

Surgical Management of Velopharyngeal Dysfunction in Patients with Cleft Palate: A Systematic Review

Aseel Asar⁽¹⁾, Mahmoud Yehia Abdulaziz⁽²⁾, Ramy Gaber⁽²⁾and Marwa Abdel Wahab Elkassaby⁽³⁾

Abstract:

Aim: A wide array of surgical techniques is used to treat post- palatoplasty VPI; each technique has its own advantages, limitations and drawbacks. The aim of this study is to review current literature regarding the speech outcome of different techniques for treatment of VPD in non- syndromic cleft patients.

Methods and Material: A systematic review was carried out according to PRISMA-P guidelines by searching Medline, Scopus and Web of Science Core Collection electronic databases. Main outcome measured: pre-operative and post-operative speech assessment.

Results: 25 relevant studies were retrieved, consisting of data on 1,175 patients. Overall there was 73% improvement in postoperative speech scores. A variety of scales were used for speech assessment. There was no notable difference between techniques with respect to speech outcome.

Discussion: There is a lack of high quality studies in this field. A standardized way for reporting speech outcome is needed.

Keywords: Velopharyngeal dysfunction, Cleft palate surgery, Speech.

1. Instructor in Oral and maxillofacial Surgery Department, Faculty of Dentistry, Ainshams University.

2. Lecturer in Oral and maxillofacial Surgery Department, Faculty of Dentistry, Ainshams University.

3. Head of Oral and maxillofacial Surgery Department, Faculty of Dentistry, Ainshams University.

Introduction:

Cleft palate is one of the most common causes of velopharyngeal dysfunction (VPD). VPD is defined as the inability of the velopharyngeal valve (VPV) to close properly, due to inadequate function of dynamic structures that work to control it. The velopharyngeal valve is

MATERIALS & METHODS

This review followed the PRISMA-P guidelines for conduct of a systematic review, and protocol registered on the PROSPERO register of systematic reviews.(7) A thorough literature review was done by searching Medline, Scopus and Web of Science Core Collection electronic databases using the following keywords: “cleft palate surgery”, “velopharyngeal insufficiency” and “speech”. Despite best attempts, primary palatal repair achieves normal speech in 70%–80% of individuals with cleft palate. That is, 20%–30%

of children born with cleft palate will require secondary surgeries to manage VPD.(3) Studies were included according to these criteria: English language, studies on A wide array of surgical techniques is used to treat post- palatoplasty VPI; each technique has its own advantages, limitations and drawbacks. These techniques can be classified into two major groups; palatal surgery and extra- palatine surgeries. (7) Treatment options are chosen based on the condition of the palate, reports, letters or commentaries were excluded, as well as, studies that did not meet the inclusion criteria.

surgeon preference.(4) Palatoplasties are considered dynamic procedures as they result in an enhanced palatal mobility and function. Up to this point, there is no one procedure that is suitable for all cases, this is due to the various clinical presentations of VPI in cleft patients. So far, no attempt was made to formulate a treatment algorithm that would consider all these decisive factors, and decide

Data Extraction upon them the appropriate surgical treatment. The aim of this study is to review current literature regarding the speech outcome of VPD in cleft patients, in an attempt to reach a treatment algorithm.

Studies reporting results for more than one technique were included as separate

records for analysis, therefore the 25 articles included increased to 28 records.

Data Synthesis

Tables were used to summarize study characteristics and outcomes. Surgical outcomes and complications were calculated manually as a ratio of the number of subjects with the defined outcome and the total number of patients in each study. To report outcome of different techniques, mean of the outcome of individual studies was manually calculated.

Assessment of Risk of Bias

The quality of each study was assessed for appraisal of potential risk of bias using the methodological index for non-randomized studies (MINORS) tool(8).

Results

Study selection

Study selection process followed PRISMA flowchart.

Study design and participants

The majority of studies reported prospective cohort, followed by retrospective series and cross-sectional studies. The total number of patients extracted from the 25 studies included in the review was 1,175.

Study Participants

All included articles reported secondary surgeries for speech in non- syndromic patients with history of cleft palate repair. Age at surgery ranged from 3- 58 years.

Study procedures

Surgical techniques included in this review were; palatal re-repair, palatal lengthening with buccal myo-mucosal flap, double opposing z-plasty, PPW augmentation, pharyngeal flaps, and combined techniques; palate re-repair with buccal myo-mucosal flap and double

opposing z-plasty combined with superiorly based pharyngeal flap.

Surgical outcome

The palatal re- repair group showed 85% and 66% improvement in resonance and nasal emission post- operatively respectively.(5) The BMMF group showed 82% and 70 % improvement in resonance and nasal emission respectively (9) Double opposing z-plasty group showed 70%, 77% and 65% improvement in resonance, nasal emission and articulation respectively. Pharyngeal wall augmentation group showed 50% and 60% improvement in resonance and nasal emission respectively. Pharyngeal flap and pharyngoplasty group showed 85%, 69% and 72 % improvement in resonance, nasal emission and articulation respectively.

Risk of bias assessment:

Regarding selection bias, none of the studies included were randomized; they comprised prospective cohort, retrospective series and cross-sectional studies, all Level IV evidence. As for detection bias, only 44% studies reported blinded assessment. All studies selected patients according to a specified inclusion criteria and none included all patients admitted to the center. Furthermore, attrition bias, all studies included subjects to whom they had complete records, therefore percentage of patients lost to follow up was not reported. Quality assessment was measured by assigning scores to each study according to MINORS items.

Discussion

The current review aimed to enhance care provided to our cleft palate patients.

This was done by reviewing articles discussing different surgical techniques used for treatment of VPD. Factors affecting technique choice and success are of paramount importance. These can be categorized into factors related to patients' demographics and others related to VP function. According to the available literature cleft type and gender showed no strong correlation with the outcome of different techniques. (10)(11)(12)

When it comes to age the following aspects should be considered; age at which the primary surgery was performed, age of speech assessment and timing of the secondary speech surgery. There was no significant correlation between timing of the primary surgery and speech results of secondary procedures, although delay in primary repair would consequently result in more compensatory errors, the post-operative nasality score of the VPI surgeries was not related to it. (12)

Timing of the VPI surgery is a controversial point. The decision to perform the surgery depends on balancing a lot of factors. Firstly, the social life of the child; in cases where the child is near school age it is sometimes crucial for his self-confidence to perform the surgery as early as possible to allow for training and speech enhancement before school. Another factor is the maxillary growth, in patient with hypoplastic maxillae, it is better to postpone surgery to allow for non-restricted growth. Thirdly, some techniques have proven to be more successful in older ages, like the pharyngeal flap and the palatal re-repair.

This could be attributed to the bigger anatomy and ease of surgical manipulation(13)(11)(14) (15) In case of a scarred palate with anteriorly tethered muscle, muscle re-repair with scar release can suffice, where in a more scarred and shorter palate, the addition of a buccal flap could be mandatory. This is also indicated if intraoperatively the bulk of the dissected muscles was found to be insufficient. (12,16) In cases of a short palate with adequately repaired muscles and minimum scar tissue, a more aggressive treatment by an extra-palatine flap would be employed. The VP gap is a crucial factor to consider when planning the VPI surgery.

Conclusion:

Choice of surgical procedure for VPD presents an ongoing challenge to cleft surgeons, no significant difference in outcome across the various procedures currently in standard practice. There is an urgent need for the multidisciplinary VPD

community to develop a universally applicable, standardized minimum data set to record postoperative speech

Financial Disclosure: None.

Conflict of Interest: None.

References:

1. Huang MHS, Lee ST, Rajendran K. Anatomic basis of cleft palate and velopharyngeal surgery: Implications from a fresh cadaveric study. *Plast Reconstr Surg*. 1998;
2. Kummer AW. Disorders of resonance and airflow secondary to cleft palate and/or velopharyngeal dysfunction. 2011;
3. Yang Y, Li Y, Wu Y, Gu Y, Yin H, Long H, et al. Velopharyngeal function of

- patients with cleft palate after primary palatoplasty: relevance of sex, age, and cleft type. *J Craniofac Surg.* 2013 May;24(3):923–8.
4. Argamaso R V., Shprintzen RJ, Strauch B, Lewin ML, Daniller AI, Ship AG, et al. The role of lateral pharyngeal wall movement in pharyngeal flap surgery. *Plast Reconstr Surg.* 1980;
 5. Sommerlad BC, Mehendale F V, Birch MJ, Sell D, Hattee C, Harland K. Palate re-repair revisited. *Cleft Palate Craniofac J.* 2002 May;39(3):295–307.
 6. Chim H, Eshraghi Y, Iamphongsai S, Gosain AK. Double-Opposing Z-Palatoplasty for Secondary Surgical Management of Velopharyngeal Incompetence in the Absence of a Primary Furlow Palatoplasty. *CLEFT PALATE-CRANIOFACIAL J.* 2015 Sep;52(5):517–24.
 7. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *J Clin Epidemiol.* 2009;
 8. Slim K, Nini E, Forestier D, Kwiatkowski F, Panis Y, Chipponi J. Methodological index for non-randomized studies (Minors): Development and validation of a new instrument. *ANZ J Surg.* 2003;
 9. Denadai R, Sabbag A, Raposo-Amaral CE, Filho JCP, Nagae MH, Raposo-Amaral CA. Bilateral buccinator myomucosal flap outcomes in nonsyndromic patients with repaired cleft palate and velopharyngeal insufficiency. *J Plast Reconstr Aesthet Surg.* 2017 Nov;70(11):1598–607.
 10. Elsherbiny A, Amerson M, Sconyers L, Grant JH 3rd. Outcome of Palate Re-repair with Radical Repositioning of the Levator Muscle Sling as a First-Line Strategy in Postpalatoplasty Velopharyngeal Incompetence Management Protocol. *Plast Reconstr Surg.* 2018 Apr;141(4):984–91.
 11. Nakamura N, Ogata Y, Sasaguri M, Suzuki A, Kikuta R, Ohishi M. Aerodynamic and cephalometric analyses of velopharyngeal structure and function following re-pushback surgery for secondary correction in cleft palate. *Cleft Palate Craniofac J.* 2003 Jan;40(1):46–53.
 12. Elsherbiny A, Gelany A, Mazeed AS, Mostafa E, Ahmed MA, Allam KA, et al. Buccinator Re-Repair (Bs + Re: IVVP): A Combined Procedure to Maximize the Palate Form and Function in Difficult VPI Cases. *Cleft Palate-Craniofacial J.* 2020;
 13. Furlow LT, Deren O, Ayhan M, Tuncel A, Gorgu M, Altuntas A, et al. The correction of velopharyngeal insufficiency by Furlow palatoplasty in patients older than 3 years undergoing Veau-Wardill-Kilner palatoplasty: A prospective clinical study. *Plast Reconstr Surg [Internet].* 2005 Jul;116(1):85–6.
 14. Elsherbiny A, Grant JH. Total Palatal Mobilization and Multilamellar Suturing Technique Improves Outcome for Palatal Fistula Repair. 2017;
 15. Elsherbiny A, Amerson M, Sconyers L, Grant III JH. Time course of improvement after re-repair procedure for VPI management. *J Plast Reconstr AESTHETIC Surg.* 2018 Jun;71(6):895–9.
 16. Sommerlad BC, Henley M, Birch M, Harland K, Moiemen N, Boorman JG. Cleft palate re-repair--a clinical and radiographic study of 32 consecutive cases. *Br J Plast Surg.* 1994 Sep;47(6):406–10.



ASDJ
Ain Shams Dental Journal