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Pharyngeal flap versus sphincter pharyngoplasty for the treatment of velopharyngeal insufficiency: A meta-analysis[☆]

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KEYWORDS

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Summary *Background:* Velopharyngeal insufficiency (VPI) has been reported in 5–20% of patients following cleft palate repair. Since VPI can limit communication, determining which operative procedure leads to the greatest improvement is of utmost importance. Since there is no consensus, this meta-analysis aims to determine which procedure results in the most significant resolution of VPI.

Methods: Two independent assessors undertook a literature review for articles that compare procedures aimed at treating VPI. Study quality was determined using validated scales. Level of agreement was assessed using intra-class coalition coefficient analysis. The heterogeneity between studies was evaluated using I^2 and Cochran's Q-statistic. Random effect model analysis and forest plots were used to report a pooled odds ratio (OR) and 95% confidence intervals (CI) for treatment effect. A *p*-value of 0.05 was considered for statistical significance.

Results: Two randomised controlled trials (RCTs) comparing pharyngeal flap to sphincter pharyngoplasty were obtained. A total of 133 patients were included, with follow-ups at 3–4 months. The pooled OR was determined to be 2.95 (95% CI: 0.66–13.23) in favour of the pharyngeal flap.

Conclusions: Based on these RCTs, which currently compose the highest quality data that compares pharyngeal flap versus pharyngoplasty, the pooled treatment effect suggests a possible trend favouring pharyngeal flap.

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Introduction

Velopharyngeal insufficiency (VPI) refers to a failure of the velum and lateral and posterior pharyngeal walls to separate the oral cavity from the nasal cavity during speech and deglutination. This incomplete closure of the velopharynx can occur secondary to a structural defect (i.e., gross tissue defect, short soft palate, deep nasopharynx, hypertrophied tonsils, and cleft palate) or after procedures that change the anatomy (i.e., adenoidectomy).¹ Following cleft palate repair, VPI remains unresolved in 5–20% of patients.²

Untreated, VPI can have a significant functional impact on breathing, eating, and speech. Speech in VPI is characterised by hypernasal resonance, decreased intraoral pressure for pressure consonants, and compensatory articulation errors. Diagnosis can be made clinically and characterised with video nasopharyngoscopy or videofluoroscopy.^{1,3}

Surgery is the definitive treatment of VPI with the goal of creating a functional seal between the nasopharynx and the oropharynx during speech while avoiding nasal airway obstruction; however, the optimal technique is unknown. While there are numerous variations, the two most common surgical techniques include pharyngeal flap and sphincter pharyngoplasty. The pharyngeal flap procedure consists of suturing a flap from the posterior pharyngeal wall to the posterior border of the soft palate. This flap, which includes mucosa and superior pharyngeal constrictor muscle, may be superiorly or inferiorly based. It functions as an obturator, allowing the pharyngeal port to be closed by the medial movement of the lateral pharyngeal walls on both sides of the flap. In contrast, the sphincter pharyngoplasty procedure involves the elevation of bilateral superiorly-based palatopharyngeal mucosa and muscle flaps, whose distal ends are sutured to the contralateral side onto the posterior pharyngeal wall.⁴ This creates a transverse mound of tissue as the flaps cross over each other, leading to a smaller central port and a shorter distance between the palate and posterior pharyngeal wall. These techniques may be highly dependent upon surgeon experience⁵ and the age of the patient,^{6,7} and may require individual tailoring to the size and nature of the velopharyngeal defect.^{8,9}

Evidence from the literature regarding the most effective surgical technique has been largely based on retrospective studies. Conclusions have been mixed,⁴ and few randomised studies exist.¹⁰ The purpose of this study is to determine the optimal surgical procedure for the treatment of VPI following cleft palate repair.

Methods

This systematic review was performed in accordance with a protocol that prescribed search strategy, eligibility criteria, outcomes and statistical analyses. Our aim was to perform a pooled analysis of the outcomes.

Literature search

Cochrane, Medline, Embase, and Cinahl databases were independently reviewed by two of the authors (J.C. and

K.C.). Search terms included: cleft palate, velopharyngeal insufficiency, palatopharyngeal incompetence, pharyngeal flap, and sphincter pharyngoplasty. These were arranged using varying combinations of Boolean operators “AND”, “NOT”, and “OR”. Additional searches were performed manually through reference lists of review articles and relevant studies. Titles and abstracts were independently scanned for relevance by two authors. A review of the complete article was carried out if relevance was not clear based on the abstract alone.

Study eligibility criteria

To be selected, studies had to meet the following inclusion criteria: 1) The studied population included non-syndromic pediatric patients of any gender who had undergone prior cleft palate repair (any type of cleft palate, any type of repair); 2) the patients demonstrated residual velopharyngeal insufficiency significant enough to require surgical correction; 3) the operative plan had to be either a pharyngeal flap (superiorly or inferiorly based) or sphincter pharyngoplasty, and these two procedures had to be compared to each other; 4) outcome measures needed to include the degree of velopharyngeal insufficiency resolution; 5) specific follow-up times had to be documented; 6) studies had to be of a relatively high level of evidence (randomised controlled trials [RCTs] and prospective cohort studies). Exclusion criteria consisted of: 1) syndromic patients; 2) adult patients; 3) patients undergoing concomitant cleft palate and velopharyngeal insufficiency surgery; 4) patients undergoing repeated velopharyngeal insufficiency surgery; 5) an operative plan consisting of a different procedure than a pharyngeal flap or sphincter pharyngoplasty (e.g., posterior pharyngeal wall augmentation); 6) outcomes with no reported methods of evaluation or follow-up times. Any disagreements in article selection between the two authors were resolved through discussion until consensus was obtained.

Outcome measures

The primary outcome targeted for analysis was velopharyngeal insufficiency resolution. This was defined in the articles with outcome measures including perceptual speech parameters, sleep studies, nasalance measures and/or endoscopic features. For each selected article, data on velopharyngeal insufficiency resolution after pharyngeal flap or sphincter pharyngoplasty, as well as follow-up times, were collected.

Quality assessment

The two authors assessed article quality using validated Detsky and MINORS scales. Detsky is a validated scale that can be used for RCTs, with global scores of 20 for positive trials and 21 for negative trials.¹¹ MINORS is also a validated scale and the global ideal score is 16 for non-comparative studies and 24 for comparative studies.¹² Intra-class coalition coefficient analysis was applied to calculate the level of agreement in quality assessment between the two authors using SPSS version 18.0 (SPSS Inc, Chicago, IL).

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