

Clinical Paper  
Cleft Lip and Palate

# Use of a modified Furlow Z-plasty as a secondary cleft palate repair procedure to reduce velopharyngeal insufficiency

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**Abstract.** Cleft palate repair is done to allow for normal speech by separating the oral and nasal cavities and creating a functioning velopharyngeal valve. However, despite cleft palate repair, some patients demonstrate velopharyngeal insufficiency (VPI). An attempt was made to determine the effectiveness of a modified secondary Furlow Z-plasty in improving VPI. Fifty-five children aged between 12 and 15 years, with postoperative VPI following primary palatoplasty, were included in the study. These children underwent a modified Furlow Z-plasty. Nasometry was done to determine the change in velopharyngeal function due to the secondary Furlow Z-plasty by comparing the preoperative with the 1-year postoperative nasalance scores. A test–retest study was performed to determine the reliability of the nasometric measures. Reliability measurements of the nasometer passages revealed good reliability for 18 out of the 25 speech passages. There was a statistically significant reduction in VPI at 1 year postoperative in patients who were treated with the modified Furlow Z-plasty, with a *P*-value of <0.001 in all passages, except velar plosives, which had a *P*-value of 0.002. Patients with VPI after primary palatoplasty and treated using a modified Furlow Z-plasty had significantly lower nasalance scores at 1 year postoperative, indicating significantly improved velopharyngeal function.

**Key words:** cleft palate; secondary palatoplasty; velopharyngeal insufficiency; Furlow Z-plasty; hypernasality; speech; nasometry.

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Velopharyngeal insufficiency (VPI) is defined as a structural abnormality that results in incomplete closure of the velopharyngeal valve during the production of oral speech.<sup>1</sup> Among other causes, VPI can be caused by inadequate length and/or movement of the soft palate. Incomplete closure of the velopharyngeal

valve can cause hypernasality and/or nasal emission. VPI is considered to be the primary cause of hypernasal speech.<sup>2</sup>

VPI has been reported in 5–36% of patients who have undergone primary palatoplasty for cleft palate.<sup>3–5</sup> A variety of treatment options have been described for VPI, including secondary velar palatoplasty.<sup>6–9</sup>

The Furlow double-opposing Z-plasty technique was initially described in 1978 for primary repair of a cleft palate.<sup>10</sup> In recent years, it has been used as a secondary procedure to treat post-palatoplasty VPI.<sup>1,11</sup> The aim of this study was to determine the effectiveness of a modified Furlow Z-plasty in improving VPI by comparing pre- and postoperative nasalance scores.

## Materials and methods

### Patients

This prospective cohort study was performed between February and December 2011. It was conducted with 55 consecutive non-syndromic patients with complete unilateral cleft lip and palate and postoperative VPI after primary palatoplasty. The patients ranged in age from 12 to 15 years. Of the 55 patients, 30 were male and 25 were female. This research study was approved by the local ethics committee based on the guidelines declared by the Government of India. The parents or guardians of all participants were informed verbally about the study and signed a written informed consent. All patients were operated on by a single surgeon (RRR).

### Surgical procedure

A modified Furlow Z-plasty technique was used for each patient. The markings for this procedure are illustrated in Fig. 1.

The marking for the first incision was started with a point on the midline of the soft palate corresponding to the posterior border of the hard palate (point A). The next point was marked at the middle of the base of the reconstructed uvula, or the middle of the posterior border of the soft palate in cases where the uvula had not previously been reconstructed (point B). A line was drawn to connect point A with point B. This line was then extended up to a distance of 10 mm on both the palatopharyngeal arches (points C and D). The incision design of the oral layer was based on the original Furlow Z-plasty, with an anterior limb on the left side and a posterior limb on the right side.<sup>10</sup> The marking for the anterior limb started from point A and followed a path parallel to the posterior border of the hard palate at a distance



Fig. 1. Marking for the modified Furlow Z-plasty in secondary palatoplasty.

of 5 mm. It was then extended up to the retromolar area of the left side of the maxilla (point E). The posterior limb extended from point B to the right side of the soft palate at a right angle to line AB (point F). Care was taken to ensure that the lines AB, AE, and BF were equal in length. These incision markings allowed for two flaps to be raised, whereby the one on the left could be rotated posteriorly and the flap on the right side could be rotated anteriorly.

The incision was started on the oral layer from point B to A. The incision was continued from point B to points C and D. After the incisions ABC and ABD were completed, the incision AE was done. A myo-mucosal flap was raised from the nasal layer with the levator muscle bundle initially attached to the oral

flap, but dissected away from the oral mucosa after raising the flap. Next, incision BF was performed. In this second flap, the oral mucosa was raised, leaving the levator muscle bundle attached to the nasal layer. The levator muscle bundle was raised from the nasal layer in a second stage. The previously closed nasal layer was left intact and not dissected as would have been done in a traditional Furlow Z-plasty (Fig. 2).

The closure of the nasal layer was started posteriorly by approximating the points C and D and moving anteriorly up to the intact part of the nasal layer. This closure of the nasal layer was done with 4–0 Vicryl sutures (Johnson and Johnson, India) (Fig. 3). The approximation of the levator muscle bundle was done with 4–0 PDS II sutures (Johnson and Johnson,

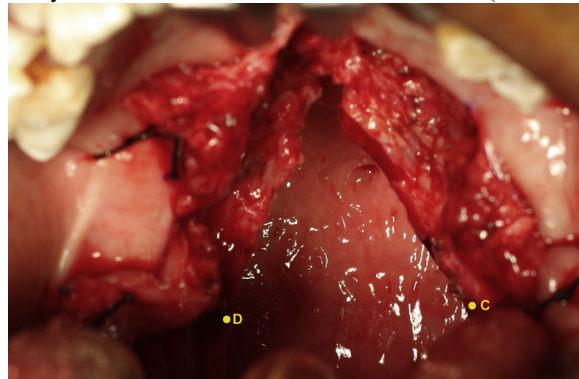


Fig. 2. Extension of the nasal layer.

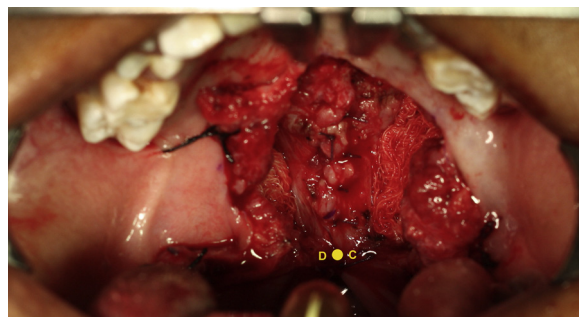


Fig. 3. Closure of the nasal layer.

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