ORIGINAL ARTICLE

Aesthetic Outcome of Unilateral Cleft Lip Repair by Utilizing Three Techniques Fisher, Millard and Tennison Meta-Analysis

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Abstract

Background: ***Cleft lip is a frequent birth defect affecting the face that affects around one in seven hundred live births. When the maxillary prominence fails to fuse with the medial nasal prominence, a unilateral cleft lip develops.***

Aim: ***To compare the Fisher with the Millard technique and Tennison technique in unilateral cleft lip regarding symmetry between cleft and non-cleft side (cutaneous roll, vermilion, cupid bow, and nostril), lip height and width, and scar appearance.***

Subjects and methods: ***This randomized controlled trial study was conducted, encompassing a search encompassing recent clinical trials, cohort trials, as well as prospective and retrospective comparative cohort studies.***

Results: ***According to the results, a random effects model was used to analyze data from 14 studies, including 293 people. With a p-value less than 0.05, the test for total effect shows statistical significance. The range of preoperative lip heights was 0.65 cm to 1.30 cm, with 1.09 cm being the median. The range of postoperative lip heights was 1.02 cm to 1.76 cm, with 1.50 cm being the median. The research was conducted using an inverse variance random model to assess the breadth of the lips before and after surgery. The minimum preoperative lip width was represents 0.89cm and maximum 2.09cm, with median 1.02cm. The minimum postoperative lip width was represents 0.96cm and maximum 2.34cm, with median 1.31cm.***

Conclusion: ***There is no correlation between the anatomical variation in cleft width and height and the diversity of cleft defects that can be treated by Fisher's incision. In cases of unilateral cleft lip repair, Fisher's incision proved to be the most effective surgical and cosmetic method.***

Keywords: Aesthetic outcome; Fisher; Millard; Tennison meta-analysis

1. Introduction

Genetic and environmental factors both play a role in the development of cleft lip.[1] On one side, the upper lip reaches the vermilion border's free edge; on the other, it stretches from the nose's base to the nasolabial folds. Beginning at the superior free vermilion border and extending laterally to the commissures, the lower lip is finally inferior to the mandible. Each lip has anatomical layers that go from the surface all the way down to the mucosa and orbicularis oris muscle fibers in the lower lip and subcutaneous tissue in the upper lip. As they wind their way between the orbicularis muscle fibers and the mucosa, the superior and inferior labial arteries can be seen in cross-section.[2]

The best method for correcting a unilateral cleft lip is subjective and depends on the cleft lip surgeon. Typically, it's a combination of both practical instruction and creative thinking. While this is somewhat correct, it is important to adhere to the established standards for cleft lip restoration.[3]

A patient's psychological well-being, sense of self, and quality of interpersonal connections have all been linked to the cosmetic outcome of cleft lip surgery.[4]

The ideal method would adhere to the notion of aligning scars along anatomical subunits, be adaptable to a broad range of severity levels, and reduce variances caused by the surgeon's skill and experience.[5]

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Over the last hundred years, cleft-lip repair has undergone both radical transformation and incremental technological improvement, ultimately culminating in its current state.[6]

The aim of this study was to compare Fisher sub-unit repair with Millard technique and Tennison technique in unilateral cleft lip regarding symmetry between cleft and non-cleft side(cutaneous roll, vermilion, cupid bow, and nostril), lip height and width, and scar appearance.

2. Patients and methods

This RCT was based on a systematic review that included all available clinical trials, cohort trials, prospective studies, and retrospective studies comparing cohorts. To ensure a thorough selection procedure, the search results were processed using the PRISMA flowchart, which incorporates predetermined inclusion/exclusion criteria. A research committee at Cairo's Al-Azhar University's Faculty of Medicine gave its clearance to this study.

Search question:

Can we compare three different techniques (Fisher, Millard, Tennison) in unilateral cleft lip repair?

Databases:

We systematically searched PubMed, MEDLINE, Science Direct, Scopus, web of science and Google Scholar databases for relevant articles using the following search terms:(("unilateral cleft Lip" or "cleft lip, unilateral" or "orofacial cleft") and ("Fisher Technique" or "Millard Technique" or "Tennison Technique")) and ("comparative study" or "comparative evaluation" or "comparative analysis"), (("surgical procedures, operative" or "surgical flaps" or "cleft lip/surgery") and ("Fisher Technique" or "Millard Technique" or "Tennison Technique")) and ("comparative study" or "comparative evaluation" or "comparative analysis").

Inclusion criteria:

Studies that include non-syndromic unilateral cleft lip with Fisher, Millard, or Tennison techniques, published from January 2019 to December 2023, studies comparing perioperative and postoperative outcomes between the techniques, and studies with English language.

Exclusion criteria:

Non-English languages, duplicates, studies without clinical outcomes, case reports, editorials, research involving three patients, textbooks, and abstracts from published oral or poster conferences.

Study Selection:

The title and abstract of the study were the main criteria for inclusion or exclusion. Using the PRISMA standards for systematic reviews and meta-analyses, data were extracted systematically and saved in EndNote by Clarivate and Mendeley by Scopus. In a meta-analysis using a random-effects model, summary measures were combined.

Outcome measures:

Criteria of the participants, including: number of cases, age, gender, and operation

Data extraction:

The PRISMA criteria were followed during the systematic data extraction process. The framework of the systematic review included the aggregated summary measures. Data extraction from the included studies was done with great care, and the whole procedure followed a uniform Excel sheet. First, summary features of the included studies; second, baseline features of the populations examined; and third, study outcomes were the essential areas that comprised the extracted data.

Data analysis:

For the statistical analyses, we used STATA version 16.0 (Stata Corp LLC, College Station, TX 77845, USA) and Open Meta Analyst (AHRQ, CEBM; Brown University, USA). In the end, we used the Der-Simonian Liard technique with a random-effects model. 7 Risk ratios (RR) with 95% CIs and weighted proportions were calculated from the combined data, which were all binary (events or no events). Both mathematical and visual methods were used to analyze publication bias. Egger's regression test, Begg's test, and Duval's non-parametric trim-and-fill analysis were utilized for the latter.[8]

3. Results

The database search turned up 1,302 publications in PubMed, MEDLINE, Science Direct, Scopus, and Google Scholar. Eight items were found to meet the qualifying criteria after 419 were screened and duplicated. We narrowed the articles for our systematic review down to eight based on the results they presented.

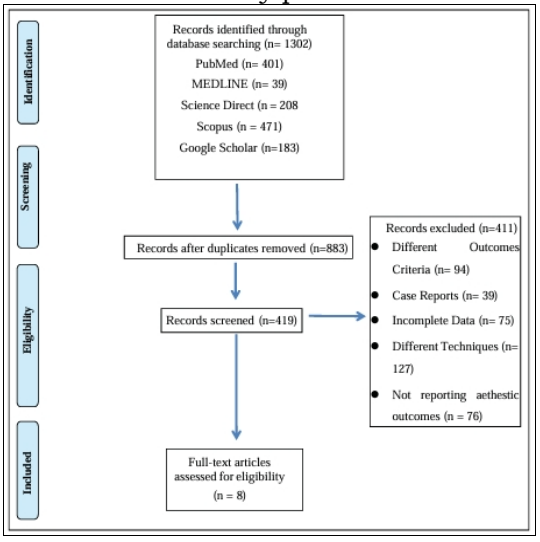

Figure 1. PRISMA 2020 flowchart of the article selection process.

Table 1. Characteristics of the included studies.

AUTHOR	YEAR	STUDY DESIGN	NO. OF CASES	TECHNIQUES	OUTCOMES
SAYED ET AL.[9]	2023	Prospective cohort randomized controlled trial	40	Tennison-Randall modified and Millard rotation-advancement method	NO MAIN CHANGE IN THE GENERAL CONSEQUENCES AMID THE TENNISON-RANDALL AND MILLARD ROTATION ADVANCEMENT REPAIRS.
GABER ET AL.[10]	2023	Prospective, randomized Controlled	30	Mohler & Fisher technique	FISHER TECHNIQUE WAS MORE FAVORABLE THAN MOHLER TECHNIQUE WITH BETTER COSMETIC OUTCOMES.
MANISHAA AND PANDURANGAN[11]	2023	Prospective	30	Millard rotational advancement versus Fisher's technique	FISHER ANATOMICAL SUBUNIT APPROXIMATION TECHNIQUE IN UNILATERAL CLEFT LIP REPAIR FOR ITS SUPERIOR RESULTS OVER THE MILLARD TECHNIQUE
SAEED ET AL.[12]	2023	Experimental Study	50	Fisher technique	FISHER ANATOMICAL SUBUNIT REPAIR IS A RELIABLE OPTION FOR UNILATERAL INCOMPLETE CLEFT LIP REPAIR PRODUCING AESTHETICALLY PLEASING RESULTS.
MISHRA ET AL.[13]	2022	Comparative study	40	Tennison-Randall versus Millard rotation advancement technique	NO MAJOR DIFFERENCE IN THE OVERALL RESULTS BETWEEN MILLARD ROTATION-ADVANCEMENT AND TENNISON-RANDALL REPAIRS
SHAH ET AL.[14]	2022	Prospective Randomized Clinical Trial study	56	Fisher's technique and Millard's Rotational Advancement Flap	FISHER'S SURGICAL METHOD IN UNILATERAL CLEFT LIP REPAIR SINCE IT PRODUCES BETTER OUTCOMES THAN THE MILLARD'S PROCEDURE
EL-MAGHRABY ET AL.[15]	2021	Prospective	40	Fisher and Millard technique	FISHER TECHNIQUE IN UNILATERAL CLEFT LIP REPAIR FOR ITS SUPERIOR RESULTS OVER THE MILLARD TECHNIQUE.
PATEL AND PATEL[17]	2019	CLINICAL STUDY	24	FISHER VERSUS MILLARD	FISHER SHOWED BETTER AESTHETIC OUTCOMES

Table 1 provide full details about the characteristics of the included study, in addition to study design, no. of cases, techniques and outcomes. Regarding the included studies, our search eligibility criteria was depending on comparing three different techniques and provide the best outcomes according; parents satisfaction, healing rates and aesthetic outcomes.

Risk of Bias:

The selected studies had a low probability of bias according to NOS criteria.

Meta-Analysis:

Among the included studies; 2-studies included Tennison technique, 6-studies included Fisher technique and 6-studies included Millard technique. Tennison technique included (Sayed et al.,[9] and Mishra et al.,[13]. Fisher technique included (Manishaa and Pandurangan[11] Shah et al.,[14] El-Maghraby et al.,[15] Patel and Patel,[16] Saeed et al.,[12] Gaber et al.,[10] with exclusion cases of Mohler technique). Millard technique included (Manishaa and Pandurangan[11] Shah et al.,[14] El-Maghraby et al.,[15] Patel and Patel,[16] Sayed et al.,[9] Mishra et al.,[13].

Demographic Data:

Regarding 2-studies included Tennison technique, 6-studies included Fisher technique and 6-studies included Millard technique. Based on the analysis performed random effects model with inverse variance method to compare the raw means (MRAW), there is a non-significance statistical difference.

Male and Female (Fisher, Tennison and Millard Technique):

There were a total of 293 subjects in the experimental group and 293 people in the control group across the 14 studies that were included. There is a statistical difference in the outcomes of the inquiry when comparing the risk ratio utilizing the random effects model with the Mantel-Haenszel method. The summary risk ratio is 1.53, with a 95% confidence interval of 1.25-1.88. A p-value less than 0.05 indicates statistical significance in the test for overall effect.

Laterality Right and Left (Fisher, Tennison and Millard Technique):

Out of the 14 trials, 293 patients from the right cohort and 293 subjects from the left cohort were used for analysis. There is a statistical difference, with a summary risk ratio of 0.75 and a 95% confidence range of 0.57-0.98, according to the inquiry results using the random effects model using the Mantel-Haenszel method to compare the risk ratio. The results of the overall effect analysis show a p-value that is less than 0.05. Inconsistent effects in size and/or direction were indicated by the considerable heterogeneity (p=0.01). Rather than being due to chance alone, heterogeneity accounts for 56% of the variation among cohorts, according to an I2-value of.

Complete Extent and Incomplete Extent (Fisher, Tennison and Millard Technique):

Out of the 14 trials that were considered, 293 patients were part of the complete cohort and 293 subjects were part of the incomplete cohort. Overall, the risk ratio is 1.17 (95% CI: 0.74-1.86),

and there is no statistically significant difference between the two cohorts, according to the analysis that was conducted using a random effects model with the Mantel-Haenszel method to compare the risk ratio. There is no significant effect, according to the test for overall effect. Varying effects in extent and/or direction were suggested by the considerable heterogeneity that was identified ($p<0.01$). Rather than random chance, heterogeneity accounts for 76% of the variation among trials, according to An-I2.

Steffensen's criteria (Fisher, Tennison and Millard Technique) lip height:

A total of 293 subjects were analyzed in 14 studies using a random effects model to compare lip height before and after surgery. The results showed a statistical difference when comparing the risk ratio (RR), with a summarized RR of 1.24 and a 95% confidence interval of 1.19-1.29. With a p-value less than 0.05, the test for total effect shows statistical significance. The results showed a notable lack of consistency ($p<0.01$), suggesting that the impacts can vary in both magnitude and direction. An I2-value of indicates that heterogeneity, and not random chance, accounts for 73% of the variation between the groups. The range of preoperative lip heights was 0.65 cm to 1.30 cm, with 1.09 cm being the median. The range of postoperative lip heights was 1.02 cm to 1.76 cm, with 1.50 cm being the median.

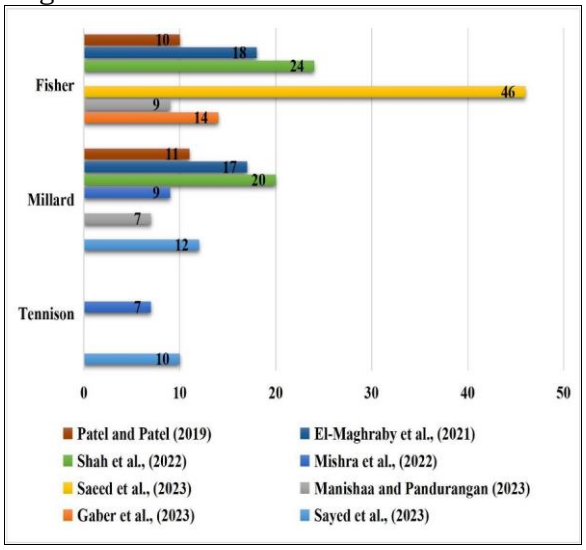

Figure 2. Symmetrical Cutenous Roll of the included 3-techniques. The number of patients per each study regarding Tennison, Millard and Fisher techniques.

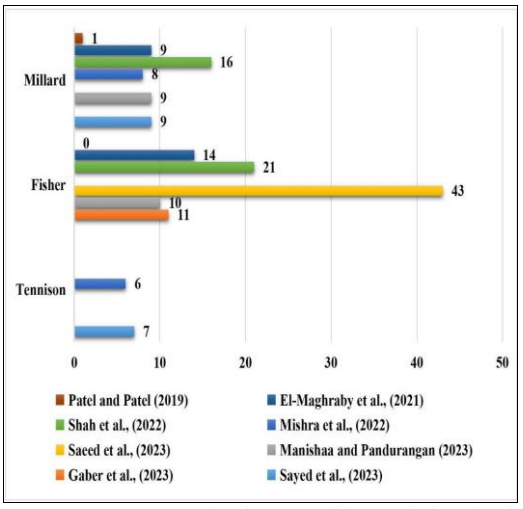

Figure 3. Symmetrical Vermilion of the included 3-techniques. The number of patients per each study regarding Tennison, Millard and Fisher techniques.

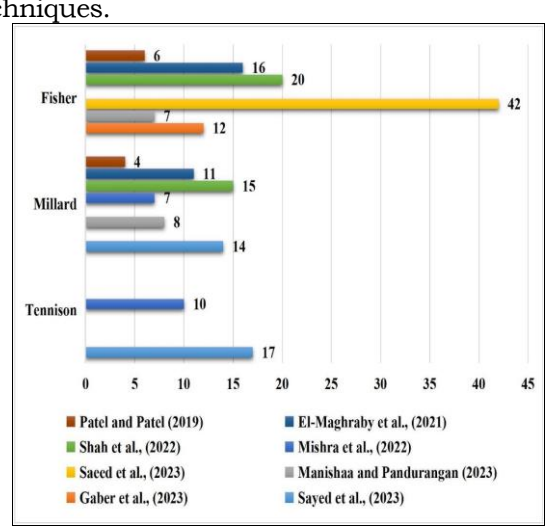

Figure 4. Symmetrical cupid bow of the included 3-techniques. The number of patients per each study regarding Tennison, Millard and Fisher techniques.

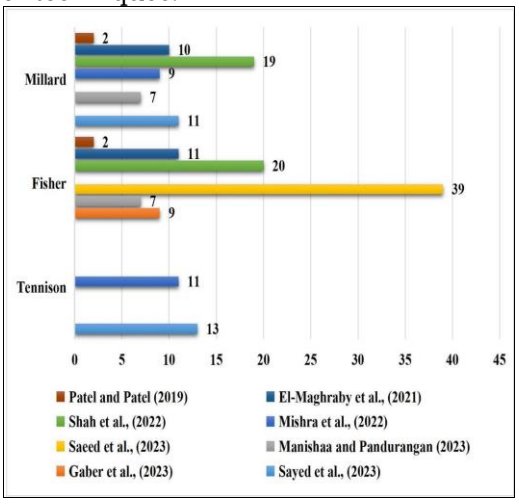

Figure 5. Symmetrical nostril of the included 3-techniques. The number of patients per each study regarding Tennison, Millard and Fisher technique.

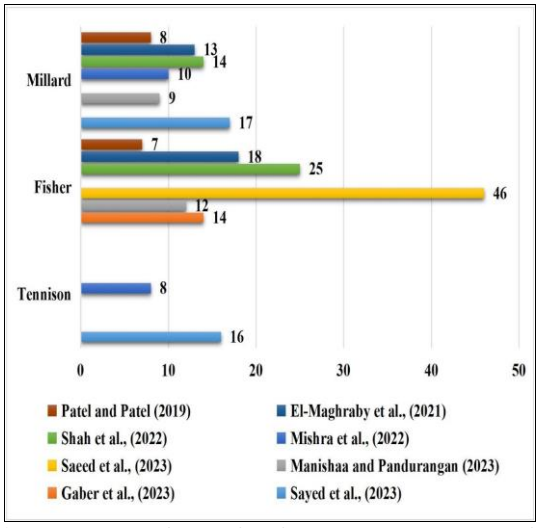

Figure 6. Good result of Scar appearance of the included 3-techniques. The number of patients per each study regarding Tennison, Millard and Fisher techniques.

Case presentation:

A boy who was four months old showed up with a cleft lip that was only on one side. Both the pre- and post-operative images show the results of the Millard rotation advancement procedure.

Figure 7. a): Pre-operative Millard marking of complete

unilateral cleft lip on left side, b): two-months post-operative.

4. Discussion

Babies with cleft lip, a prevalent congenital defect affecting the craniofacial region, sometimes struggle to open their mouths at birth. Due to the difficulty in obtaining satisfactory outcomes, numerous different approaches have been developed throughout time, yet none of them have emerged as clearly superior. Given that the method for approximating anatomical subunits has been described.[17]

El-Maghraby et al.,[15] found no statistically significant variation in the anthropometric parameters of vermilion height, alar base length, lip width, and lip height when comparing the two methods of unilateral cleft lip repair. Using Steffensen grading criteria, we found that the Fisher group outperformed the Millard group, particularly with regard to the scar appearance. This is because the scar on the nose in the Fisher group is contained within the cleft-side nostril sill, which respects the anatomical subunits of the lip and nose (cleft side column). Patients were selected at random for each procedure, and the study included participants of varying ages, so the results may be representative of the actual world. Photos were taken from both the frontal and submental perspectives at each 6-month and weekly postoperative follow-up appointments.

Sayed et al.,[9] concern the contentment of patients. The majority of patients were said to be extremely satisfied, with 60% in group M and 85% in group T. In the end, the Tennison-Randall and Millard rotation advancement repairs produced quite similar outcomes. Considering the advantages and disadvantages of both techniques, it is possible to employ either one for unilateral clefts. This study presents the results of a randomized controlled experiment in which all patients had their images taken before and after surgery. With only three months of postoperative follow-up time, it is not possible to assess the scar's visual impact.

Gaber et al.,[10] There is no statistically significant difference between the Fisher and Mohler groups, but the former had more favorable outcomes. Results reveal that the Fisher group had a lower rate of bad outcomes compared to the Mohler group, although the difference is not statistically significant. The data from Mohler's work is not incorporated into this analysis because it is not part of the comparison between Fisher and Mohler in this paper.

Manisha and Pandurangan,[11] Fisher's method was shown to be superior to Millard's method when the two groups were compared using Steffensen grading criteria. Results for alar dome, nasal symmetry, and lip length were comparable between the two sets of participants. Nonetheless, according to Fisher's method, the vermilion roll symmetry, white roll symmetry, scar appearance, and cupid bow were the best. For a more objective picture of the study's outcome, we can look at the patient distribution according to demographic data, cleft size, and surgical procedure.

Patel and Patel,[16] Regarding cases when the cleft lip is not completely repaired, there was a noticeable imbalance in vermilion height when using the rotation-advancement technique, but no such findings when using the anatomical subunit method. Statistically significant asymmetry was found in the rotation advancement repair for repairs involving a complete cleft lip in terms of vermilion height and alar base, as well as in lip height for the anatomical subunit method.

The lead author had three years of experience and was trained in the Millard technique; all of the cases in this study were performed by the same surgeon. In contrast, the cases involving the Fisher approach were the first ten repairs that the surgeon had performed later in her career. Thus, another cause of prejudice is the disparity in experience in surgical procedures.

Saeed et al.,[12] With the exception of nose height, all parameters were successfully repaired using the Fisher anatomical subunit approximation technique, which yielded dependable and favorable outcomes for incomplete cleft lip repair. Additionally, all parameters met the requirements set out by Steffensen, indicating good outcomes.

In order to reduce bias, this study utilized typical aesthetic ratios on both the cleft and non-cleft sides, and it included 50 patients. However, it is important to note that this study only included patients with partial unilateral cleft lip.

Mishra et al.,[13] Nasal width on the non-cleft side and cleft side nasal length before and after surgery did differ significantly in the Tennison group. Following surgery, the non-cleft side of the nose widens while the cleft side narrows. Millard repair resulted in a postoperative vertical lip height of 17.9–15.8 mm=2.1 mm between the cleft and non-cleft sides. Similarly, 2.5 mm was the average difference between the cleft and non-cleft sides of the lips after surgery. On the other hand, a 0.2 mm gap was seen between the non-cleft and cleft sides of the nose after surgery.

Following surgery, total nasal width differed significantly between Millard and control, Tennison, and Millard alone, but not between the two groups. For the main repair of the unilateral cleft lip, when performed by an experienced and competent plastic surgeon, there was no statistically significant difference between the modified Millard's rotation advancement technique and Randall-Tennison's Triangular flap approach.

Fifty patients (twenty in each group) with age-matched controls were evaluated quantitatively and qualitatively, including scar appearance, symmetry between cleft and non-cleft lips, and more. However, this report solely included cases of complete unilateral cleft lip.

Shah et al.,[14] In regard to alar dome, nasal symmetry, and lip length, the results from both the Fisher and Millard procedures were identical. Alternatively, when comparing the vermilion roll symmetry, white roll symmetry, scar appearance, and cupid bow, Fisher's method was clearly the best. Complete and partial cleft lip did not provide significantly different results.

The 56 patients included in the trial were divided into two groups, with a brief follow-up duration of only one month following surgery.

4. Conclusion

The incision made by Fisher might accommodate several forms of cleft lip repairs. The height and breadth of each cleft lip deformity are unique. There is no correlation between the anatomical variation in cleft width and height and the diversity of cleft defects that can be treated by Fisher's incision. Reason being, the lip can be rotated and elongated exactly where it's needed because of the incision's design. With this incision, any type of cleft can be addressed. A comparison of Fisher's incision with Millard and Tennison incisions reveals that it is not superior in the alar dome and alar base. In cases of unilateral cleft lip repair, Fisher's incision proved to be the most effective surgical and cosmetic method.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

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