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BEYOND SURGICAL REPAIR IN BILATERAL CLEFT LIP AND COMPLETE CLEFT PALATE: PERSISTENT SPEECH AND RESONANCE DISORDERS IN ADULTHOOD – A CASE STUDY

[1]Amit Yadav, [2]Rajeev Ranjan

[1]BASLP 3rd Semester Student, [2]Assistant Professor (Speech and Hearing)
[1,2]Composite Regional Centre for Skill Development, Rehabilitation & Empowerment of Persons with Disabilities (CRC), Lucknow, Uttar Pradesh, India

Abstract : Bilateral cleft lip and complete cleft palate (BCLP) is a severe congenital anomaly that requires multistage surgical management, yet speech and resonance problems often persist into adulthood. This case study describes a 20-year-old male with repaired BCLP who underwent palatal fistula closure with an anterior-based pedicle tongue flap in 2025 and was evaluated for speech and language assessment for disability certification. Oral peripheral mechanism examination showed an absent uvula and reduced tongue precision after the flap. Perceptual assessment showed hypernasality, nasal air emission and nasal turbulence, with speech intelligibility rated 4/5. CAPE-V overall severity was 90/100 and GRBAS was G3 R2 B1 A1 S2. Maximum phonation duration was reduced (/a/ 12 s, /i/ 11 s, /u/ 9 s), speech rate was 115 wpm, and the S/Z ratio was 0.72. Structural repair alone did not restore functional speech. Intensive, multidisciplinary, function-focused rehabilitation is needed beyond surgical intervention.

IndexTerms **- Bilateral cleft lip and palate, velopharyngeal insufficiency, hypernasality, tongue flap, laryngeal hyperfunction, speech-language pathology.**

I. INTRODUCTION

Bilateral cleft lip and complete cleft palate (BCLP), occurring in approximately 1 in 700 live births (Mossey & Modell, 2012), is a severe congenital anomaly arising from multifactorial genetic-environmental disruption of embryonic craniofacial development during weeks 4–12 of gestation (Kummer, 2020). BCLP causes complete disruption of the lip, alveolus, and palate, resulting in hypernasality, nasal air emission, and compensatory articulation errors (Peterson-Falzone et al., 2009). Despite multistage surgical management, compensatory speech patterns resist correction due to neuro-motor habituation (Kleim & Jones, 2008). This case examines persistent speech dysfunction in a surgically repaired adult BCLP male following palatal fistula closure.

II. CASE PRESENTATION

Demographic Data

Age: 20-year-old male
Education: B.Tech 2nd Year, IIIT Lucknow
Purpose of visit: Speech and language evaluation for disability certificate at Composite Regional Centre (CRC), Lucknow, on 2nd January 2026
Referral: District Hospital Lucknow
Complaints: Hypernasality, reduced speech clarity
Diagnosis: Repaired bilateral cleft lip and complete cleft palate (BCLP)

Surgical History

Table 1. Surgical history

Stage	Year	Procedure & Institution
1	2005	Cleft Lip Repair – Sir Ganga Ram Hospital
2	2006	Cleft Palate Repair – Sir Ganga Ram Hospital
3	2008	2nd Palatal Repair – Vivekananda Hospital
4	2014	Alveolar Bone Grafting – Vivekananda Hospital
5	2017	Alveolar Bone Grafting – Vivekananda Hospital
6	June 2025	Palatal Fistula Closure via Anterior-Based Pedicle Tongue Flap – SGPGI
7	July 2025	Tongue Flap Division and Insetting – SGPGI

Social Factors

- **Academic burden:** Communication demands of an engineering programme (IIIT Lucknow) heighten functional speech requirements.
- **Psychosocial impact:** Reduced self-confidence, social withdrawal, and restricted peer interaction secondary to reduced intelligibility.

III. Clinical Examination

Oral Peripheral Mechanism Examination (OPME)

OPME is the foundational structural-functional evaluation of the articulatory system. In post-surgical BCLP clients it is essential to:

(i) Verify surgical repair integrity
(ii) Assess tongue mobility after tongue flap procedure
(iii) Identify residual oro-nasal communication

Table 2. Oral peripheral mechanism examination findings

Structure	Structural Status	Functional Status
Lips	Repaired	Mild protrusion
Tongue	Normal	Mild protrusion, reduced precision post-flap
Teeth	Repaired	Normal
Hard Palate	Repaired	Sucking ability affected
Soft Palate	Repaired	Straw suction affected
Uvula	Missing	VP closure contribution absent
Mandible	Normal	Normal
Maxilla	Normal	Normal

OPME Interpretation

Absent uvula removes its contribution to velopharyngeal (VP) sphincter closure, contributing to hypernasality.
Repaired palate with compromised sucking signals incomplete VP functional competence despite anatomical closure.
Post-tongue flap tongue restriction reduces articulatory precision for anterior lingual phonemes: /t/, /d/, /n/, /l/, /s/, /z/.
Overall: Structural repair was achieved, but OPME confirms multiple residual functional deficits demanding intensive speech-language intervention.



Fig 1. Shows cleft in palate

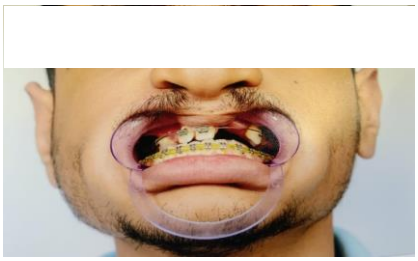


Fig 2. Shows missing teeth



Fig 3. Shows missing uvula



Fig 4. Shows repaired cleft palate

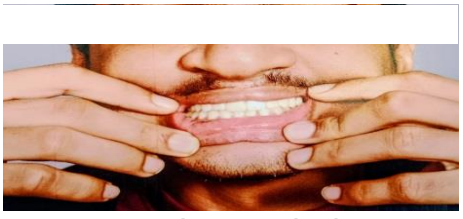


Fig 5. Shows repaired teeth

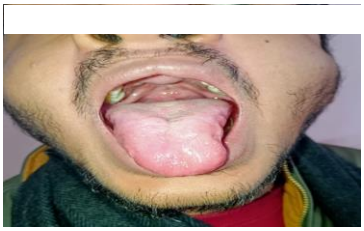


Fig 6. Shows repaired tongue flap

IV. Assessment and Tests

A. Perceptual Speech Assessment

Perceptual assessment was carried out to quantify the presence and severity of hypernasality, nasal air emission, nasal turbulence, and overall speech intelligibility, which are the primary functional consequences of velopharyngeal insufficiency (VPI) in BCLP.

Table 3. Perceptual speech assessment

Hypernasality	Nasal air emission	Nasal turbulence	Speech Intelligibility Rating
Present	Present	Present	4/5

B. Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) and Grade, Roughness, Breathiness, Asthenia, Strain (GRBAS) Scale (as per The Gazette of India)

These standardized perceptual tools document multi-dimensional voice quality parameters and grade dysphonia severity in the context of secondary laryngeal hyperfunction from chronic VPI.

Table 4. CAPE-V and GRBAS findings

Scale	Parameter	Client Score	Normal	Interpretation
CAPE-V	Overall Severity	**90/100**	< 30	Severely deviant overall voice quality
GRBAS	Grade (Overall Severity)	**G3**	G0	Severe dysphonia
	Roughness	**R2**	R0	Moderate – irregular vocal fold vibration
	Breathiness	**B1**	B0	Mild – audible air escape through incomplete glottal closure
	Asthenia	**A1**	A0	Mild – reduced phonatory effort and vocal intensity
	Strain	**S2**	S0	Moderate – laryngeal hypercompression compensating for nasal air loss

C. Maximum Phonation Duration (MPD)

MPD assesses respiratory-phonatory efficiency. Reduced MPD reflects wasted airflow through an incompetent VP sphincter, indicating residual functional VPI even after structural repair.

Table 5. Maximum phonation duration

Vowel	Client	Normal Adult	Status
/a/	12 sec	15–25 sec	↓ Reduced
/i/	11 sec	15–25 sec	↓ Reduced
/u/	9 sec	15–25 sec	↓ Reduced

D. Speech Rate

Speech rate measures fluency and ease of connected speech. Reduction indicates effortful, compensation-laden speech production.

115 wpm (normal: 140–160 wpm) → effortful, compensation-laden speech production.

E. S/Z Ratio

The S/Z ratio compares the maximum sustained durations of /s/ and /z/ and is used as an aerodynamic-acoustic indicator of laryngeal function (Boone et al., 2014). In this case, VPI-related air escape is thought to force excess laryngeal recruitment that persists after surgery.

S/Z = 0.72 (normal: 0.8–1.2) → consistent with laryngeal hyperfunction, together with the strained voice quality on GRBAS.

V. Discussion

This case demonstrates that surgical anatomical correction does not guarantee functional speech recovery in adults with repaired BCLP. Despite successful palatal fistula closure via anterior-based pedicle tongue flap at SGPGI (June 2025), hypernasality with severely deviant overall voice quality (CAPE-V: 90/100), reduced MPD (/a/: 12 s; /i/: 11 s; /u/: 9 s), an abnormal S/Z ratio (0.72), and reduced speech rate (115 wpm) persist, indicating ongoing velopharyngeal functional insufficiency and secondary laryngeal hyperfunction.

The S/Z ratio of 0.72 is consistent with laryngeal hyperfunction (Boone et al., 2014), that is, excessive laryngeal tension as a secondary adaptation to nasal air loss. The tongue flap, while achieving fistula closure, introduced tongue restriction affecting articulatory precision for /t/, /d/, /n/, /l/, /s/, /z/, further compounding the speech profile.

Speech deficits compromise this client's academic performance and social confidence within a demanding engineering programme (Hunt et al., 2005). Effective management demands intensive, individualized speech-language therapy targeting resonance normalization, articulation retraining, voice therapy for laryngeal hyperfunction, and coordinated multidisciplinary care.

VI. CONCLUSION

This case study demonstrates that structural repair alone is insufficient to restore normal speech function in adults with repaired BCLP. Despite successful palatal fistula closure via anterior-based pedicle tongue flap, comprehensive assessment revealed persistent and severe communication deficits. Perceptual evaluation confirmed hypernasality with audible nasal air emission and nasal turbulence, and speech intelligibility was rated 4/5. CAPE-V Overall Severity scored 90/100 (severely deviant), while GRBAS indicated G3 R2 B1 A1 S2, confirming significant dysphonia with moderate laryngeal strain. Maximum phonation duration was reduced across all vowels (/a/: 12 s, /i/: 11 s, /u/: 9 s), reflecting impaired respiratory-phonatory efficiency. Speech rate of 115 wpm and an S/Z ratio of 0.72 further indicated effortful speech production and laryngeal hyperfunction. OPME revealed an absent uvula and post-flap tongue restriction, compromising both velopharyngeal competence and articulatory precision. These findings collectively highlight the critical need for intensive, multidisciplinary, function-focused rehabilitation beyond surgical intervention.

The implications for clinical practice are significant. Management of adult repaired cleft cases must shift from a purely structural focus to a function-centered rehabilitation approach. Intensive, individualized speech therapy targeting elimination of compensatory articulations, resonance therapy for hypernasality, and voice therapy for laryngeal hyperfunction are essential components of comprehensive care. The multidisciplinary team, including plastic surgeons, otolaryngologists, orthodontists, speech-language pathologists, and psychologists, should work in coordination to achieve the best functional outcome.

VII.ACKNOWLEDGMENT

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