Comparison of Surgical Technique’s Dynamic Outcomes for Velopharyngeal Insufficiency

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What is Velopharyngeal Insufficiency?

• Speech impediment due to an improper functioning soft palate
  • Gap between soft palate and throat
  • Air escapes through patient’s nose
  • Hypernasality makes speech difficult to understand

Figure 1: Soft Palate in a Patient with VPI vs. without VPI [1]
Causes of Velopharyngeal Insufficiency

Causes of VPI...

- Traumatic brain injury
- Adenoidectomies
- Neurological disorders
- Veloccardiofacial syndrome

Most common cause of VPI...

- Cleft palate and lip
Diagnosis

The most common methods used to diagnose VPI are:

- Videofluoroscopy
- Flexible Nasopharyngoscopy
- Nasometry
- Aerodynamic Measures
Current Treatment

• Three common types of surgery
  1. Furlow Palatoplasty

Figure 2: Furlow Palatoplasty Surgery [2]
Current Treatment

• Three common types of surgery
  2. Sphincteroplasty

Figure 3: Sphincter pharyngoplasty Surgery [2]
Current Treatment

• Three common types of surgery
  3. Pharyngeal Flap Surgery

Figure 4: Pharyngeal Flap Surgery [2]
Motivation

- 7,000+ children are born yearly with a form of cleft palate or lip
  - Average lifetime cost to treat 7,000+ cleft babies is estimated at $697 million
  - 40% of these children will develop VPI (~2,800) [3]
- Low success rate
- High revision rate
- Postoperative complications
Previous Investigations

1. A survey of assessment and management of velopharyngeal incompetence (VPI) in the UK and Ireland [4]
2. Furlow Palatoplasty for Previously Repaired Cleft Palate with Velopharyngeal Insufficiency [5]
Shortcomings

- Survey location and translation
- Furlow is examined as secondary surgery
- Pharyngeal flap and sphincteroplasty investigation: only compares two of the three surgical options, wide age range, not just cleft patients
- Unable to acquire any investigations comparing all three surgical option’s dynamic outcomes
Proposed Research

Comparing the results of dynamic assessments pre and postoperative of the three common surgery options to determine the most successful surgery based on dynamic outcomes.
Proposed Research

Candidate Requirements

• 30 children
• Exhibit only cleft palate
• Previously undergone palate repair surgery
• Between the ages of 8 and 10 years old
• Resting gap size < 8 mm

Figure 11: Cleft palate patient pre and postoperative [5]
Proposed Research

Assessments

1. Auditory Perceptual Assessment
   - Performed by a speech pathologist
   - Classifies combination of nasal defects
   - Utilizes the Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) to assess voice quality [8]

Figure 12: Sample of CAPE-V [9]
Proposed Research

Assessments

2. Nasometric Assessment
   - Candidates read a passage
   - Utilizes nasometer to obtain nasalance score
   - Nasalance score is a ratio of nasal to nasal-plus-oral acoustic energy during speech [10]
Proposed Research

Assessments

3. Flexible Nasopharyngoscopy
   - Flexible nasopharyngoscope inserted through nostril
   - Patient produces sample speech
   - Quantifies degree of maximal velopharyngeal closure, length and quality of the soft palate, and the degree of motion of the soft palate [12]
Proposed Research

Preoperative

- Tonsillectomy
- Auditory Perceptual Assessment (APA)
- Nasometric Assessment
- Flexible Nasopharyngoscopy

Figure 11: Flexible nasopharyngoscopy pre and postoperative [5]
Proposed Research

Operation

- Candidates will be split into 3 groups of 10
- Each group will undergo one of the following surgeries
  1. Furlow Palatoplasty
  2. Sphincteroplasty
  3. Pharyngeal Flap Surgery
Proposed Research

Postoperative

• 2 week recovery time
• Speech therapy 1 time/week for 6 months
• 3 checkups every two months
  • Preoperative assessments will be performed
• Data analysis
  • Improvement in scores
  • Comparison to palate with no defect of with shear modulus of 2.53 ± 0.31 kPa [13]
Timeline

6 weeks pre-op tonsillectomy

3 weeks pre-op perform pre-op assessments

Operation

2 weeks post-op weekly speech therapy for six months

2 weeks post-op perform post-op assessments every two months up to six months

Analyze data
Objectives

1. Determine best surgery for VPI patients
2. Decrease postoperative complications
3. Improvement of speech for patients
4. Improve quality of life
Conclusion

Limitations

• Variation in cleft palate
• Translation of results to patients with cleft palate and lip
• Patient age
• Previous surgeries

Future Works

• Personalization of surgeries
• Studying a combination of the surgeries