

Research Article

Outcomes of Fisher Technique for Unilateral Incomplete Cleft Lip Repair

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Abstract

Background:- Cleft lip repair is imperative for a child's physical and mental well-being. Fisher's innovative technique adds versatility to conventional methods with optimal aesthetic results. An inconspicuous scar along the anatomical subunits is a hallmark of this procedure.

Objective: This study aimed to evaluate the outcomes of Fisher technique for unilateral incomplete cleft lip.

Methods: This Quasi experimental study was conducted at the Plastic Surgery Department, Mayo Hospital Lahore from 2017 to 2021. 50 consecutive patients with primary unilateral incomplete cleft lip were included in the study. Qualitative analysis was performed using Steffensen Grading Criteria 9. Improvement in pre-operative and post-operative anthropometric ratios was also analyzed. Symmetry of repaired cleft to normal cleft side was also assessed 9,12.

Results: Mean age of patients was 4.14 ± 0.72 months. Parent's satisfaction score on the Likert scale was 4.84 ± 0.37 (Mean $\pm$ SD). Significant improvement in anthropometric parameters (vertical lip height, vermilion height, nostril width and nostril height) except lip width was recorded. Significant symmetry was achieved for all parameters (p-value less than 0.05) except nasal height ratio (p-value=0.071). Good results were also achieved on all parameters according to Steffensen criteria.

Conclusion: Fisher anatomical subunit repair is a reliable option for unilateral incomplete cleft lip repair producing aesthetically pleasing results.

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Introduction

Being one of the commonest disfiguring craniofacial anomalies, restoration of normal form and function in a cleft deformity is indispensable. The incidence of cleft lip and palate in Pakistan is 1 in 5231 births. Continuous refinements in

surgical approaches for cleft lip repair are largely inspired by the immense psychological impact of this deformity. Fundamental problems of Cleft lips include a vertical deficiency of lip, vermilion bulk deficiency and a lack of philtral column volume or bulk. Nasal abnormalities in cleft patients comprised nasal sill defects, dome under-projection/malrotation and alar base asymmetry. Different techniques to address all of the above have been devised but none has been declared gold standard with differing results by different surgeons incorporating their own techniques. The main goals of unilateral cleft lip



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surgery are symmetry, an inconspicuous scar within the lip anatomic subunits, an accurate white roll alignment, muscle realignment and correction of the nasal deformity.

Dating back to the first documented surgical repair of cleft lip in China in 390 A.D.², techniques for cleft lip repair have continuously evolved. All strived to lengthen the upward rotated medial lip element and bring it down. Rose and Thompson introduced a straight-line closure technique; lengthening achieved from the straight line closure of a diamond-shaped defect. Mirault inserted a quadrangular flap from alongwith the inferior aspect of the lateral lip. Tennison–Randall modified Mirault's technique interposing a triangular flap instead to bring the medial lip element downwards and lengthened it at the expense of an unaesthetically conspicuous scar traversing the philtral precincts.^{3,26}

In 1955, Ralph Millard introduced his revolutionary technique of rotation –advancement and the concept of “cut as you go” for unilateral cleft lip repair.⁴ Although this technique gained popularity, aesthetic problems seen with his original technique include a conspicuous scar that crosses the upper third of the cleft philtral column, asymmetric nostrils and lip notching.⁵ Consequently, many modifications to the original technique were conceived to mitigate imperfections.⁶

Though Millard's principles have withstood the test of time, David M. Fisher in 2005 introduced a new technique to overcome the shortcomings of Millard's repair.⁷ He devised his repair to position the scar along the anatomical subunits. This technique is basically a type of a straight-line repair incorporating preceding principles; lengthening achieved by Rose-Thompson effect and a triangular flap to fill in the defect created by a back cut for downward rotation of the Cupid's bow. Although this hybrid approach has gained popularity, the outcomes of this technique have not been widely published and studies comparing Fisher's with the Millard technique are meagre and exiguous.^{9,19,22} The rationale for this study was to analyze the quantitative and qualitative outcomes of Fisher's technique for unilateral cleft lip repair.

Methods

After institutional board review (290/RC/KEMU), this Quasi-experimental study was conducted at Burn Reconstructive & Plastic Surgery Department, Mayo Hospital Lahore from 2017 to 2021. Primary unilateral cleft lip patients; 3 months to 18 years of age were inclu-

ded in this study. All the patients participating in this study were non-syndromic. Consecutive sampling technique was used. Sample size of 50 patients was calculated with 90% confidence level and 6.5% absolute precision. The procedure and postoperative follow up were explained to patients' parents and informed consent was taken. Demographic details, history and clinical examination were recorded. Preoperative and postoperative photographs were taken for comparison.

Under general anesthesia, marking for Fisher anatomical subunit repair was made as shown in figure 17. Dissection was carried out to release the abnormal attachments of orbicularis oris muscle from the alar base, collumellar base and maxilla in the extra periosteal plane. Lateral crus of lower lateral cartilage were released from pyriform aperture to allow antero-medial advancement of the alar base. The triangle base and length of the back cut was determined using Rose Thompson effect and varied from 1 mm to 2 mm. Orbicularis oris muscle was repaired by overlapping sutures to create a prominent philtral ridge. A Nordhoff triangular flap from the lateral lip was planned to prevent notching.

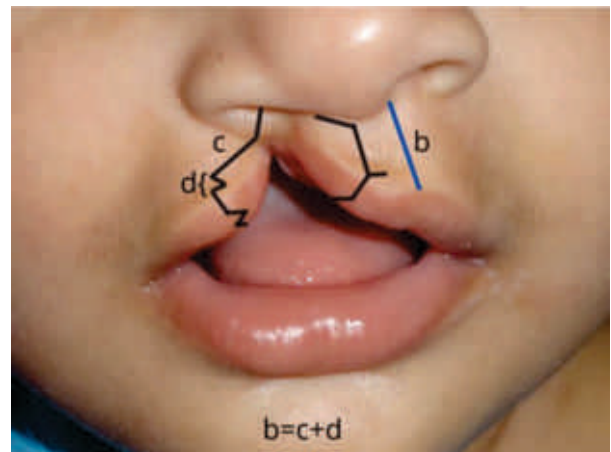


Figure 1. Figure illustrating the marking of Fisher technique for unilateral incomplete cleft lip

The muscle was approximated with vicryl 4/0, while vicryl 5/0 was used for dermal closure. Mucosa and vermilion were sutured with vicryl 5/0. Epidermal closure was achieved with prolene 6/0. Primary nasal by closed technique was done. Depending on the severity, the Tajima suspension suture, alar cinch suture and alar transfixation suture were used for nasal correction. Moreover, wedge resection of nasal sill as described in the original Fisher technique was also employed. However, tip plasty was not performed. Post operatively, surgical adhesives tapes (Steristrips™) were applied.

Epidermal sutures were removed on 7th postoperative day under sedation. Surgical adhesive tapes (Steristrips TM) applied thereafter for 2 weeks. Massage and silicone sheet application were advised two weeks after the operation. The patients were advised a follow up and photographs taken. Assessments were done at 2 week and 6 month follow up.

At each follow up, both qualitative and quantitative assessments were made using photographs to compare pre and post-operative variables. Given the age of the actual infant subjects, recording differences in millimeters was difficult. Photographic software (Adobe Photoshop CS6) was used for quantitative comparison of pre and post-operative pictures in millimeters. Objective assessment was done by anthropometric parameters as described by Rossell-Perry; vertical lip height, lip width, vermilion height, nostril width and nostril height were noted.⁸ Improvement in pre-operative and post-operative parameters was statistically analyzed using SPSS (version 25). A ratio of cleft to non-cleft side was used as a quantitative measure for standardization of outcome in every patient. To analyze the symmetry, ratios of repaired cleft side to non-cleft side were calculated and compared with ideal standard ratio of 1.009,19. A ratio of 1.00 is considered to be perfect in an ideal symmetrical face as anthropometric parameters must be same for both sides of face. Qualitative analysis was performed using Steffensen criteria.^{9,10} Scar placement within the anatomical subunits was also reviewed including cutaneous roll symmetry, vermilion symmetry scar appearance, Cupid's bow symmetry, lip length, nostril symmetry, alar dome and alar base symmetry. A consultant plastic surgeon who was not involved in the surgery was assigned to assess the outcome using photographs. The Likert scale was employed to gauge parent's satisfaction.

Results

Mean age of the patients in this study was 4.14 ± 0.72 months. Among the patients 30(60%) were male and 20(40%) were female. Thirty one(62%) patients had left unilateral incomplete cleft and nineteen(38%) patients had right unilateral cleft. According to Likert score scale, parent's satisfaction for resultant scar was reported as 4.84 ± 0.37 (Mean $\pm$ SD).

As depicted in Table 1, all anthropometric parameters showed significant improvements postoperatively except lip width. This leads to infer that anatomical subunit technique for cleft lip repair provides significant

Table 1: Quantitative analysis of pre and post-operative anthropometric analysis of Fisher technique for unilateral incomplete cleft lip repair

	Preoperative (a)	Postoperative (b)	Difference (b-a)	p-value*
N	50	50	50	
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	
Vertical lip height	0.657 $\pm$ 0.16	1.015 $\pm$ 0.045	0.357 $\pm$ 0.16	<0.001
Lip width	0.948 $\pm$ 0.07	0.966 $\pm$ 0.049	0.017 $\pm$ 0.10	0.237
Vermilion height	0.882 $\pm$ 0.06	1.010 $\pm$ 0.028	0.128 $\pm$ 0.07	<0.001
Nostril width	1.339 $\pm$ 0.17	1.022 $\pm$ 0.067	-0.317 $\pm$ 0.17	<0.001
Nostril height	0.778 $\pm$ 0.08	0.977 $\pm$ 0.086	0.199 $\pm$ 0.09	<0.001

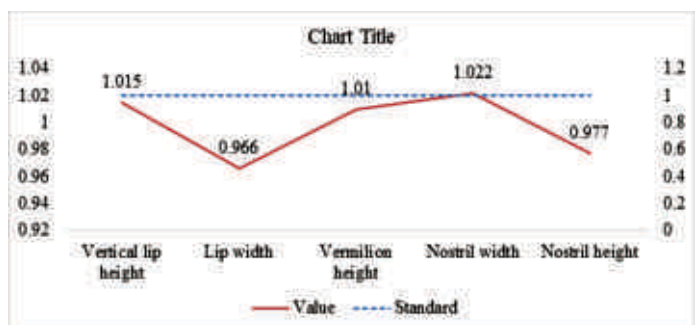
Note: * Paired Sample t-test

improvements in vertical lip height, vermilion height, nostril width and nostril height.

Table 2: Postoperative anthropometric analysis with Standard

	Comparison with Ideal value	Mean $\pm$ SD	p-value
Vertical lip height	1.00	1.015 $\pm$ 0.045	0.024
Lip width	1.00	0.966 $\pm$ 0.049	<0.001
Vermilion height	1.00	1.010 $\pm$ 0.028	0.015
Nostril width	1.00	1.022 $\pm$ 0.067	0.023
Nostril height	1.00	0.977 $\pm$ 0.086	0.071

Note: * One Sample t-test, Test value=1. The perfect standard value is 1.009.



Graph-1: Graph-1 shows the anthropometric values comparison with the standard value. Only lip width and nostril height was below 1.

Statistical analysis showed significant symmetry for all parameters measured except nostril height. This obviates the need for adding of nasal suspension

sutures after dissection of the nasal tip to improve nasal symmetry. Additionally, this technique results in a slightly longer lip (1.015 ± 0.045). Table 2 and graph 1 illustrated this analysis.

Table-3 shows assessment of patients as per Steffensen

Table 3: Qualitative analysis of anatomical subunit technique of unilateral cleft lip repair (n=50)

Sn	Steffensen Criteria	Response	n	%
1	White roll symmetry	Average	3	6%
		Good	46	92%
		Poor	1	2%
2	Vermilion symmetry	Average	4	8%
		Good	43	86%
		Poor	3	6%
3	Scar appearance	Average	3	6%
		Good	46	92%
		Poor	1	2%
4	Cupid bow symmetry	Average	6	12%
		Good	42	84%
		Poor	2	4%
5	Lip length	Average	6	12%
		Good	42	84%
		Poor	2	4%
6	Nostril symmetry	Average	9	18%
		Good	39	78%
		Poor	2	4%
7	Alar dome symmetry	Average	19	38%
		Good	30	60%
		Poor	1	2%
8	Alar base symmetry	Average	14	28%
		Good	34	68%
		Poor	2	4%

criteria. As per this criterion, good results were achieved for all variables measured. The best results were seen for white roll symmetry, vermilion symmetry, scar appearance, Cupid's bow symmetry and lip length whereas alar dome and base symmetry had lesser scores.

Discussion

David Fisher, in 2005, introduced the principle of anatomical subunit approximation to achieve the "ideal line of repair". Millard's breakthrough concept of rotation advancement for cleft lip repair had pitfalls that were

(1) a scar under the base of collumella (2) notching of vermilion (3) alar base malpositioning with lack of curved contour (4) Scarring and narrowing of nasal sill¹¹. Consequently, Fisher incorporated "Rose-Thompson effect" with a triangle above the white roll for lengthening of the medial lip and augmenting the vermilion with Nordhoff's flap. This idea evolved into the revolutionary new approach of anatomical subunit approximation for cleft lip repair.⁷

Though the Fisher method of cleft lip repair has been around for a while, not many studies have been published to analyze the technique. Raymond Tse et al published 100 Consecutive Case series using Anatomical Subunit Approximation with its modifications and analysis of early results.¹² The study ratifies the improvements in anthropometric measures and favorable early results with the Fisher technique. It emphasizes the applicability of this technique in all cleft types and its low learning curve. Mbuyi-Musanzayi et al. analyzed the outcomes of the Fisher technique in 101 cases and found it to lengthen the medial lip and produce a pleasing scar.¹³ Hui Young Kim et al in his article exhorted on the effectiveness of this technique for aesthetic results with good symmetry.¹⁴ Samira Ajmal et al provided subjective analysis of improvement in vertical height discrepancy, nostril size and alar base height with this repair¹⁵. A comparative study of the Fisher anatomical Subunit and Modified Millard Rotation-Advancement cleft lip repair by Terral A. Patel showed that although outcomes do not differ significantly between the two surgical techniques, results of the Fisher technique are less dependent on the severity of the cleft lip.⁹ Mohamed A et al advocates the superior results of Fisher's technique in comparison with Millard's repair.¹⁶ Hoffman D not only worked out a comparison of Fisher and Millard but also suggested modifications of Fisher technique to further enhanced its results.^{17,18} These studies report the anatomical subunit approximation technique to be a reliable method for cleft lip repair with a natural scar along the philtral column.

Our study provides both quantitative and qualitative evidence of good results with Fisher technique for incomplete cleft lip repair. Though incomplete cleft lip is considered to be of lesser severity than a complete cleft lip, it requires considerable skill to produce an aesthetic scar. Additionally, prior studies cite Fisher's method to have favorable outcomes irrespective of the severity of the cleft, compared to Millard's original

method and its variations. The fisher repair with its resultant scar is planned as a mirror image of the opposite philtral column. Fisher's mantra of "measure twice, cut once" provides a calculated improvement in anthropometric parameters proven objectively in our study. "Delineating an ideal line of Repair" is an essential element of this novel technique allowing the scar to lie within the anatomical subunits.¹⁹ Scar appearance is good in 96% of patients with excellent patient parent's satisfaction (4.86 ± 0.36). White roll alignment, Cupid's bow symmetry and vermilion symmetry were good in the majority of cases.²⁰ Figure 2-5 shows the representative cases. Addition of a triangle above the white roll provides adequate white roll alignment and increase in medial lip height.^{21,22} Preservation of lateral lip vertical and transverse height is made possible with fixed a Nordhoff point and calculated triangulation with calipers. Additionally a diamond shaped excision and a well-measured inferior triangle rarely result in under-rotation.



Figure 2:- A 3-month old male presented with right sided incomplete (minor form) cleft lip with moderate nasal deformity (A) pre-operative frontal view (B) Pre-operative basal view. Fisher anatomical subunit repair was done. Five-year follow up showing good lip and nasal symmetry. The resultant scar is fine and lie within the anatomical subunits (C) post-operative frontal view (D) Post-operative basal view.



Figure 3:- (A) Four-months-old male having incomplete (minor form) right sided cleft lip (B) Immediate post-operative view (C) 6 months follow up showing good lip and nasal symmetry.

postoperative after Fisher cleft lip repair (C) 6 month follow up showing satisfactory lip and nasal symmetry

Achievable goals of primary rhinoplasty in the originally described Fisher method are symmetrical nostril size, centralization of collumellar base, release of aberrant attachment of orbicularis oris from the lower lateral cartilages and the pyriform aperture, advancement of cleft side lateral crus and repositioning of alar bases without dissection in nasal tip area. However in our study, to achieve good nasal symmetry, excision of a nasal sill wedge combined with Tajima suspension sutures was also employed.²³ Consequently we achieved statistically significant improvement in nasal anthropometric measurements.²⁴ In contrast to the rotation-advancement technique, Fisher's method avoids a scar along alar base and columella. Additionally, anteromedial advancement and rotation of alar base preserves the natural alar contour.²⁵



Figure 4:- (A) 4 months old female presented with left sided minor form cleft lip and moderate nose deformity (B) 6 month follow up showing good symmetry (C) 5 year follow up with symmetrical lip and inconspicuous scar.



Figure 5:- (A) A 3 months old female with left sided minor form cleft lip (B). Intra-operative marking for cleft lip repair with fisher's technique (C) Per-op picture after skin closure (D) 6 months follow up having slight longer lip.

To summarize, eminent features of the Fisher's anatomical subunit repair include an acceptable scar within the anatomical sub units of nose and lip, better alignment of the vermilion cutaneous roll, adequate lengthening of the vertical and transverse lip height and a natural alar base contour curve. We found the Anatomical subunit Approximation to be a reliable alternative to the rotation advancement with an added benefit of a scar along the philtral column and dynamic symmetry.

Certain limitations of this study were a small sample size, being a single center study and included only unilateral cleft lip in our study. Standard aesthetic ratios using cleft and non-cleft side were used to minimize any bias. Future studies aim to compare anthropometrics with the Millard's repair.

Conclusion

Fisher's Anatomical subunit approximation technique has reliable and favorable results for cleft lip repair. Natural appearance of resultant scar makes this technique an acceptable alternative to conventional rotation advancement technique especially for incomplete cleft lip.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest.

Funding Source: None

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