

The Non-denuded Mucoperiosteal Palatoplasty Technique in Precipitating Healing Process of Palatal Lateral Defect

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Background: Conventional two-flap palatoplasty technique which is a very common technique used including in our center, will result in lateral defects without any periosteal coverage. In this conventional technique, epithelialization of lateral defect was achieved within 3-4 weeks. These denuded lateral defects are prone to contamination and infection. The wound healing process in these wound will involve wound contraction, trigger scar formation, and will result in maxillary growth impairment.

In our center, the retrospective study showed that conventional two-flap palatoplasty technique resulted in a fair maxillary growth (mean Goslon score=3.5). Thus, we explore other technique, which is non-denuded mucoperiosteal palatoplasty technique. We intend not to elevate all layers of mucoperiosteal flap in order to gain lateral defect covered by a thin sub-mucosa and periosteal layer. We assume that this technique will precipitate the re-epithelialization process. Faster re-epithelialization is expected to decrease wound contraction thus reducing scar formation, and in the long run will result in good maxillary growth.

Method: Total 48 patients with unilateral or bilateral cleft palate were divided into 2 groups. Twenty-four patients underwent the non-denuded mucoperiosteal technique (intervention group) and another 24 patients underwent the conventional two-flap palatoplasty technique (control group). Evaluation of lateral defect closure was done in both groups and compared statistically.

Result: Faster epithelialization was significantly influenced by age, WBC count and non-denuded mucoperiosteal technique.

Summary: The non-denuded mucoperiosteal technique, along with age and WBC count, significantly accelerate the process of epithelialization of lateral defect post palate repair.

Keywords: non-denuded mucoperiosteal, two-flap palatoplasty, epithelialization

Latar Belakang: Teknik konvensional two-flap palatoplasty adalah teknik yang umum dipakai termasuk di pusat pelayanan kami, dimana teknik ini menghasilkan defek di lateral tanpa pelindung periosteum. Pada teknik konvensional ini epitelisasi defek lateral akan tercapai dalam 3-4 minggu. Defek lateral yang terbuka ini rentan terhadap kontaminasi dan infeksi. Proses penyembuhan luka pada defek ini akan melibatkan kontraksi luka, menstimulasi terbentuknya parut dan terhambatnya pertumbuhan maksila. Di pusat pelayanan kami, studi retrospektif menunjukkan bahwa teknik konvensional two-flap palatoplasty, akan berujung pada pertumbuhan maksila yang kurang baik (rerata skor Goslon=3.5). Oleh karena itu, kami mencoba teknik lain, yakni teknik mucoperiosteal palatoplasty yang menyisakan periosteum. Kami sengaja tidak mengangkat seluruh lapisan flap mucoperiosteum dengan tujuan mendapatkan defek lateral yang tertutup oleh lapisan submukosa tipis dan periosteum. Kami berasumsi teknik ini akan mempercepat proses re-epitelisasi. Proses re-epitelisasi yang cepat akan mengurangi kontraksi luka, yang mana akan mereduksi pembentukan parut dan akhirnya akan menghasilkan pertumbuhan maksila yang baik.

Metode: Total 48 pasien dengan sumbing langit-langit unilateral ataupun bilateral dibagi dalam 2 kelompok. Dua puluh empat pasien menjalani operasi dengan teknik mucoperiosteal palatoplasty dan 24 pasien lainnya menjalani operasi dengan teknik konvensional two-flap palatoplasty. Pada kedua kelompok dilakukan evaluasi terhadap penutupan defek lateral dan dibandingkan secara statistik.

Hasil: Dalam studi ini, epitelisasi yang cepat secara signifikan dipengaruhi oleh usia, jumlah sel darah putih dan teknik mucoperiosteal palatoplasty yang menyisakan periosteum.

Ringkasan: Teknik mucoperiosteal palatoplasty, bersama dengan faktor usia dan jumlah leukosit secara signifikan mempercepat proses epitelisasi defek lateral pascapalatoplasty.

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A cleft palate is a frequently occurred congenital malformation. Surgical closure of these clefts is indicated to overcome feeding and speech problems. However, the existing surgical procedures lead to scar formation, which impairs the growth of the maxilla and the development of the dentoalveolar complex.¹⁻⁴

The conventional two-flap palatoplasty technique (Figure 1), which is a very common technique used including in our institution, will result in lateral defects without any periosteal coverage. In this conventional technique epithelialization of lateral defect was achieved within 3-4 weeks. These denuded lateral defects are prone to contamination and infection.⁵⁻⁸

Thus, we explore this technique, which is a non-denuded mucoperiosteal palatoplasty technique (Figure 2). We intend not to elevate all layers of mucoperiosteal flap in order to gain lateral defect covered by a thin periosteal layer. We assume that this technique will precipitate the re-epithelialization process.

The aim of our study was to evaluate the progress of epithelialization of lateral defect in group of patients who underwent the non-denuded mucoperiosteal palatoplasty

technique compared to the control group, patients who underwent the conventional two-flap palatoplasty technique.

METHODS

This study was conducted in Cipto Mangunkusumo Hospital, One Day Care operating theatre. Cleft palate patients, bilateral or unilateral, who underwent palate repair using the non-denuded mucoperiosteal palatoplasty technique and the conventional two-flap palatoplasty technique from October 2010–February 2011.

Between October 2010 and February 2011, a prospective study was performed, with approval of the ethical committee of Universitas Indonesia. All the patient or patient parents were informed about the study.

Inclusion criteria are unilateral or bilateral cleft palate patient who will undergo palate repair in Cipto Mangunkusumo Hospital, One Day Care operating theatre. We performed consecutive sampling technique to patients who meet the inclusion criteria.

We divided all patients into 2 groups. Each group consists of 24 patients who will undergo the non-denuded mucoperiosteal



Figure 1. The conventional two-flap palatoplasty technique with denuded mucoperiosteal lateral defect



Figures 2. The non-denuded mucoperiosteal palatoplasty technique with lateral defect still covered by a thin layer of mucoperiosteum (red colored area)

technique (intervention group) and 24 patients who will undergo the conventional two-flap palatoplasty technique (control group).

We performed evaluation of lateral defect closure of this control group and intervention group. We requested all patients in each group to have a follow up visit in our hospital every week, for 4 consecutive weeks after surgery, in order to evaluate epithelialization of the lateral defect. Progress of the epithelialization process was documented. Statistical analysis was performed using SPSS 15.0 for windows, with the $p=0,05$ as a significant level of difference.

RESULTS

During a 5-months period, we performed two-flap palate repair in 48 patients, twenty-three among them were treated by non-denuded mucoperiosteal technique. The median age of the study population was 24 months old (IQR 18-26) and 62,5% were male. Eighty-three point three percent had unilateral complete cleft lip and palate and 16,7% had bilateral complete cleft lip and palate.

We compared white blood cell (WBC) count before and after surgery in the intervention group. Forty four point four percent had high WBC count before surgery, which came to normal limits after surgery. The other 55,6% had normal WBC before surgery, which remained normal after surgery.

In univariate analysis (Table 1), we found that the non-denuded mucoperiosteal technique was significantly precipitate lateral defect epithelialization (RR 7.667, 95% CI 2,665 - 22.023, $p<0.000$). Besides technique, age (RR 0.062, 95% CI 0.00–0.063, $p<0.0021$) and WBC count (RR 4.000, 95% CI 0.0733–21.838, $p<0.048$) were also significantly related with faster epithelialization.

DISCUSSION

There are more male (62,5%) than female subjects in this study, and there are more unilateral cleft lip and palate (83,3%). This is consistent with cleft lip and palate prevalence, which is higher among male population and the higher incidence of unilateral cleft lip and palate.

One patient in the intervention group dropped out. This patient lived outside of Jakarta province, and he did not come back for follow-up, most probably because of the long travel distance. This might be a good point to consider when designing a study in the future, to add residences outside of the province as one of the exclusion criteria.

In our study, we divide the epithelialization process to be before 2 weeks and after 2 weeks. The proliferative phase lasts 2 weeks in the wound healing process. Complete epithelialization process, which occurs less than 2 weeks, will have less wound contraction and

Table 1. Factors associated with epithelialization

	Statistical Analysis	RR (95% CI)	p
Age	Mann-Whitney	0.062 (0.00 - 0.063)	<0.021
Gender	Fisher	2.4 (0.677-8.505)	0.143
Cleft type	Fisher	0.5 (0.98–2.540)	0.330
WBC count	Fisher	4.000 (0.733 – 21.838)	0.048
Non-denuded mucoperiosteal technique	Fisher	7.667(2.665 – 12.023)	<0.000

better scar. We identified several factors, which might influence the epithelialization process.⁹

The conventional two-flap palatoplasty technique will result in lateral defects without any periosteal coverage. These denuded lateral defects are prone to contamination and infection. We tried to see whether the intervention group could lessen contamination or infection on the lateral defect by checking WBC count in the intervention group. Although bacterial count is more representative in detecting local infection, WBC count has long been used to screen active process of infection.⁹ Due to technical limitation in obtaining bacterial count sample from the lateral defect, we decided to perform WBC count to screen whether there is infection process or not. The result was 44,4% did not have elevated white blood cell count after surgery; it affected the epithelialization process significantly (RR 4.000, 95% CI 0.733–21.838, $p < 0.048$).

Experimental studies show that the inflammatory and proliferative phases are less efficient in older animals, particularly compared with very young subjects. Studies suggest that the defect in age-related wound healing is related to abnormal initiation of healing as a result of insufficient presence of growth factors.¹⁰⁻¹² In this study, age was significantly related with faster epithelialization (RR 0.062, 95% CI 0.00–0.063, $p < 0.021$).

We tried to precipitate the epithelialization process by using non-denuded mucoperiosteal technique. As previous studies showed, this technique has the effect in precipitating epithelialization. In this study, non-denuded mucoperiosteal technique significantly precipitates the epithelialization. (RR 7.667; 95% CI 2.665–12.023; $p < 0.000$). This probably in the non-denuded lateral defect had more vascularized and “epithelial sources” to precipitate epithelialization process.

SUMMARY

In this study, we found that the non-denuded mucoperiosteal technique, along with age and WBC count, significantly accelerate the process of epithelialization of lateral defect post palate repair.

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