

Usage of Endoscopic Soft Tissue Augmentation in Velopharyngeal Insufficiency: A Review Article

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Abstract:

Disorder to the velopharyngeal sphincter can lead to decreased speech intelligibility and functional and social impairment in a child. There have been various procedures that have attempted to treat the disorder. The rate of velopharyngeal insufficiency (VPI)-affected children has been documented to be 33% with higher rates of recurrence post-surgery seen in VPI due to genetics. Endoscopes have been used mainly in the field of gastroenterology to view the changes in the tissues. Their use in the field of dentistry can aid in examining the tissues until the soft palate. Endoscopic soft palate augmentation was developed as it overcame the drawbacks of surgery, and the recurrence rate was found to be low. Only a few studies have been done using the ESPA technique thus their effects in long run are unknown.

Keywords: Cleft lip, Cleft palate, Soft palate, Velopharyngeal dysfunction, Velopharyngeal sphincter

INTRODUCTION:

Velopharyngeal dysfunction (VPD) is a disorder of the velopharyngeal (VP) sphincter or valve. The velopharyngeal sphincter separates the nasal and oral cavities for functions such as speech, swallowing, vomiting, blowing, and sucking. In a VPD, the soft palate and pharyngeal walls are unable to form an active seal, thus forming an abnormal connection between the nasal and oral cavities resulting in hypernasal speech, increased nasal resonance, nasal regurgitation, nasal emission, and decreased intraoral pressure during speech. The overall result is decreased speech intelligibility and significant functional and social impairment.

Diagnosis and treatment require a multidisciplinary approach, centered around speech-language pathology, otolaryngology, and plastic surgery. Velopharyngeal dysfunction signifies a deficit of the velopharyngeal without a specified cause. It is further subdivided into velopharyngeal insufficiency, incompetence, and mislearning, which provides additional information on its etiology. Velopharyngeal insufficiency suggests a structural defect, incompetence due to neurological dysfunction, and mislearning due to learned errors in articulation [1].

Velopharyngeal dysfunction may result from incomplete closure of the velopharyngeal sphincter, which controls the airflow into the nasal cavity during speech and prevents nasal regurgitation during swallowing. VPD can occur secondary to structural deficits, neurological disorders, faulty learning, or as a syndromic finding [2][3]. The most common diagnosis in patients with VPD of unknown cause is 22q11.2 deletion syndrome [4]. The initial step in treating VPI is through speech therapy which when fails, a speech aid is used to close the nasopharynx by lifting the soft palate or by filling the gap. After VPI is controlled with the speech aid, pharyngeal flap surgery is performed to wean the child from the speech aid. But the difficulty in this procedure is that it can lead to fundamental changes to the velopharyngeal form, which may result in sleep apnea

or inability to perform nasal intubation during future orthodontic surgeries. The rate of children affected with velopharyngeal insufficiency is documented to be 33% and their recurrence rate following surgery is found to be high in children affected genetically [5]. Thus, the necessity to develop another technique was entailed [6].

Presently, studies have been done to treat velopharyngeal disorders using an endoscope. An endoscope is a thin, tube-like instrument that is used to look at the tissues inside the body. It has a light and a lens for viewing and may also have a tool to remove the tissue. The endoscopic soft palate augmentation (ESPA) technique was originally developed by E T Isamura et al. and they conducted their first study on beagle dogs [7].

REVIEW OF LITERATURE

Emiko Tanaka Isamura et al. conducted a study to investigate the use of injectable materials for endoscopic soft palate augmentation in dogs to ameliorate velopharyngeal insufficiency. The procedure was conducted on 11 beagle dogs under general anesthesia following which an electric knife and an 8mm hole were made in the anterior part of the soft palate to provide access for the endoscope. Then the endoscope was inserted into the nasal side of the soft palate and purified sodium hyaluronate, atelocollagen, or autogenic fat tissue was injected into the nasal mucosal side of the anterior two-thirds of the soft palate in all the dogs. Then, the amount of nasal air leakage during inspiration at rest and during expiration under rebreathing system was assessed at 1, 2, 3, 4, 5, and 6 months post-injection of these materials. The amount of nasal air leakage during expiration under the rebreathing system was significantly decreased in all dogs injected with the ESPA materials, but a significant decrease was observed in dogs injected with autogenic fat tissue, but neither apnea nor hypopnea was observed [7]. Emiko Tanaka Isamura et al. described a new endoscope-assisted approach in which the materials for velopharyngeal structure augmentation were administered

to 5 patients aged between 8-16 years under general anesthesia, while observing the injection points directly, also enabling adjustment of the amount of material injected. Autologous fat tissue was injected into the nasal mucosa of the soft palate using a needle-type device of an endoscope, and the effects of the treatment were evaluated. The injections were performed successfully, and the velopharyngeal function was improved [6].

The main advantage of the ESPA technique is that it does not cause injury to the levator veli palatine muscle, and the injectable materials can be implanted while monitoring the augmentation volume simultaneously through an endoscope. In the first study conducted by E T Isamura et al., a hole was created in the soft palate of the dog for the endoscope to pass through as their nasal cavity is narrow. But this wasn't required in humans as it can pass through the nasal cavity [7].

The study conducted in the dogs though showed improvement in breathing yet the speech could not be assessed thus limiting the knowledge of its advantages and disadvantages.

To overcome the former problem, the study was conducted on humans wherein few of the limitations were observed. It was noted that ESPA was slightly difficult to perform with the existing endoscopes and devices as a thin endoscope allows only a device of 19-gauge needles to pass into the nasal cavity of a child, and the tip of the endoscope only bends in one direction allowing the adjustment of the insertion site. In addition, the most suitable length of the needle device is 70 cm, and therefore adipose tissue remains in the device and as a result, is wasted. Thus, it is a necessity to develop more appropriate endoscopes and devices in the future [6].

ESPA cannot replace pharyngeal flap operation as it can be used to improve mild- to moderate VPI. Yet, there are a few advantages to using this procedure. Firstly, even if the pharyngeal operation is necessary after maturation, ESPA performed during childhood improves early speech therapy. Secondly, Palatoplasty with Furlow's method can lead to the recurrence of VPI due to scarring of the soft palate. This recurrence can be avoided by the administration of fat injection into the soft tissue as it does

not involve the extension of the soft palate. Finally, if VPI recurs after a pharyngeal flap operation, autologous fat tissue can be injected at the back of the velopharyngeal flap. Currently, surgeries for VPI are performed through the velopharyngeal flap, but the expansion of the surgical procedures with the use of ESPA is expected [6].

CONCLUSION

The main aim to treat velopharyngeal disorder is to improve breathing as well as to improve speech. In order to meet these demands various procedures are developed. Yet each has its own limitations. ESPA technique has been observed to have more merits and also allows the clinician to achieve better results than other treatments. Stem cell therapy stands out to be the best even now but the cost of the procedure and the number of surgeries to be conducted makes to be the least favorable procedure to be done on a child. Thus, many studies have to be conducted using the ESPA technique to understand its effects in a long term.

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