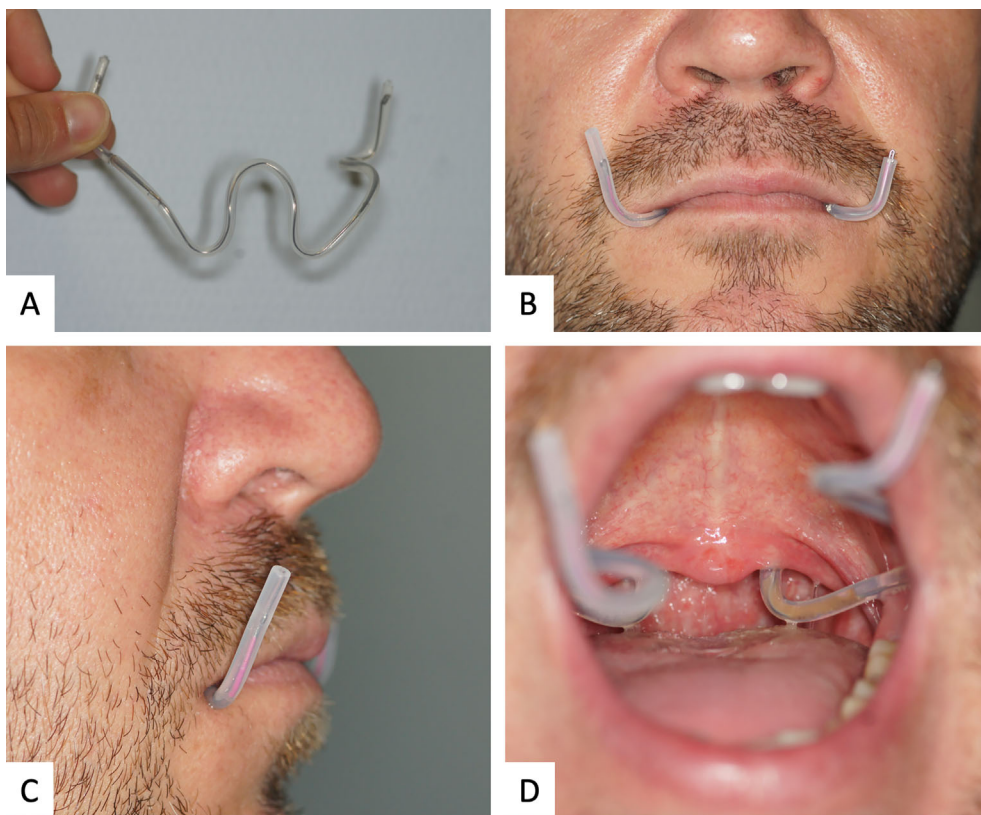


Fig. 1. Velumount® palatal device. (A) The whole device. (B–D) The palatal device in use. [Color figure can be viewed in the online issue, which is available at [www.laryngoscope.com](http://www.laryngoscope.com).]

TABLE I.

Comparison of Apnea-Hypopnea Index, Daytime Sleepiness on the Epworth Sleepiness Scale and Snoring on a Visual Analog Scale (VAS) Before Treatment, With Hypoglossal Nerve Stimulation (HNS), With Velumount® Palatal Device and the Combination of HNS and Velumount® Palatal Device.

|                           | Pretreatment (December 8, 2021) | HNS alone (December 22, 2022) | Velumount® alone (November 14, 2023) | HNS and Velumount® (April 26, 2023) |
|---------------------------|---------------------------------|-------------------------------|--------------------------------------|-------------------------------------|
| Apnea-Hypopnea Index      | 51/h                            | 43/h                          | 27/h                                 | 11/h                                |
| Oxygen Desaturation Index | 39/h                            | 37/h                          | 27/h                                 | 11/h                                |
| Epworth Sleepiness Scale  | 15                              | 5                             | NA                                   | 2                                   |
| Snoring VAS               | 10                              | 10                            | NA                                   | 5                                   |

regarding snoring, daytime sleepiness, and AHI. Nasal breathing impairment persisted despite conservative nasal steroid treatment. In March 2023, a drug-induced sleep endoscopy was conducted, followed by septoplasty, radiofrequency of the soft palate, and shortening of the uvula. Although the drug-induced sleep endoscopy showed a good upper airway opening of the tongue base and the epiglottis, a complete palatal collapse with an anterior–posterior pattern persisted. After surgery, nasal breathing was improved. However, no changes in AHI, snoring, or daytime sleepiness were observed. Due to temporomandibular joint and dental issues, the patient could not receive additional treatment with a mandibular advancement device.

A Velumount® palatal device was advised and fitted in April 2023. The patient tolerated the palatal device well and reported no adverse effects. The combination of HNS and the palatal device led to a reduction in AHI to 11/h. The Epworth Sleepiness Score was normalized to 2/24, and the bedpartner’s observation indicated a 50% reduction in snoring. To differentiate the contribution of the HNS and palatal device on therapy success, the patient performed additional sleep testing with the palatal device alone. Both monotherapies improved sleep apnea compared to baseline, but the combination proved most effective. Table I presents an overview of the different treatment effects.

## DISCUSSION

Palatal devices such as Velumount® and RonchAP® have been devised for treating habitual snoring and mild OSA with suspected palatal collapse. Favorable treatment effects on respiratory events, daytime sleepiness, and snoring were reported, although the literature is limited.<sup>3,4</sup> Not all patients tolerate the palatal devices due to gag reflex and foreign body sensation, limiting adoption. Other less frequently cited adverse effects are hypersalivation and pain. These adverse reactions are reported as the primary reason for discontinuing the therapy, reflected in the modest long-term adherence. Among patients who tolerate the device, compliance is 73% after 1 month and 40% after a follow-up of 3 years.<sup>4,5</sup> Despite these limitations, some patients report good benefits from the palatal device and continue the therapy long-term. While a substantial number of patients have received palatal device therapy, limited data exists on its viability as monotherapy for obstructive sleep apnea. Palatal devices are popular in Switzerland, Germany, and Austria but are also available in the Netherlands and South Africa.

From our experience, persisting palatal collapse is often encountered in patients with suboptimal HNS outcomes, stemming from an insufficient coupling between the soft palate and the tongue through the palatoglossal arch. Although uvulopalatopharyngoplasty and tonsillectomy combined with HNS can surgically address the soft palatal collapse, this might be of limited effect in patients with small or absent tonsils, as in the case of our patient. Moreover, patients may favor a conservative treatment. Palatal devices can effectively prevent velar collapse in these patients. In our patient, HNS and the palatal device as monotherapies showed moderate effectiveness. Combining both treatment modalities augmented the effect of each treatment alone. To our knowledge, this is the first report of the combination therapy of HNS and palatal devices. We outline a successful approach to

addressing residual palatal collapse under HNS with a palatal device. In the authors' opinion, combining palatal devices with HNS is a valuable treatment option for patients with an insufficient opening at the palatal level with HNS alone. Future research might also investigate the use of palatal devices in CPAP-intolerant patients to improve adherence.

## CONCLUSION

Suboptimal responses to HNS often stem from insufficient palatal coupling and residual velar collapse. Combining palatal devices, such as Velumount®, with HNS represents a simple and cost-effective strategy to treat residual palatal collapse. Patients desiring conservative treatment for residual palatal obstruction under HNS may consider this combined approach.

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