Lateral Rectangular Flap for Augmenting Vermilion Deficiency in Unilateral Cleft Lip Repair

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Cleft lip and palate, unilateral repair, lateral rectangular flap.

ABSTRACT
Background and Objective: Cleft lip and palate are common congenital anomalies that require precise management with main component of repairing lip is the aesthetic outcome. Using lateral rectangular flap is a new method to optimize the medial vermilion deficiency. The goal of this study is to evaluate the efficacy of lateral rectangular flap for augmenting medial vermilion deficiency in unilateral cleft lip repair.
Methods: This is a clinical trial was conducted in Rizgary Teaching Hospital and several private hospitals in Erbil, Iraqi Kurdistan Region from June 2021 to June 2023. A total of 18 patients with unilateral, complete and incomplete, isolated cleft lip and cleft lip and palate were included. Preoperative and postoperative photos were documented. Outcomes were analyzed up to one year following the repair.
Results: The included patients had either isolated cleft lip (44.4%) or cleft lip and palate (55.6%). Cleft side was right (38.9%) or left (61.1%). Cleft was incomplete in only 2 patients (11.1%) and complete in 16 patients (88.9.%). No early postoperative complications were reported; however 5 patients complained of scar later after surgery. Outcome evaluation score for Cubid's bow was 1 for 5 patients and 2 for 13 patients. On the other hand, score for lateral vermilion deficiency was 2 for all patients. No significant association was detected between patients'clinical data and the type of cleft.
Conclusion: We found that lateral rectangular flap for augmenting medial vermilion deficiency in unilateral cleft lip repair was effective with excellent surgical outcome and minimal patients' morbidity.

1. Introduction

Cleft lip with or without palate is the most common congenital craniofacial deformity. Children with this deformity face serious social and medical repercussions [1]. Cleft lip develops when the medial nasal prominence and maxillary prominence fail to fuse during embryonic development. The functions of the lip, nose, and maxilla are affected by this deformity, in addition to the appearance of the face [2]. Over the centuries, as medical professionals have refined both the form and function of cleft lip surgery, the art and science behind surgical restoration have evolved significantly. Cleft lip surgery is usually done in infancy in order to improve the psychological and social well-being and to restore the normal architecture and function of the affected components [3].

The objectives of surgery are to achieve a symmetrical, functional, and aesthetically pleasing lip contour, vermilion border, and nasal structure. In order to eliminate social stigma and psychological distress, as well as to improve facial look and function, surgical correction of a unilateral cleft lip is usually carried out within the first few months of life [4]. Several approaches have been established in the past for the repair of cleft lip, such as the triangle flap technique, Tennison-Randall technique, and Millard rotation-advancement technique [5]. Each method has its advantages and limitations, and the choice of technique depends on the degree and intricacy of the cleft, the surgeon's experience and preferences, and the unique attributes and objectives of the patient [6]. Preferred methods for surgically treating cleft lip defects have improved over the past century with the overarching objective of restoring soft tissue and bone abnormalities with the least amount of disruption to future craniofacial development [7]. All repairs focus on enhancing social integration, restoring function, and achieving aesthetic normalization, though specific surgical techniques and treatment plans may vary by institution and region [8]. One of the recent techniques is the lateral rectangular flap technique that aims to convert a complete cleft lip into a complete and normal lip [9]. The flap is taken from the part of lateral lip element (vermilion) in rectangular shape and expanded into medial deficient vermillion. By adjusting the position of the dry-wet vermilion and augmenting thinner medial vermilion, this technique achieves a more symmetric, functional, and esthetically pleasing lip contour [10].

In this study we evaluated the efficacy of lateral rectangular flap for augmenting medial vermilion deficiency in unilateral cleft lip repair.

2. Patients and Method:

Our study was conducted in Rizgary Teaching Hospital and several private hospitals in Erbil, northern Iraqi Kurdistan from June 2021 to June 2023. A total of 18 patients of both genders with cleft lip (unilateral, complete and incomplete, isolated cleft lip and cleft lip and palate) were included. Babies with syndromic cleft or requiring revision cleft lip were excluded. The study was approved by ethical committee of Kurdistan Board of Medical Specialties in Erbil, Iraq. Informed consent was obtained from the guardians of all participating infants.

A full medical history was obtained from the caregivers of all included patients. Routine preoperative blood tests were conducted for each patient, including hemoglobin levels, electrolyte, urea, and creatinine assessments, as well as electrocardiography. Echocardiography was performed when indicated. Babies were referred to their pediatrician for clinical evaluation to rule out cardiovascular congenital anomalies, upper respiratory tract infection, ear infection, and any other potentially significant congenital conditions. All infants were at least three months old, weighed at least 4.5 kg, and had a minimum hemoglobin concentration of 10 g/dL. Preoperative photographs were taken for all subjects prior to surgeries.

All Surgical repairs were done under general anesthesia with endotracheal intubation. The surgical approach was very similar to modified Millard technique; however, a rectangular flap was performed instead of triangular flap. The aim was to achieve better predictability and minimize vertical scar contraction, especially across the vermilion border. The surgical procedure entails advancing the outer cleft segment of the upper lip inward and rotating the inner lip segment downward, preserving both Cupid's bows and the philtrum. The tension from suturing is aligned along the vermilion border, preventing the scar from spreading outward. The surgical procedure involves creating a curved incision line on the inner lip segment from the highest point of the Cupid's bow to the base of the cleft, rotating the tissue downward from the cleft base, and performing a horizontal incision at the vermilion base of the outer cleft segment to advance it inward. Figure 1 shows the steps of the surgical repair of rectangular flap. A single dose intravenous antibiotic was administered intraoperatively, and an oral antibiotic was prescribed postoperatively for one week.

Figure 1: Steps of surgical repair of a six-month male patient presented with unilateral complete cleft lip and palate:

Preoperative (A); Marking of the flap (B); Dissection and inset of the flap (C), postoperative (D)

After surgery, parents were instructed to apply wound dressings with a topical ointment twice daily. No suture removal was necessary as the skin was sutured with 6/0 vicryl. Parents were also instructed to place tapes across upper lip wound and both cheeks. Silicone gel was prescribed for use starting in the second week post-surgery, continuing for three months. Follow-up appointments were scheduled at 1 week, 2 weeks, 1 month, 3 months, 6 months, and 1 year post-surgery, with photographs taken at each visit (Figures 2-4). Outcomes were assessed using a 3-point scale for each feature (Cupid's bow, lateral lip, and free vermillion): 2 (excellent), 1 (mild asymmetry), and 0 (unsatisfactory).

Data were collected, tabulated and analyzed using the Statistical Package of Social Sciences (SPSS, version 25). Chi-square test was employed to compare proportions, while Fisher's exact test was used when more than 20% of the cells in the table had an expected count of less than 5. A p-value of 0.05 or less was considered statistically significant.

3. Results:

The study included 18 patients (6 males and 12 females). Among them 8 patients aged 3 months, 5 patients aged 4 months and 5 patients aged 5 months. As shown in Table 1, the enrolled patients had either isolated cleft lip (44.4%) or cleft lip and palate (55.6%). Cleft side was right (38.9%) or left (61.1%). Cleft was incomplete in only 2 patients (11.1%) and complete in 16 patients (88.9.%).

Table 1: Clinical data of the enrolled patients

Cleft type No (%)	Isolated lip	8 (44.4%)
	Lip and palate	10 (55.6%)
Cleft side No (%)	Right	7 (38.9%)
	Left	11 (61.1%)
Severity No (%)	Incomplete	2 (11.1%)
	Complete	16 (88.9%)

No early complications were reported in the patients; however, 5 patients complained of scar later. Outcome evaluation score for Cubid's bow was 1 for 5 patients and 2 for 13 patients. The score for lateral vermilion deficiency was 2 for all patients (Table 2).

Table 2: Surgical outcome in the enrolled patients

Complications (early) No (%)	No		18 (100%)
	Scar		0 (0%)
Complications (late) No (%)	No		13 (72.2%)
	Scar		5 (27.8%)
Outcome evaluation score	Cubid's bow	0	0
		1	5 (27.8%)
		2	13 (72.2%)
	Lateral Vermilion deficiency	0	0
		1	0
		2	18 (100%)

No significant association was detected between patient's gender or clinical data with the cleft type.

Figure 2: Follow up of a five-month old male patients presented with unilateral complete cleft lip and palate: Preoperative (A), Postoperative (B), One week postoperative: healthy wound (C), One-month postoperative: well formed scar (D), Six month postoperative: a reasonable cubid's bow formed (E), One year postoperative: flat and matured hidden scar formed (F).

Figure (3): Follow up of a four-month old female patients presented with unilateral incomplete cleft lip and palate: Preoperative (A), Postoperative (B), One week postoperative: healthy wound (C), One-month postoperative: well formed scar (D), Six month postoperative: a reasonable cubid's bow formed (E), One year postoperative: flat and matured hidden scar formed (F).

Figure (4): Follow up of a six-month old female patient presented with unilateral complete cleft lip and palate: Preoperative (A), Postoperative (B), One week postoperative: healthy wound (C), One-month postoperative: well formed scar (D), Six month postoperative: a reasonable cubid's bow formed (E), One year postoperative: flat and matured hidden scar formed (F).

4. Discussion:

Oral cleft lip and palate are among the most common craniofacial anomalies worldwide, yet there is relatively little evidence on aesthetic results of surgical repair [11]. Repair of the unilateral cleft lip is a controversial topic which continues to evolve. The goal of unilateral cleft lip repair is to achieve a functional and cosmetically acceptable lip and nose while minimizing the cost and burden on the families of these patients [12]. The evolution of unilateral cleft lip repair has been marked by significant advancements over the years, improving both functional and aesthetic outcomes for patients. This progress started with the introduction of curved incisions and advancement flaps followed by straight line, quadrilateral flap, and triangular flap repairs, and later the rotation-advancement techniques [13]. Today, modern approaches include the modified Mohler technique and Fisher anatomic subunit approximation [14].

In the current study, we evaluated the usefulness of lateral rectangular flap for augmenting medial vermilion deficiency in unilateral cleft lip repair. The study involved 18 patients under 6 months of age who underwent lip repair. Previous reports have shown considerable variation in the age and gender of patients with cleft lip. In a study from China, females made up 61.1% of 36 patients under 6 months diagnosed with unilateral complete cleft lip and palate [15]. Meanwhile, in Taiwan, 55.6% of 72 patients with unilateral complete cleft lip and palate were females, with an average age of 12.3 months [16]. Conversely, two separate studies in the USA by Adetayo et al. and Grewal et al. reported a male predominance among their patients with unilateral cleft lip, with 56.3% and 65% of their patients being male, respectively. The ages of these patients at the time of lip repair ranged from 3 to 12 months. A similar trend was observed by Alwadeai et al. in Egypt, who reported that 60% of their patients were male [19].

In the current study, the included patients had either isolated cleft lip (44.4%) or cleft lip and palate (55.6%). Cleft was incomplete in 2 patients (11.1%) and complete in 16 patients (88.9.%). No association was found between the patient's gender or clinical data and the type of cleft. In the same context, Adetayo et al. reported that complete cleft lip and palate was the most common type of cleft deformity among the study subjects (43.8%). They also noted a higher incidence of cleft deformities on the left side (68.8%) compared to the right side [17]. Patients of the later study were divided into two groups, one group underwent cleft repair with the Tennison-Randall technique, while another group underwent cleft repair with the Millard rotation-advancement technique. In contrast, Chang et al. focused exclusively on unilateral complete cleft lip and palate, with the majority of cases affecting the left side (83.3%). Repair of the cleft lip and palate was performed using the routine rotation-advancement method along with primary rhinoplasty using a triangular vermilion flap [15]. Similarly, Pai et al. in Taiwan included patients with unilateral complete cleft lip and palate, primarily affecting the left side (69.4%). All patients in this study underwent palate repair using the two-flap method [16]. Alwadeai et al. studied only unilateral incomplete cleft lips, with most cases (80%) being left-sided. Subjects of the later study were randomly assigned to either the modified Millard or Fisher techniques for repair [19].

In this study, no early complications were reported following surgery; however, 5 patients complained of scar later. This is similar to the findings of Chang et al. who also noted no records of wound infection, bleeding, or dehiscence, a result that was corroborated by Alwadeai et al. [15,19]. In the current study, the outcome evaluation score for Cupid's bow was 1 for 5 patients and 2 for 13 patients, while the score for lateral vermilion

deficiency was 2 for all patients. Adetayo et al. reported that the Millard group demonstrated a greater postoperative increase in horizontal lip length and vertical lip height, along with a more significant reduction in nasal width and total nasal width. In contrast, the Tennison-Randall group showed better results in reducing Cupid's bow width and improving philtral height [17]. Alwadeai et al. found no statistically significant differences in vermilion symmetry or scar quality between the two cleft lip repair techniques. Notably, one patient in the modified Millard group displayed a notch on the vermilion border, though this was not statistically significant [19]. Alwadeai et al. reported no statistically significant differences in vermilion height and width among the patients. Likewise, no significant differences were observed between patients regarding scar length and width [19].

5. Conclusion:

In conclusion, although five patients developed minor scarring, the lateral rectangular flap technique proved effective in enhancing medial vermilion symmetry in unilateral cleft lip repairs for infants under six months of age, with positive aesthetic outcomes and minimal early complications. Continued study into comparative outcomes of cleft lip repair techniques remains essential for optimizing patient results.

Conflict of Interest:

The author reports no conflict of interest.

Reference

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