

Velopharyngeal Insufficiency Treatment in Cleft Palate Patients

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Cleft lip and palate (CLP) are one of the most common congenital anomalies with a global prevalence of 1:700. Velopharyngeal insufficiency may occur as a result of an anatomical or structural defect and may be present in patients with cleft lip and palate. The treatment options presented in the literature are varied, covering invasive and non-invasive methods.

Keywords: cleft palate ; velopharyngeal insufficiency ; palatopharyngeal

1. Introduction

Cleft lip and palate (CLP) are one of the most common congenital anomalies with a global prevalence of 1:700 ^[1]. This condition is characterized by the lack of fusion in facial structures, which usually occurs between the 5th and 10th weeks of pregnancy ^[2]. There is no single cause for this congenital anomaly, and it is thought to have multifactorial etiology ^{[2][3]}. Some risky behaviors during pregnancy are known to predispose the fetus to this condition, such as alcohol and tobacco consumption, anti-epileptic drugs or corticosteroids, and inadequate nutrition ^{[2][3]}. Additionally, people of low socioeconomic status have been reported to have a higher prevalence of orofacial clefts ^[2].

After primary bone graft surgery, around 20 to 50% of patients develop velopharyngeal insufficiency (VPI) ^[4]. Some factors are considered to increase risk for VPI, such as being of the male sex and having a shorter palate length or a wider cleft ^[5].

VPI can be described as the insufficient closure between the soft palate and the posterior wall of the pharynx ^{[6][7][8]}. This condition occurs in open cleft palates, submucosa, or CLPs that were surgically closed, but remained low or immobile due to the remaining scar tissue or irregular palate muscle positioning ^{[6][9]}. The main methods used to diagnose VPI are through auditory-perceptive evaluations and video naso-endoscopies ^[8].

In regular circumstances, the velopharyngeal valve is made up of lateral and posterior pharyngeal walls and the soft palate. When this valve closes, it divides the oral cavity and the nasal cavity. This can be observed in many instances, such as when an individual is swallowing, speaking, or breathing ^[9]. However, in CLP patients that present palatal muscle debilitation, there is no velopharyngeal closure during phonation, which leads to air and acoustic energy being emitted by the nasal cavity ^{[5][10]}. This results in a hypernasal speech pattern, nasal air emission, compensatory articulation, and nasal regurgitation ^{[5][7][8][9][10]}.

The initial approach for VPI treatment involves speech therapy. Nonetheless, open surgery may be required in certain cases, such as cases with structural issues, a subpar speech therapy response, serious VPI, a low palate, or inadequate mobility ^{[7][9][10]}. Speech therapy can be used in both pre- and post-surgical stages. However, when it comes to VPI surgery, there is no predetermined timing nor a standardized surgical protocol ^{[9][10]}. The most common surgical procedures for VPI treatment include a pharyngeal graft or sphincter pharyngoplasty, which can reach a normal resonance of 76 and 61%, respectively ^{[3][4][9]}. Although both of these techniques are highly effective, they also present a risk of developing obstructive sleep apnea (OSA), which ranges from 19 to 93% ^{[3][4][11]}. Taking this into account, palatoplasty has emerged as an alternative with a lower risk for developing OSA ^{[3][4]}. This procedure is performed with a straight incision into the palatal mucosa or a double-opposing Z-plasty, also known as a Furlow palatoplasty ^[4]. Despite having an 82% success rate and not compromising the upper airway, this technique is not broadly used ^{[3][4]}. In patients with moderate VPI, autologous or synthetic implantable materials, such as cartilage, fat, or silicone, have been used to augment the posterior pharynx wall ^{[9][10][11]}. Besides the conventional surgical treatments for VPI in patients with CLP, there are also prosthetic options, such as speech bulbs or palatal lifts, that can aid in velopharyngeal closure ^[12].

2. Velopharyngeal Insufficiency Treatment in Cleft Palate Patients

Velopharyngeal insufficiency may occur because of an anatomical or structural defect that results from incomplete closure between the soft palate and posterior pharyngeal wall, resulting in an opening between the oral and nasal cavities [13]. This pathology may be present in patients with cleft lip and palate, and is characterized by difficulty swallowing, hypernasality, and difficulty in speech articulation, which ultimately results in a lower quality of life [7][11]. In these cases, the main goal of treatment is to restore nasopharyngeal and oropharyngeal function, allowing for improved speech articulation [12]. The treatment options presented in the literature are varied, including invasive and non-invasive methods depending on the severity of the insufficiency. These include speech and swallowing therapy, prosthesis placement, palatoplasty, pharyngoplasty, muscle repositioning, and posterior pharyngeal wall enlargement procedures, such as injection augmentation pharyngoplasty (IPA) [7][12][14]. Regarding non-invasive methods, speech therapy is the most referenced method. This treatment entails long and continuous follow-up, which may contribute to exhaustion and decreased collaboration.

In symptomatic patients, treatment does not solely comprised speech therapy, as surgical intervention is often necessary [7]. Although there is no surgical technique considered to be the gold standard for the correction of velopharyngeal insufficiency, the Furlow Z-plasty technique, minimal incision palatopharyngoplasty (MIPP), and other modified versions of these procedures were the best techniques reported [12]. Nevertheless, the clinician should recognize the risks associated with these interventions, such as the development of obstructive sleep apnea and risk of hemorrhage and infection [4][7][12]. Teblick et al. also concluded that this surgical technique was associated with a lower prevalence of otitis media with effusion and lower number of ear tubes needed [15]. In the included systematic reviews, the Furlow Z-plasty technique was the most referenced form of treatment in 8 of the 13 publications evaluating invasive methods [3][4][9][13][15][16][17][18]. However, only one study was found to report statistically significant differences between the Furlow Z-plasty technique and the straight-line intravelar veloplasty closure approach, with a lower re-intervention rate of 0–11.4% vs. 0–6.7%, respectively [16]. These results should be interpreted with caution as this research was of overall low quality, namely due to the lack of independently collected data, an adequate protocol, and any considerations of the risk of bias. The remaining reviews did not present differences between several surgical techniques, but these conclusions may also have some bias, because the included studies had high clinical and methodological heterogeneity, specifically in sample size, cleft phenotype, methods used to assess speech and velopharyngeal incompetence, surgeon experience, and inclusion of syndromic patients. This heterogeneity may also affect the results of the present research and made it impossible for some SR results to be used for the meta-analysis. Overall, there appears to be no surgical technique considered to be the gold standard.

3. Conclusions

Velopharyngeal insufficiency treatment usually comprised speech therapy and surgical intervention. Although there is no surgical technique considered to be the gold standard, the Furlow Z-plasty technique and minimal incision palatopharyngoplasty were among the best reported.

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