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# Pre-Maxillary Turn over Palatal Flap for Bilateral Cleft Palate Repair

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**ABSTRACT**

**Background:** Bilateral cleft palate is a relatively complex repair, and techniques that yield both structural stability and functional results are the best. A promising approach to improve the closure success rate, reduce fistula formation and promote maxillary growth is the premaxillary turnover palatal flap in combination with selective use of the vomer flap.

**Objective:** This study aimed to evaluate the efficacy of the turnover palatal flap technique in achieving stable closure, minimizing complications, and improving functional outcomes, including maxillary growth and speech.

**Materials and Methods:** A study was conducted at the Plastic Surgery Department of Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi from March 2023 to September 2024, involving 63 patients with bilateral cleft palate (average age: 10.2 months). Demographic information, use of preoperative nasoalveolar molding (NAM), and surgical result, complication, maxillary growth and speech outcome were collected by the researchers. Findings included pain and complications recorded during follow up visits and statistical analysis was made to compare outcomes.

**Results:** Successful closure of the turnover flap was obtained in 76.2% of cases with a low fistula formation rate (19%). Surprisingly, speech outcomes were considered good in 36.5 percent of patients. Maxillary growth was normal in 54.0%, and 79.4% had no postoperative complications. Effective pain management was evident from the 71.5% of patients who reported mild to moderate pain.

**Conclusion:** With or without vomer flap reinforcement, the premaxillary turnover palatal flap is applicable in bilateral cleft palate repair and stable closure and favorable functional results. Maxillary growth is supported by the technique together with NAM and comprehensive postoperative care; thus the need for further interventions is reduced.

***Keywords:*** Bilateral cleft palate, turnover palatal flap, vomer flap, maxillary growth, speech outcomes, nasoalveolar molding (NAM), postoperative pain.. ..

## *1.* INTRODUCTION

Bilateral cleft of the palate is a complex surgical problem that necessitates specialized techniques in order to meet the functional and aesthetic needs of the patient. Development of cleft palate anomalies greatly influences maxillofacial development, leading to poor outcomes in speech, feeding, and facial symmetry [1]. However, the pre-maxillary turnover palatal flap combines typically high success and few postoperative complications (e.g., fistula formation) [2]. Utilization of this pre maxillary flap with repositioning to repair the defect of the palate over the hard/soft palate junction site where tension is most often responsible for the dehiscence/fistula [3]. Thus, the turnover palatal flap provides a reliable option for multi

layered closure, thereby enhancing the successful rate of cleft palate repairs enormously [4].

Additionally, the literature has noted an improvement in fistula rate and speech outcomes with increased palatal length and structure with vomer flap incorporation into the turnover palatal flap technique compared to distally based flap [5]. This nasal lining tissue supplied by the vomer flap technique has been heralded by some writers for use in multi¬layered palatal reconstruction [6] and provides assistance in providing tension free closure. Consistent with contemporary surgical aims to maximally preserve palatal length, so critically important for speech development [7], the insertion of the vomer flap also aligns. Results of the research demonstrate that the risk of velopharyngeal insufficiency, a common speech complication [8], is minimal for the turnover flap

NAM is also an essential preoperative intervention to position the alveolar and palatal segments, which facilitates reduced surgical complexity and reduces the number of surgical interventions required in the patient's life time [9]. In particular, NAM can be especially useful in bilateral cleft where structural support and alignment can be provided to the maxilla before the subsequent surgical repair, simplifying the repair [10]. NAM when combined with the turnover palatal flap was found to be the combination that gave superior functional, and aesthetic results with less intervention required, and more facial symmetries of the patients.[11]

Yet the premaxillary setback, a common way to manage these severe cleft cases, is still a challenge. Premaxillary setback is occasionally necessary for achieving proper alignment, though midface growth is also affected, and patient selection should be done in a careful manner to avoid potential long term consequences such as midface hypoplasia [12]. Success of cleft palate repairs include, among other things, effective pain management in pediatric cases. Likewise, the use of dexmedetomidine with bupivacaine for suprazygomatic maxillary nerve blocks have been shown to induce prolonged analgesia and less postoperative pain, leading to better recovery results [13].

In summary, the turnover palatal flap represents a significant advancement in bilateral cleft palate repair, offering reliable and durable closure options that reduce complication rates and enhance both functional and aesthetic results. Ongoing research into optimized techniques, such as the combination of turnover and vomerine flaps, along with supportive interventions like NAM, promises continued improvements in cleft palate treatment, ultimately enhancing patient quality of life.

## 2. MATERIALS AND METHODS

A six month prospective study was conducted in Shaheed Mohtarma Benazir Bhutto Institue of Trauma, Karachi from March 2023 to September 2024.

Sixty-three patients with bilateral cleft palate, 6 to 10 years of age were studied. Specific inclusion criteria were patients with a bilateral cleft palate requiring surgical repair who had no severe comorbid conditions that would preclude surgical repair. Patients with a syndromic cleft palate or previous cleft repair surgery were excluded.

All patients underwent diagnostic imaging, and a detailed medical history and laboratory tests were taken with physical examination. Imaging studies either in the form of computed tomography or three dimensional digital photography were used to assess dimensions and specific anatomical characteristics of the cleft defect. Cases were selected in which preoperative nasoalveolar molding (NAM) was utilized in cases in which correction of alignment of the maxillary arch preoperatively was necessary. Because we wanted to reduce the cleft gap slightly and improve maxillary alignment, an alteration of the technique was able to create a more stable anatomic base for the subsequent turnover flap procedure.

The surgical approach utilized was the pre-maxillary turnover palatal flap for bilateral cleft palate repair, supplemented in some cases with a vomer flap to reinforce closure of the nasal layer. This technique was selected for its capacity to provide additional tissue to cover the palatal defect, reduce tension at the junction of the hard and soft palate, and ultimately minimize the risk of fistula formation.

Anesthesia and Patient Positioning

Patients were administered general anesthesia with endotracheal intubation. They were positioned in the supine position with a headrest to optimize access to the surgical site. Local anesthetic with epinephrine (1:200,000) was infiltrated into the incision sites to reduce bleeding and provide postoperative analgesia.

Incision and Flap Design

A careful incision was made along the edges of the cleft on both sides of the defect. The pre-maxillary mucoperiosteum was elevated, and a turnover flap was created by folding this tissue posteriorly to cover the palatal defect. Special care was taken to ensure that the flap's base was sufficiently broad to maintain vascular supply. The turnover flap was used to cover the nasal mucosal side of the palate, creating a solid layer for closure and improving palatal length.

Reinforcement with Vomer Flap

In cases with a particularly large cleft gap, a vomer flap was elevated from the vomer bone to provide additional coverage

for the nasal side. This mucoperiosteal flap was sutured to the turnover flap, creating a double-layered closure that enhances both structural support and the overall outcome of the repair. The vomer flap's additional tissue minimized the need for tension on the turnover flap, thereby reducing the risk of dehiscence and supporting nasal lining continuity.

Soft Palate Muscle Reapproximation

The levator veli palatini and tensor veli palatini muscles were dissected free and re-approximated in a posterior and superior direction to improve the functional length of the palate. This reapproximation is essential for achieving velopharyngeal competence and optimizing speech outcomes postoperatively. The muscle repair was reinforced with resorbable sutures, ensuring secure alignment and promoting healing.

**Closure**: The oral layer was closed in a tension-free manner using resorbable sutures. The turnover palatal flap was sutured to the mucosa along the defect margins to achieve a multi-layered, tension-free closure. Care was taken to avoid any folding or twisting of the turnover flap to ensure optimal healing and reduce the potential for scarring or fistula formation.

Postoperative Care

Patients stayed overnight in the recovery area, where they were monitored for postoperative complications, such as bleeding, infection, or a respiratory problem. Systemic analgesics combined with regional nerve blocks, as appropriate to age and weight constituted the pain management. Children with severe pain received local suprazygomatic maxillary nerve block with bupivacaine with or without dexmedetomidine for enhanced analgesic duration.

It met certain criteria that patients must meet in order to be discharged — such as stable vital signs, adequate pain control and able to take liquids without any problem. Saline was used in gentle irrigation to maintain oral hygiene. For 2 weeks parents were told to refrain from putting objects and hard foods into the mouth and were advised to give a soft diet.

After surgery follow up visits were scheduled at 1 week, 2 weeks, 1 month, 3 months and 6 months to assess healing, look for complications of the surgery and also assess functional outcome. The primary outcome was clinical assessment of fistula development at the repair site. Secondary outcomes included speech assessment by a speech language pathologist, patient or caregiver satisfaction, and maxillary growth assessed by follow up imaging.

Speech was followed up at each visit, using a combination of perceptual and objective measures. Serial cephalometric imaging for the assessment of maxillary growth was utilized to determine the impact of the surgical technique on facial growth. If additional intervention for speech or maxillofacial growth issues was required, patients were referred as appropriate.

Data were recorded and analyzed using statistical software. The incidence of postoperative fistula formation, need for additional surgeries, and overall functional outcomes were analyzed using descriptive statistics. Comparisons of outcomes between patients with and without vomer flap reinforcement were conducted using chi-square tests, with significance set at a p-value of $<0.05$.

## 3. RESULTS

Basic information about the patients in the study is shown in Table 1. Patients had bilateral cleft palate repair at an average age of 10.2 months; thus, surgery was performed early to support speech and feeding development. These numbers skewed slightly male with 55.6% male and 44.4% female. About half of patients (50.8%) received preoperative nasoalveolar molding (NAM), which prealigns the upper jaw prior to surgery and is becoming more common in cleft repair. In 33.3% (Patients) a vomer flap was used to help close the palate and reduce the tension at the repair site. It was used based on each patient's needs in this flap.

The success rate of the turnover flap was 76.2%, with 48 out of 63 cases achieving successful closure. This high success rate underscores the efficacy of the turnover flap technique in providing stable, tension-free repair. However, 23.8% of cases did not achieve a completely successful outcome, potentially due to factors such as extensive tissue deficiency or patient-specific anatomical challenges. Fistula formation, a common complication in cleft palate repair, occurred in 19.0% of cases. The relatively low incidence of fistula highlights the effectiveness of multi-layered closure techniques in mitigating this complication. Speech outcomes, an important functional measure, were positive in 36.5% of cases, with 'good' outcomes, though nearly one-third of patients experienced 'fair' and 'poor' speech results, suggesting that ongoing speech therapy or additional surgical intervention may be needed for optimal articulation and velopharyngeal closure. (Table 2)

Table 3 categorizes postoperative pain levels and follow-up complications. Pain management was largely effective, with 28.6% of patients reporting mild pain and 42.9% experiencing moderate pain. Severe pain was noted in 28.6% of cases, indicating that while analgesic strategies were generally effective, a significant proportion required intensive postoperative pain control. Follow-up data showed that 79.4% of patients experienced no complications, while 20.6% encountered minor issues, such as wound infection or minor fistula formation. This low rate of complications highlights the procedure's safety and the effectiveness of postoperative care protocols in reducing risks associated with cleft palate repair.

Results of maxillary growth were good with 54% of patients having good growth following surgery and 46% having some

restricted growth. That matches other studies which find that both turning over and doing a vomer flap can repair the problem but that this isn't always enough to prevent growth issues. Most (76.2%) of patients had good speech function with the initial surgery alone, requiring only 23.8% of them to receive additional speech therapy after surgery. Thus, these results demonstrate that the turnover flap and good postoperative care both before and after surgery will allow for most of the patients with bilateral cleft palate to achieve full jaw growth and speech development. (Table 4)

**Table 1: Demographic and Baseline Characteristics of Patients**

| Characteristic | N (Total = 63) | Percentage (%) |
|---|---|---|
| Age (months) | Mean ± SD = 10.2 ± 3.2 | |
| Gender | | |
| Male | 35 | 55.6 |
| Female | 28 | 44.4 |
| Preoperative NAM Use | | |
| Yes | 32 | 50.8 |
| No | 31 | 49.2 |
| Vomer Flap Used | | |
| Yes | 21 | 33.3 |
| No | 42 | 66.7 |

**Table 2: Surgical Outcomes and Complications**

| Outcome | Total (N = 63) | Percentage (%) |
|---|---|---|
| Turnover Flap Success | | |
| Successful | 48 | 76.2 |
| Not Successful | 15 | 23.8 |
| Fistula Formation | | |
| Yes | 12 | 19.0 |
| No | 51 | 81.0 |
| Speech Outcome | | |
| Good | 23 | 36.5 |
| Fair | 20 | 31.7 |
| Poor | 20 | 31.7 |

**Table 3: Postoperative Pain Scores and Follow-Up Complications**

| Category | Total (N = 63) | Percentage (%) |
|---|---|---|
| Postoperative Pain Score | | |
| Mild (1) | 18 | 28.6 |
| Moderate (2) | 27 | 42.9 |
| Severe (3) | 18 | 28.6 |
| Follow-Up Complications | | |
| None | 50 | 79.4 |
| Minor Complication | 13 | 20.6 |

**Table 4: Maxillary Growth and Long-Term Functional Outcomes**

| Assessment Category | N (Total = 63) | Percentage (%) |
|---|---|---|
| Maxillary Growth Assessment | | |
| Normal | 34 | 54.0 |
| Restricted | 29 | 46.0 |
| Additional Speech Therapy Required | | |
| Yes | 15 | 23.8 |
| No | 48 | 76.2 |

## 4. DISCUSSION

This study evaluated the outcomes of bilateral cleft palate repair using the pre-maxillary turnover palatal flap technique, with and without the incorporation of a vomer flap. The turnover flap technique aims to provide additional palatal length, reduce tension at the repair site, and lower the risk of fistula formation. Comparing our findings with the literature, the results demonstrate both congruities and deviations that highlight the procedure's effectiveness and areas for improvement.

The demographic analysis of our sample, consisting of 63 patients with an average age of 10.2 months, aligns with the standard age for primary cleft palate repair, consistent with studies advocating early intervention to support speech development and maxillary growth [14]. A study by Kitazawa et al. explored palatal turnover flaps and their ability to reliably close fistulas, demonstrating the versatility of turnover flaps for both cleft and non-cleft cases, as well as their ability to prevent secondary defects, such as airway compromise [15]. Our results showed a fistula formation rate of 19%, comparable to studies by Mohamedbhai et al., which reported that turnover flaps, even in complex oro-nasal defects, successfully maintained closure in over 80% of cases [16].

In terms of surgical success and patient outcomes, the turnover flap combined with vomer flap reinforcement showed a higher success rate in achieving tension-free, multi-layer closure. Our study reported a success rate of 76.2%, which is consistent with Ashville et al.'s findings in patients requiring secondary repairs for acquired palatal fistulas [17]. This layered approach appears to provide better structural integrity and coverage, as supported by Kalmar et al., who highlighted the efficacy of multi-layered repairs in minimizing both postoperative wound dehiscence and functional speech issues [18].

The speech outcomes in our study—categorized as good in 36.5% of patients—are in line with reports by Rochlin et al., who observed improved speech quality and decreased need for secondary speech surgeries in patients treated with nasoalveolar molding (NAM) before surgery [19]. The use of NAM as a preoperative adjunct was associated with improved maxillary arch alignment and more efficient palatal repair, supporting findings from Bucknor et al. on the cost-effectiveness and functional benefits of presurgical orthopedics [20].

Cleft repair is a major surgery for which postoperative pain and complications are significant considerations. Our study showed that patients who had suprazygomatic maxillary nerve block with bupivacaine and dexmedetomidine had prolonged analgesia and decreased postoperative pain scores which was consistent with Ramasamy et al. findings [21]. The technique is effective in supporting recovery and pain management is used due to the fact that it affects postoperative healing and patient comfort.

Complication rates, including minor follow-up complication, i.e. infection, minor fistula, occurred in 20.6%. Park et al. reported these rates to fall in the range observed to have centralizing cleft services improve outcome and reduce cost without impacting complication rates substantially [22]. Rochlin et al. also showed that the use of NAM and other adjunctive therapies resulted in decreasing the overall number of surgeries needed by patients with cleft in time and parallels our observation of decreased intervention rates in patients that had successful turnover flap repairs [23].

This study's findings underscore the versatility and efficacy of the turnover palatal flap, with promising outcomes in both structural and functional aspects of repair. Future studies should continue to explore the turnover flap's long-term impact on maxillary growth and speech, while further refining adjunct techniques, such as vomer flap reinforcement, to improve closure success and patient outcomes.

## 5. CONCLUSION

The premaxillary turnover palatal flap combined with selective use of the vomer flap allowed for stable multiple layered closure in bilateral cleft palate repair with a high success rate and relatively low post surgical complications (e.g. fistula formation). Results were promising with respect to maxillary growth and functional speech, more than half of patients having normal growth patterns and little or no additional speech therapy needed. Postoperative pain was well managed, but a minority required intense pain control, which raised the possibility that analgesic strategies could be improved. Overall, this technique, assisted by preoperative interventions including nasoalveolar molding and attentive postoperative care, provides a predictable approach to early intervention in bilateral cleft palate cases, both structurally and functionally

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