



# Oral Mucosal Z-Plasty in Combination with Intravelar Veloplasty

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**Summary:** Our aim was to establish a reliable, functional surgical technique for soft palate closure. A step-by-step description of the operative procedure is presented. A cross-over procedure has been developed by combining the principles of a mucosal Z-plasty only on the oral side of the cleft palate, the intravelar veloplasty following Sommerlad's principles and a straight line closure on the nasal side. In the last 2 years, 25 patients have undergone the operation at the Cleft Centre of the 1st Paediatric Department of the Semmelweis University Budapest, Hungary. In all cases the operative technique could be adapted, operations were uneventful and straightforward. This technique was appropriate to close all the soft palate clefts, even the wide ones. This procedure combines the advantages of both procedures and has shown very good early postoperative results. (*Plast Reconstr Surg Glob Open* 2015;3:e456; doi: 10.1097/GOX.0000000000000424; Published online 16 July 2015.)

The double-opposing Z-plasty has been an important advance in cleft surgery.<sup>1</sup> Advantages of this procedure have been shown when compared with straight-line repairs.<sup>1-4</sup>

Correction of the abnormal musculature by intravelar veloplasty has been used by many.<sup>5</sup> With the knowledge of the anatomy of the palatal muscles,<sup>6</sup> Sommerlad<sup>7</sup> developed a technique with meticulous preparation and reunion of the levator palati muscle.

A cross-over procedure has been developed for soft palate closure by combining the principles of a mucosal Z-plasty only on the oral side of the cleft palate, the intravelar veloplasty following Sommerlad's principles, and a straight line closure on the nasal side. A step-by-step description of this procedure is presented.

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## MATERIALS AND METHODS

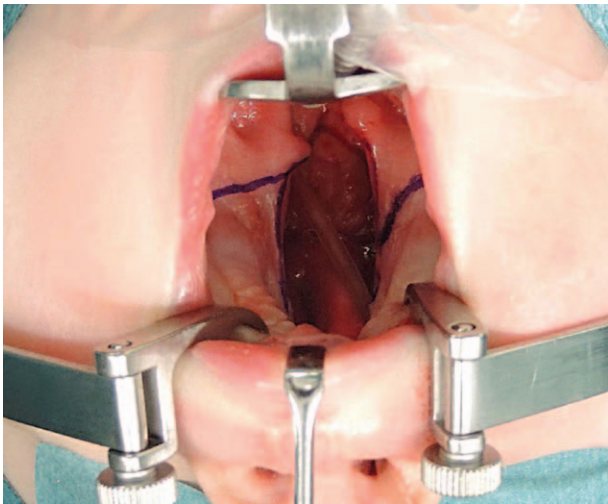
This technique has been used for 2 years in 25 consecutive patients at the 1st Pediatric Department, Semmelweis University Budapest, Hungary [cleft palate, 12; unilateral cleft lip and palate, 9; bilateral cleft lip and palate, 4; mean age, 13.4 months (range: 11–20 months)].

The operation is done under general anesthesia with endotracheal intubation at the age of approximately 1 year. We aim at closing the whole palatal cleft in case of Veau types 1 and 2. In Veau types 3 and 4 and in case of extremely wide palatal clefts, the hard palate is closed at the age of 4 years.

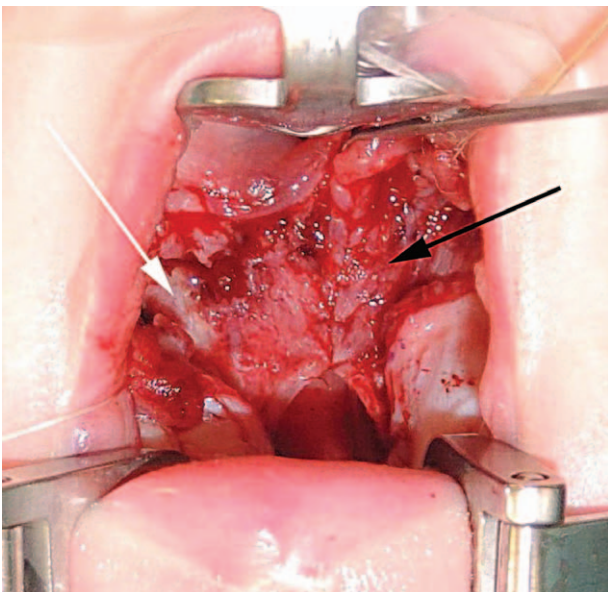
1. Oral incisions are marked as the mirror image of the original double opposing Z-plasty<sup>2</sup> (Fig. 1).
2. The mucosa and underlying tissues are infiltrated with lignocaine and adrenaline (1 per 100,000).
3. The incisions are made along the cleft margins at the junction between oral and nasal mucosa and along the limbs of the oral triangles of the Z-plasty with Nr. 15 blade.
4. Elevation of the oral flaps begins anterior from the junction of the soft and hard palate in the subperiosteal plane. To identify the muscle attachments, one has to proceed subperiosteally on the hard palate.

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5. The oral mucosa is dissected off the musculature to the posterior border of the velum and laterally to the pterygoid hamulus (Fig. 2). This is done on both sides.
6. The nasal mucosa is separated from the palate and sutured in the midline. This is a major difference to the Furlow palatoplasty, where nasal triangular flaps are also elevated. For the nasal layer closure, 5-0 absorbable sutures (polyglactin 910) are used.
7. Muscle elevation and repositioning are carried out according to Sommerlad.<sup>7</sup> The palatopharyngeus and tensor veli palati are divided from the posterior hard palate. After division of the tensor tendon medial to the hamulus, dissection continues until the levator palati muscle becomes mobile.



**Fig. 1.** Incision lines for the oral mucosal Z-plasty. The intraoperative photographs were taken from above, as the surgeon looks at the palatal structures sitting at the head of the cleft patient.

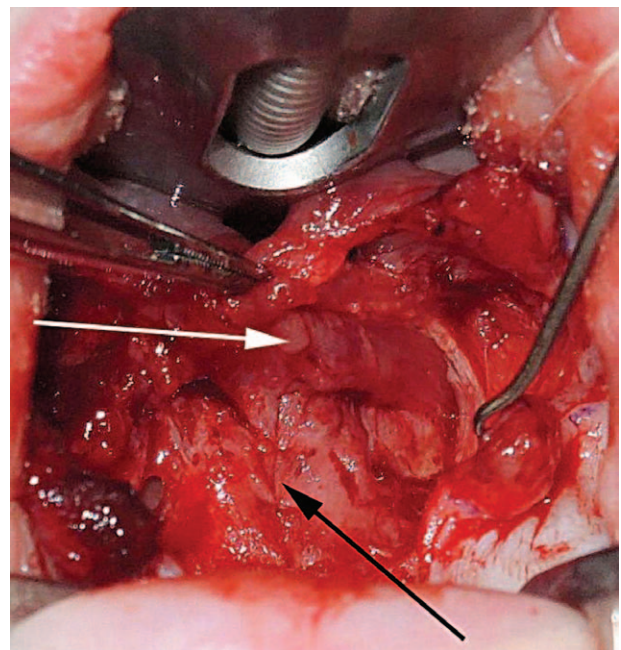


**Fig. 2.** Visualization of the palatal musculature (black arrow, palatopharyngeus muscle; white arrow, tensor veli palati muscle), after dissecting off the oral mucosa.

8. The levator bundles are united (Fig. 3) with non-absorbable (5-0 nylon) sutures.
9. An absorbable mattress suture is inserted through the realigned muscle bundles and the nasal mucosa to keep the muscle in its posterior position.
10. For the oral layer, 4-0 absorbable sutures are used (polyglactin 910). The triangular mucosal flaps are approximated in a manner similar to that of the original Furlow technique, with the following differences: the flaps are only mucosal bilaterally; the orientations of the flaps are mirror images of the Furlow-flaps; and we use a V-Y technique laterally when closing the oral layer (Fig. 4).

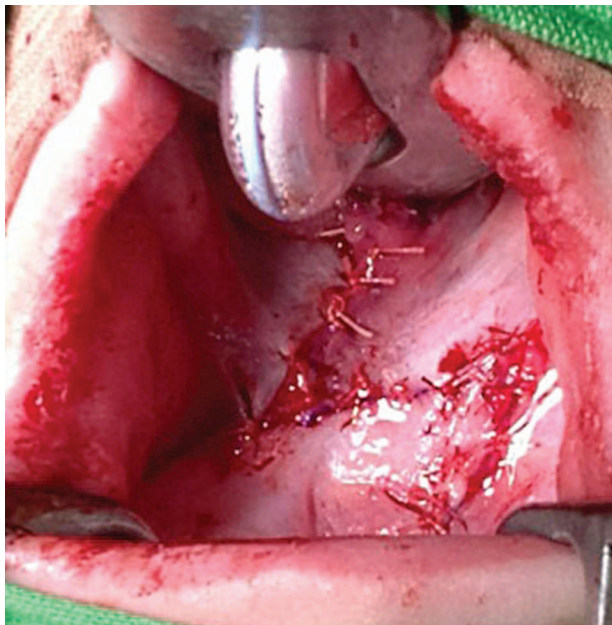
## RESULTS

The procedure was performed in each case uneventfully. There was no significant delay in the duration of the operative procedure. The mean time of the palatal closure was 56 minutes (ranging from 51 to 69 minutes). We did not have to change our postoperative pain nor our feeding protocol. There were no adverse postoperative events, no hemorrhage, no dehiscence, and no inflammation.



**Fig. 3.** Realignment of the palatal musculature and the levator palati muscle (black arrow, midline closure of nasal mucosa; white arrow, realigned levator palati muscle sling).





**Fig. 4.** Completed closure of cleft palate. Note the lengthening effect of the oral mucosal Z-plasty.

Early speech results are promising but up till now were not objectively evaluated because the short follow-up time and young age of the patients.

### DISCUSSION

The double opposing Z-palatoplasty involves alternating Z-plasties of the nasal and oral flaps and repositioning the levator veli palatini muscle within the posteriorly mobilized flaps.<sup>2</sup> The soft palate is lengthened while the palatal muscles are reoriented. This procedure was also effective for closure of submucous cleft palate and secondary correction of velopharyngeal insufficiency.<sup>1,3,4</sup>

The primary significance of Furlow's technique is that it increases velar length. However, the extra length is only efficient if the palatal muscles work effectively.<sup>8</sup> The major objection to the technique is the nonanatomic placement of the levator muscle. Two other issues have been raised: the Furlow procedure was suggested to be limited to narrow clefts and concern has been expressed about a possible high fistula rate.<sup>9</sup> This technique is indeed challenging in closing wider clefts.<sup>2</sup>

Levator muscle repositioning during palatoplasty is an accepted method to achieve velopharyngeal competence.<sup>7</sup> Surgeons emphasized careful dissection of abnormally positioned levator muscles to restore the levator sling. The operation is challenging, but more radical levator muscle dissection and overlapping offer better functional results for velopharyngeal and otological function.<sup>7,10</sup>

We have developed a technique, which follows the oral flap elevation technique of the Furlow palatoplasty, but only the palatal mucosa is elevated off with the submucous glands from the palatal muscles on both sides. The flaps are elevated in the opposite direction as in the original Furlow palatoplasty because we felt it giving a better approach to the right-handed surgeon. Limited subperiosteal flap preparation on the hard palate was performed only if necessary. The nasal mucosa was released from the nasal side of the palate and sutured in the midline. Even in wide clefts, nasal closure could be performed without tension. We have omitted the lateral nasal mucosa incisions for 2 reasons: the nasal mucosa has much more elasticity than the oral one and the lateral incisions make the closure of the nasal mucosa more tedious and time consuming. Muscle preparation was done similarly to the technique of Sommerlad.<sup>7</sup> This gives an anatomical and functional soft palatal closure. Closure of the oral side was achieved with Furlow-type flaps.<sup>11</sup>

### CONCLUSIONS

This technique was appropriate to close the soft palate in each case, even in the Pierre Robin sequences and bilateral clefts. We combined the advantages of a mucosal Z-plasty only on the oral side of the cleft palate, the intravelar veloplasty, and a straight line closure on the nasal side and have shown good early postoperative results. Speech development and tendency to velopharyngeal insufficiency are yet to be evaluated.

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