# International Collaboration for the Prosthetic and Surgical Intervention of Velopharyngeal Insufficiency

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**Abstract:** Interdisciplinary teamwork is essential for the rehabilitation of patients with cleft lip and palate, and therefore, the application of treatment techniques for velopharyngeal insufficiency, both surgical and prosthetic, depends on the experience of each rehabilitation team. For this reason, the following study consisting of the cooperation between interdisciplinary cleft lip and palate teams from Chile and Argentina, which succeeded in correcting velopharyngeal insufficiency in an adolescent, initially using a pharyngeal bulb prosthesis and speech therapy, and finally through pharyngeal flap surgery, is presented. This shows that international cooperation is a valuable tool for training, implementation, and follow-up of different treatment techniques for teams in formation.

**Key Words:** Cleft palate, international cooperation, patient care team, pharyngeal bulb prosthesis, velopharyngeal insufficiency

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Velopharyngeal insufficiency (VPI) is one of the most frequent speech disorders in patients with cleft lip and palate; two interdisciplinary teams with experience in Latin America report a persistence rate of VPI ranging from 19% to 37% after primary palatal surgery.[1,2] Its correction requires physical treatment, which can be both surgical or prosthetic (using a pharyngeal bulb prosthesis) in nature, accompanied by speech and language therapy. The first option for VPI correction is always surgical, however, in cases where surgery is contraindicated, either due to a medical condition or anatomical alterations of the tissues which will be intervened, the use of pharyngeal bulb prostheses is considered.[3] In this regard, a complex situation where the use of the pharyngeal bulb has been described is in cases of velopharyngeal hypodynamism,[4] characterized in the endoscopic or fluoroscopic examination as a weak velopharyngeal movement, a gap that exceeds 50% of the velopharyngeal space at rest, or an antagonistic movement of the lateral walls of the pharynx during oral speech.[4,5]

Pegoraro-Krook et al (2009),[6] highlight that a major contraindication for the confection of a prosthesis is the lack of trained professionals. Moreover, surgical success in VPI surgery is associated with the surgeons' experience, which stems from a need to surpass the steep learning curve associated with this intervention.[7] There have been few reports on collaborations between interdisciplinary cleft lip and palate teams, cooperating in the implementation of these treatment options. For this reason, the approach, and results of a VPI rehabilitated with a pharyngeal bulb prosthesis and pharyngeal flap surgery, carried out with the cooperation of Chilean and Argentinian CLP teams, are presented.

## METHODS

This study is based on the treatment of a 13-year-old Argentinian adolescent girl, who had previously been operated on for a cleft palate, at the age of 2 years. The delay in the primary surgery is due to different unfavorable sociodemographic reasons.

She attended the outpatient speech therapy ward at Dr Humberto Notti Pediatric Hospital, in Mendoza, Argentina, due to a nasal voice. There, she was evaluated and diagnosed with VPI, using perceptual analysis and nasopharyngoscopy. This diagnosis was achieved after training conducted by professionals from Fundación Gantz, Hospital in Santiago de Chile, selected Cleft Leadership Center of South America by Smile Train.

The patient presented severe hypernasality and constant nasal emission, a large circular gap (> 50% of velopharyngeal rest), a coronal closure pattern with a Passavant ring, and features of a hypodynamic velopharynx, without presenting a fistula or compensatory articulation errors.

On the basis of the patient's history and examinations, the interdisciplinary teams (consisting of surgeons, speech-language therapists, and orthodontists) decided on VPI rehabilitation with a pharyngeal bulb prosthesis and speech-language therapy, aiming toward a continuous reduction program of the pharyngeal bulb. To correct the patient's VPI, both her speech and language therapist and her orthodontist from Notti Hospital

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started training at Gantz Foundation in Santiago de Chile. The prosthesis was made by an orthodontist at Notti Hospital, monitored by specialists from Fundación Gantz, who also carried out in-person training at Notti Hospital.

## RESULTS

Mild hypernasality and absent nasal emission were immediately achieved with a pharyngeal bulb prosthesis, after which the patient continued speech therapy with her prosthesis for 24 months. During this period, 4 bulb reductions were performed, after the increase in velopharyngeal movement observed in the nasopharyngoscopy controls.

Thirty-four months after the installation of the prosthesis, her VPI was surgically rehabilitated with a superior pedicle pharyngeal surgery, which was performed in Mendoza with the support of a surgeon from the Fundación Gantz. In this surgery, the posterior pharyngeal wall and the free edge of the soft palate were infiltrated with 2% lidocaine and 1:100,000 epinephrine; a musculo-mucosa flap with an upper base was cut from the posterior wall of the pharynx, regardless of the width and the level or height of its base. The posterior edge of the leaflet is incised where the end of the flap is installed, which is removed from the distal mucosa, suturing in 3 planes with 4-0 and 5-0 absorbable sutures of polyglycolic acid. The width of the pharyngeal flap was determined by the width of the pharyngeal bulb (this distance was measured with a foot-meter in between the lateral aspects of the pharyngeal bulb.

Afterward, her velopharyngeal function was adequate, in other words, she had a voice without hypernasality and nasal emission. In addition, the patient reported a positive impact on her self-esteem and quality of life, which was reflected in effective communication, social insertion, and participation in activities, such as singing, which she did not do before rehabilitation.

Supplemental Table (Supplemental Digital Content, Table 1, http://links.lww.com/SCS/F281) shows the results obtained in the different phases of treatment, which can also be observed in the video linked using a QR code in Figure 1.

## DISCUSSION

As observed in the present study, the use of a pharyngeal bulb prosthesis in combination with speech therapy is an effective approach to eliminate VPI that can be implemented temporarily while awaiting secondary surgery.[8] In addition, this combination allows patients to increase intraoral pressure and better direct airflow, stimulating the movement of the velopharyngeal mechanism, and reducing the velopharyngeal gap, which provides a better surgical prognosis for VPI. Due to this, it can also be considered a temporary treatment that facilitates the planning of surgical rehabilitation.[9,10] This is especially important in moderate to severe hypernasality as it avoids the use of wide and obstructive flaps. Although the confection of a pharyngeal bulb prosthesis is contraindicated in teams lacking trained professionals,[6] these results demonstrate that collaboration among professionals from different centers can provide learning opportunities and proper implementation of this treatment.

In contrast, the superior pedicle pharyngeal flap, sphincter pharyngoplasty, posterior wall augmentation, and a new surgical repair of the palate are procedures for the surgical treatment of VPI.[11] These are the most widely used methods and the first option for patients, their parents, and the rehabilitation team because they are considered a more natural and definitive way as it is performed with tissues from the regions of the velopharynx.[12]

In superior pedicle pharyngeal flap surgery, the surgeon creates a tissue bridge that connects the posterior wall of the pharynx with the soft palate, leaving two portals on each side of the nasopharynx to allow airflow during breathing and phonation of nasal sounds. In complications of the pharyngeal flap in the upper airway, postoperative hyponasality and symptoms of obstructive sleep apnea[13] have been reported. In this regard, Shprintzen et al,[14] (1979) suggested tailor-made flaps, where the width of the flap is determined according to the degree of movement of the lateral walls of each individual.

Regarding the planning and realization of the pharyngeal flap, its width was determined using the size of the pharyngeal bulb, allowing the team to design a custom flap, as has been suggested in several studies.[15] This is a useful strategy for surgeons in teams that do not have access to carry out a velopharyngeal videofluoroscopy in their patients using a velopharyngeal bulb. In addition, this experience accounts for the fact that the VPI surgery of a CLP patient should be performed by their treating team, in some cases counting with the support of an expert surgeon, as in the present case. This allows local teams to deliver comprehensive treatment to their patients who normally would have been treated by foreign groups, due to precarious social conditions, poverty, geographical isolation, or lack of information. Due to the nature of these interventions, they are unable to deliver interdisciplinary treatment from the prenatal period until discharge in adolescence, as is suggested in the clinical guidelines of Latin American countries.[16]

Finally, although researchers based in Latin America, particularly in Argentina, Brazil, Chile, and Mexico, have substantially increased their rate of scientific publications during the last decades, international collaborations reported in the scientific literature have mainly been concentrated in areas of epidemiology, genetics, and prevention,[17] and not in the collaboration of interdisciplinary CLP care teams at a clinical level (surgeries, speech and language therapy, orthodontics, etc). In this sense, the promotion of interdisciplinary teams, such as the Latin American Craniofacial Association (LATICFA), has initiated important work in the establishment of international networks and the increase of scientific production in Latin America.[18]

## CONCLUSION

The collaboration of interdisciplinary cleft lip and palate teams from Chile and Argentina managed to correct VPI in an adolescent initially through a pharyngeal bulb prosthesis and speech therapy, and later with pharyngeal flap surgery. Contact between teams and constant training is essential to provide patients with efficient and quality treatment.

**FIGURE 1.** QR code providing access to speech.

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