ORIGINAL ARTICLE

COMPARISON OF OUTCOMES BETWEEN LINEAR VERSUS TRIANGULAR FLAP REPAIR TECHNIQUES AT VERMILION IN UNILATERAL CLEFT LIP REPAIR

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Background: Surgery for unilateral cleft lip repair has evolved over centuries. Many studies give detailed inside to this process of evolution of various techniques and their modifications. Objectives were to compare linear repair of Millard rotation advancement technique and triangular flap technique of Nordhoff, at vermilion in unilateral cleft lip repair. **Methods:** This cross-sectional analytical study was conducted at Departments of Plastic Surgery, Services Institute of Medical Sciences, and WAPDA Teaching Hospital Complex, Lahore form Jan 2004 to Dec 2011. Patients presenting with unilateral cleft lip deformity were included in the study. In the early part of the study (2004–2008), only Millard linear repair at vermilion was the routine practice. Last consecutive 40 cases repaired with this technique during this period were selected for the study. From 2009 to 2011 the unilateral cases were operated with Nordhoff triangular flap repair. A group of 40 consecutive cases repaired with this technique was also selected for the study. In both groups, the postoperative period exceeded one year. Results were compared for the presence of notch on repaired vermilion area. **Results:** Notch was absent in 29 cases (72%) treated with Millard Technique whereas Noordhoff Technique Group showed a higher number of 34 cases (85%). On other extreme, a notch of more than 1 mm was evident in two cases (5%) of Millard technique only and Noordhoff technique did not show this wide notch at vermilion. Similarly, two subgroups of 0.5 mm notch and 0.5–1 mm notch had a slightly higher number of cases in group dealt with Millard technique (5 and 4 cases respectively) as compared to cases dealt by Noordhoff technique (3 cases in each subgroup). **Conclusion:** Nordhoff triangular flap repair at vermilion reduces the chances of notching to minimum due to break in the linear repair in vermilion and also helps in reconstructing a symmetrical vermilion by bringing in the vermilion from lateral to medial segment.

Keywords: Flap repair, cleft lip, congenital

INTRODUCTION

Techniques for unilateral cleft lip repair have evolved over centuries. Many studies give detailed inside to this process of evolution of various techniques and their modifications.[1,2] Before the rotation and advancement technique, proposed by Millard in 1955, straight line and geometrical techniques of lip repair were being commonly utilized.[3] Millard rotation advancement method of repair with and without its various modifications is quite frequently used worldwide for unilateral cleft lip repair.[4]

Whereas Millard technique was revolutionary and success of technique was mainly in camouflaging the incisions along subunits of the lip, it had one setback as well. Like many of other techniques it also recommends straight line closure at vermilion which results in linear scar and a depression at vermilion on both sides of the scar as well as break in the free border of the lip.[5] This deformity is referred to as a notch and it is one of the most common secondary deformities in unilateral cleft lip repair cases.[6] Medial segment of cleft lip is more or less deficient of the vermilion width as compared to the non cleft side. This factor also contributes to the effect of the linear scar and thus makes the depression or the notch more obvious.

An effective method to avoid the straight line closure of classical Millard repair was to add a z-plasty on the vermilion. This z-plasty served the purpose of converting the straight line closure into an interpolated flaps closure and also helped to balance the thickness of vermilion on both sides of cleft. However, Noordhoff introduced a triangular flap on the vermilion of the lateral segment which served the purpose in a more natural way.[7]

Much less has been written to compare the results of the two original techniques. The present study compares the outcomes of the two basic techniques in terms of postoperative notching at vermilion.

METHODOLOGY

Present study included the patients of primary unilateral cleft lip repair. Primary bilateral cleft lip and secondary unilateral cleft lip cases were not included in the study. Authors were trained on Millard rotation advancement method and continued operating unilateral cleft lip cases till 2008. Having gone through the details of Noordhoff triangular flap technique authors switched to this technique in coming years.

Consecutive 40 cases of unilateral cleft lip repair were selected from each group to compare the outcome of two techniques at vermilion with reference to the notch formation. Millard classical repair consists

of a straight line closure at vermilion whereas Noordhoff repair involves a triangular flap of vermilion and marginal orbicularis muscle from lateral segment of cleft lip which has comparatively thicker vermilion. This flap is designed from the excess vermilion which is otherwise pared off in Millard straight line repair at vermilion. Noordhoff technique further places a back cut at medial cleft lip segment starting immediately below the white roll. The back cut is extended to redline to such an extent that redline on medial segment rotates downwards and comes to horizontal level. At this point the triangular defect created by the downward rotation opens up displaying the exact width of deficient vermilion on medial side. The triangular flap on lateral segment then interposes to fill this defect. Results were studied on last available consecutive 40 cases of Millard repair and were compared with first 40 consecutive available cases of Noordhoff technique. All cases were well beyond one year post operative follow up. These repairs were then analyzed for presence of notch at vermilion. Results in every group were analysed in four categories. 1. No notch appreciable. 2. A notch having a difference of thickness of <0.5 mm from the surrounding tissue. 3. A notch of >0.5 mm but <1 mm, and 4. A notch at vermilion of >1 mm. The results were then compared for final outcome.

RESULTS

Study included 80 patients, 58 males and 22 females. Age range was from 4 months to 34 years. Notch was absent in 29 cases (72%) treated with Millard Technique whereas Noordhoff Technique Group showed a higher number of 34 cases (85%). On other extreme, a notch of more than 1 mm was evident in two cases (5%) of Millard technique only and Noordhoff technique did not show this wide notch at vermilion. Similarly, two subgroups of 0.5 mm notch and 0.5–1 mm notch had a slightly higher number of cases in group dealt with Millard technique (5 and 4 cases respectively) as compared to cases dealt by Noordhoff technique (3 cases in each subgroup). Results are shown in Table-1.

Table-1: Comparison of postoperative notch complication in two groups

	Group One Millard Repair		Group Two Noordhoff Repair	
Vermilion notch	No	%	No	%
No notch	29	72	34	85
<0.5 mm	5	13	3	8
>0.5 mm	4	10	3	8
>1 mm	2	5	-	-

DISCUSSION

Millard rotation and advancement proved revolutionary in unilateral cleft lip repair. Whereas both elements of rotation and advancement were being utilised by a number of surgeons before this technique, it introduced a design which not only allowed rotation but also minimised the disruption of the lip subunits. A recent study, among the 269 respondents, on current surgical practices revealed that 46% of the North American surgeons were utilising Millard technique without any modification and other 38% were using this technique with various modifications. It clearly speaks of the popularity of this technique.[4] Similarly, studies from subcontinent also speak of the popularity of this technique in this region.[8,9]

Focusing on the outcomes of Millard technique, most common complication is formation of notch at vermilion.[10] The most obvious reason for this notching remains the straight line closure of the vermilion. However, unequal width of the lateral and medial cleft segments would also play its role depending upon the disparity of the thickness on both sides. Studies have also mentioned about the inadequate rotation of the medial element and turning in of the sutured edges as other causes of notching.[2] Another factor may be an incision at lateral lip segment which is too far medially thus going beyond the maximum vermilion thickness where all three segments vermilion, skin and muscle are underdeveloped.[11] In this case straight line closure further adds a factor for notching because of the thin lateral lip tissues sutured to thicker non cleft side.[12]

Various modification of this technique have been mentioned.[13–15] Fischer incorporated a triangular flap at vermilion.[16] Also, z-plasty with unequal flaps has been mentioned to break the linear scar and also to equalise the discrepancy in the width of the vermilion across the cleft.[17,18]

Noordhoff technique was described in 1996.[19] Instead of linear closure at vermilion border; a triangular flap was developed at lateral cleft lip segment which served three purposes. First, it avoided the linear closure. Second, the vermilion portion of the lateral segment which usually was discarded in Millard approach was made to play a useful role in repair. Third, and above all, exact amount of deficiency of the vermilion thickness was immediately evident after the back cut on medial segment and finally triangular flap of the exactly the same dimensions would advance to create a vermilion of equal thickness across the cleft repair.

Among various modifications of Millard repair, incorporation of a z-plasty at vermilion remains most common one to avoid straight line closure and vermilion notching. However, this z-plasty has to have unequal flaps in an attempt to shift the more thick vermilion of the lateral lip segment to the deficient medial segment. Again this z-plasty is not part of the initial markings and is marked out only when rest of the repair has been done and medial most part of lateral lip segment have been pared off. As a result, it is evident that: i. It is difficult to measure the exact deficiency at lateral segment, ii. As in classical Millard repair, the medial most vermilion on lateral segment is lost, and iii. Due to inability to measure exact length of amount of deficiency planning the z-plasty flaps is an estimate. However, Noordhoff technique has the benefits that it

has incorporated triangular flap as part of this technique which serves to break the straight line as well as save the vermilion which is otherwise pared off in Millard technique. Also when the back cut is opened up and rotated so that red line of Noordhoff on medial segment reaches to exact horizontal level it exactly speaks of the amount of vermilion deficient on this segment. The triangular flap will now sit exactly into the triangular defect created at medial segment. It very clearly shows the edge Noordhoff technique has got on Millard and, also on, its modification of z-plasty at vermilion. Due to the inherent problems with z-plasty modifications in Millard repair, mentioned above, authors did not incorporate it in this study. However, literature also does not have much of the comparison of the outcomes with the Millard and Noordhoff techniques. Present study compared the results of these two techniques as regards the outcome at vermilion.

A major difference that one comes across, while operating with these two different techniques, is marking the point on the lateral part of the cleft lip which will coincide with the cupid bow on the cleft side in Millard technique. Whereas there are chances of putting this point to far medially in Millard technique, as pointed out in some of the studies, Noordhoff has an absolutely different criteria for marking this point, as he places this mark at a point where the vermilion first gains its maximum thickness. As one proceeds with technique, one feels that this land mark helps a lot to avoid the discrepancy in the vermilion thickness.

Study itself showed that percentage of patients having complication of notching at vermilion dropped to a significant level with Noordhoff technique.

This marked improvement in the results at vermilion could be contributed to the fact that the inherent drawback in the Millard technique, i.e., the straight line closure was avoided. Also the medial most part of the lateral segment was no more discarded but utilized to build up the deficiency in medial segment. And last, the placement point 4 of the Millard technique was made more precise in Noordhoff technique.

This study, therefore, finds Noordhoff technique quite effective in addressing the complication of vermilion notch after unilateral cleft lip repair with the Millard technique. It also clearly shows the causes of the vermilion notch and also points out the advantages of the Noordhoff technique in overcoming this problem.

CONCLUSION

Nordhoff triangular flap repair at vermilion reduces the chances of notching to minimum due to break in the linear repair in vermilion and also helps in reconstructing a symmetrical vermilion by bringing in the vermilion from lateral to medial segment.

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