11. Cleft Palate Repair: Double Opposing Z-Plasty

Patrick A. Gerety, MD

HISTORY

Dr. Leonard Furlow (University of Florida) first published the concept of double-opposing Z-plasty for palate repair in 1986. The Furlow palatoplasty is considered a challenging technique by many because of its multiple flaps and sometimes difficult anatomic visualization. However, many credible surgeons use this technique for all cleft palates with excellent outcomes. The intent of this chapter is to give a basic understanding of this technique recognizing that many individual surgeons have made significant modifications to the technique.

INDICATIONS

- Short palate (long velopharyngeal depth)
- Prior palate repair with resultant short palate and velopharyngeal insufficiency (VPI)
- All palatoplasties – some surgeons including Furlow are proponents for using this technique for all cleft palates

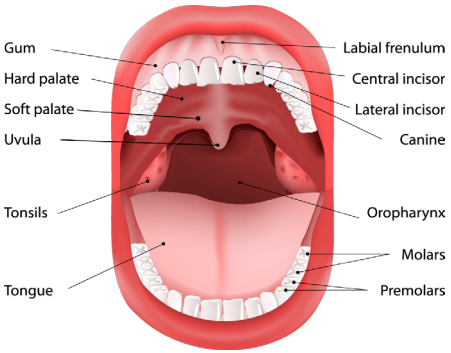


Figure 11-1. Short palate. © 2017 A Campbell, C Restrepo

ADVANTAGES

- Palatal lengthening
- Minimizes incision overlap of nasal/oral closure lowering risk of fistula
- Anatomic muscle positioning with less direct muscle dissection/damage
- Improved speech outcomes

DISADVANTAGES

- Increased transverse tension (inherent to Z-plasty) may not be appropriate for wide cleft palates.
- Muscle incompletely dissected and not coapted with suture as in intravelar veloplasty (IVV).

TECHNIQUE

The Furlow soft palate technique treats the soft palate only and should be used in combination with hard palate closure when necessary. Lateral relaxing incisions and release of hard palate mucoperiosteal flaps – von Langenbeck or Bardach two-flap are most effective. This allows decreased tension at the hard-soft palate junction as well adequate mobilization of the soft palate oral mucosa.

ANATOMY

- Mirror image Z-plasties are created on the oral and nasal layers to close the cleft and align the levator muscles
- Posteriorly based muscle-mucosa flaps
- Anteriorly based mucosa-only flaps

OPERATIVE MARKINGS

- Palpate and mark the hook of pterygoid hamulus on each side
- Left side Z-plasty: Hook of hamulus to midline just posterior to hard-soft junction
- Right side: base of uvula to hook of hamulus
- Cleft margin marked at oral-nasal junction

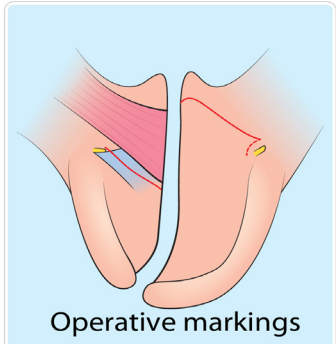


Figure 11-2. Operative markings.

- These designed incisions should create a traditional 60 degree z-plasty but this may be distorted by three dimensional palatal anatomy
- Nasal lining reversed z-plasty is not marked intraoperatively but is a mirror image

PROCEDURE STEPS

- Areas of dissection are infiltrated with epinephrine-containing local solution
- Oral mucosa is incised along cleft margin and Z-plasty markings. (In soft palate only, a short midline incision may be carried onto the hard palate to allow for safe dissection over bone)

Key Tip: Visualization of posterior hard palate is poor but levator muscle mass should be cut from edge of palate to maximize muscle. Importantly, proceeding laterally the levator is separated from the tensor aponeurosis. Sharp dissection should stop at the hamulus to avoid injury to the superior pharyngeal constrictor.

- Left side triangular flap: oral mucosa + levator muscle raised off of the thin nasal mucosa (small amount of muscle may be left on mucosa) – this can be done with scissors, knife, or cautery
- Levator tunnel is entered bluntly with elevator to release it posteriorly from the tensor aponeurosis.
- Opposing Z-Plasty: when left mucosal-muscle flap is raised, the left nasal mucosa is cut in the opposite direction (mirror image) – this nasal flap will determine how the contralateral mucosa-muscle flap lies and therefore levator orientation.
- Right side – oral flap will not contain any muscle – this flap may be raised more quickly in the same blunt manner as in the straight-line technique by avulsing oral mucosa from the levator muscle (See Chapter 11) but more often is raised from the tip of the flap working anteriorly.
- The Z-plasty incision is completed through oral mucosal only avoiding injury to underlying levator muscle

Key Tip: Oral mucosa and submucosa of the soft palate is quite thick and therefore the flap should be thick when raised

Closure: Nasal floor closure is performed first by insetting the tips of the flaps and then proceeding along the incision lines. The uvula is repaired.

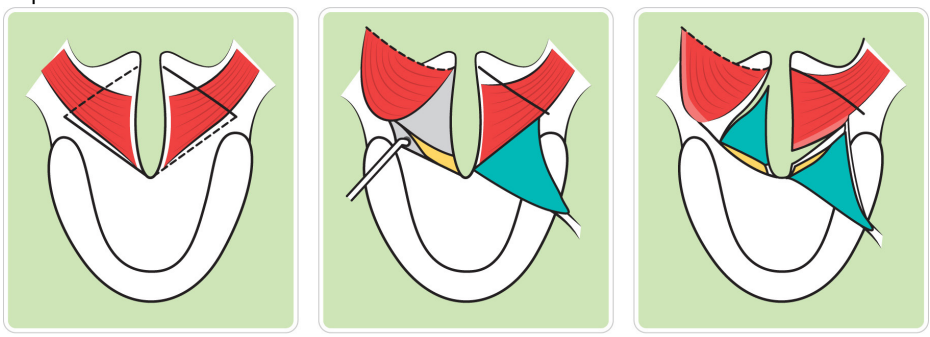
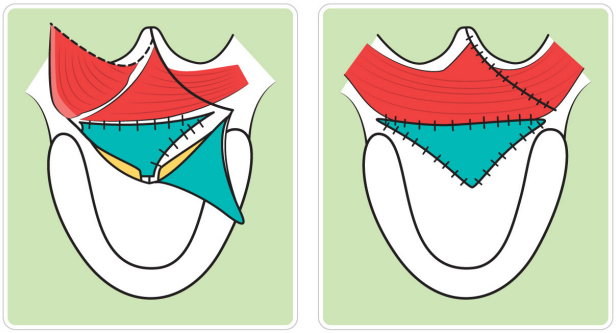


Figure 11-3. Operative sequence of double opposing z-plasty. Oral incisions (solid) and nasal incisions (dashed) (A). Elevation of left side posteriorly based oral myomucosal flap and right side anteriorly based oral mucosa flap (B). Nasal mucosa cut to create left side anteriorly based nasal mucosa flap and right side posteriorly based nasal myomucosal flap (C). © 2017 A Campbell, C Restrepo



Double Opposing Z-plasty:
Oral incision design (solid), nasal incisions (dashed).

Figure 11-4. Rotation and inset of flaps for closure of nasal mucosa (A) and oral mucosa (B). ©2017 A Campbell, C Restrepo

CHOP MODIFICATION

Surgeons at the Children's Hospital of Philadelphia (CHOP) adopted Dr. Furlow's technique for the soft palate. But whereas Furlow avoided lateral relaxing incisions on the hard palate, the surgeons at CHOP adopted a von Langenbeck (bipedicled hard palate mucoperiosteal

flaps – See Chapter 12) approach with lateral releasing incisions that are described above. Results of their large series demonstrate low fistula and VPI rates.

WOO MODIFICATION

Some surgeons have advocated for additional modifications to the Furlow technique. One modification of note is the "Woo palatoplasty". This technique involves 1) straight line nasal mucosal closure, 2) intravelar veloplasty – dissection and suture apposition of the levator muscle, and 3) z-plasty of the oral layer. There are numerous other modifications to the handling of the levator muscle while performing a Furlow-like palatoplasty. Many of these are unpublished.

OUTCOMES

Fistula Rates

Large series in the literature have demonstrated low fistula rates in Furlow palatoplasty. Dr. Furlow reported a 5.6% fistula rate in his original report. The CHOP group reported a rate of 6.5%.

Speech Outcomes

In 1999, Kirschner et al from the CHOP group reported on 390 palatoplasties and presented speech data for 181 non-syndromic patients. This study describes that 93% of patients had no or only mild hypernasality and 7.2% of patients went onto secondary surgery.

Comparison to Straight-Line with IVV

Proponents of Furlow palatoplasy have argued that speech outcomes are better than straight-line repair with IVV. In 2014, a meta-analysis was published supporting this assertion. However, large series in the literature of radical IVV and Furlow palatoplasty seem to demonstrate similar occurrence of VPI.

SECONDARY PALATE SURGERY

Furlow palatoplasty is often recommended for revision palate surgery (Chapter 15).

CONTROVERSIES: Degree of muscle dissection and use of hard palate relaxing incisions remain debated. Furlow avoided relaxing incisions while possible. The CHOP group uses relaxing incisions nearly universally and found an acceptable rate of maxillary retrusion. The group at Hospital for Sick Children (Toronto, Canada) is a proponent for more muscle dissection from the flaps and sutured intravelar veloplasty.

KEY READING

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