

# Surgical repair of hard palate cleft with absorbable membrane: the new surgical technique and its clinical application

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## Summary

This study evaluated a new surgical technique with absorbable membrane to repair hard palate cleft without extensive mobilisation of the mucoperiosteum. From 2001 to 2002, 32 selected patients with complete unilateral clefts underwent this surgical operation. The traditional flap surgical operation was performed at the soft palate, uvula and anterior alveolar cleft. The absorbable membrane was implanted to the hard palate cleft gap to guide the regeneration of the mucoperiosteum. The patients were followed up for 1-6 months after the operation. The speech assessment was carried out 12 months after the operation. Of 32 patients, 30 were successfully operated

by this method and no obvious complications occurred. Primary healing on tissue defect of hard palate was obtained in 27 patients and secondary healing in 3 patients. Eighty percent of the 30 patients had good or excellent speech 12 months after the operation. The operation failed in 2 patients. The surgical technique with absorbable membrane to repair hard palate appears to have several valuable advantages including the decreased area of the hard palate involved and favourable outcome for speech in the majority of cases.

*Key words:* cleft palate; surgical technique; absorbable membrane; speech

## Introduction

Early cleft repair offers advantages in speech and hearing [1]. However, it is generally accepted that early and extensive mobilisation of the mucoperiosteum is the chief factor to interfere with facial growth in the long term [2, 3]. Various modifying surgical flap techniques have been designed to decrease the hard palate area involved for avoiding the dilemma [4, 5]. A two-stage procedure with early repair of the soft palate and a long delayed closure of the hard palate could be a favourable choice to achieve optimal results in the development of speech and facial growth [6-8]. But two surgical processes are not convenient or econom-

ical, especially for those patients in the developing countries and regions where the medical conditions are not good.

Various membranes with favourable biocompatibility have been successfully used to repair the cleft maxilla and oroantral communication [9, 10]. By using absorbable poly-DL-lactic (PDLA) acid membranes, a one-stage approach was designed to treat the patients with unilateral complete cleft palate in this study. The clinical observation and the speech assessment were carried out to evaluate this surgical technique.

## Methods

From 2001 to 2002, 32 patients (18 males and 14 females with mean age of 25.4 months, range 12 to 36 months) with complete unilateral clefts (13 in the right

side and 19 in the left side, the size of the palatal gaps, range 7 to 14 mm, 10 mm on average) were selected. After approval by the ethical committee of the University Hos-

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pital and with the consent of the patients' parents, we performed the surgical operations at the Cleft Lip & Palate Centre, Children's Hospital, Chongqing Medical University, Chongqing, P.R. China (figure 1). The absorbable PDLA membranes (Dikang Biomedical Co., LTD) were 0.5 mm thick, colourless and transparent.

The soft palate and uvula were closed with the technique introduced by Laurence [7]. A slight push back was obtained. The anterior alveolar cleft was repaired by the traditional surgical technique. Then the mucoperiosteum at the edge of the hard palate cleft gap was dissected. Both sides of nasal mucoperiosteum were closed by suture as nearly as possible, and the nasal mucoperiosteal gap was closed completely in most cases, only leaving a small remaining gap in some cases. Then the PDLA membrane was cut according to the shape of the bone defect and implanted to the hard palate cleft gap between the periosteum and the bone at the hard palate to guide the regeneration of the mucoperiosteum. The 2 mm wide membrane edge overlapped the hard palate bone on both sides of the gap. Suture closed both sides of oral mucoperiosteum to minimise the gap from the soft palate to the hard palate, and fixed the mucoperiosteum, the membrane and

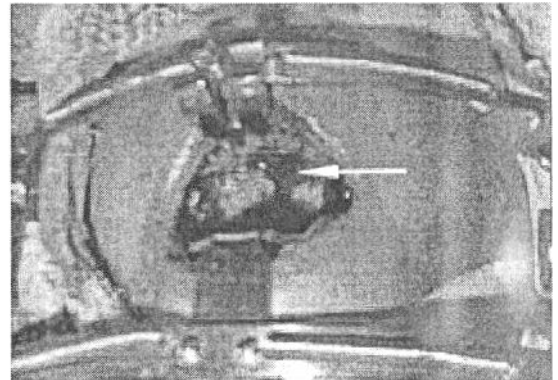
the bone together. Part of the membrane was open to oral cavity. All patients were given the routine antibiotics to prevent infection (figure 2-3).

Body temperature, bleeding volume and respiration rate were recorded during 7 post-operative days. The patients had a follow-up of 1-6 months for clinical observation after the operation. Evaluation criterion included: the primary healing, in which oral mucoperiosteum regenerated along the membrane and the gap closed in 3 months without morphological abnormality (infection or irregular granulation); the secondary healing, in which the gap closed in 3 months with the morphological abnormality (infection or irregular granulation) which disappeared within 6 months; the failure, the gap did not close in 6 months.

The speech assessment for the patients with the primary and secondary healing was carried out 12 months after the operation. According to the standard of The Great Ormond Street Speech Assessment [11], the speech therapists recorded the patients' nasal emission, nasal turbulence, nasal grimace and articulation of simple words, and then gave the assessment about patients' speech function.



**Figure 1**  
A patient with complete unilateral cleft before the operation.

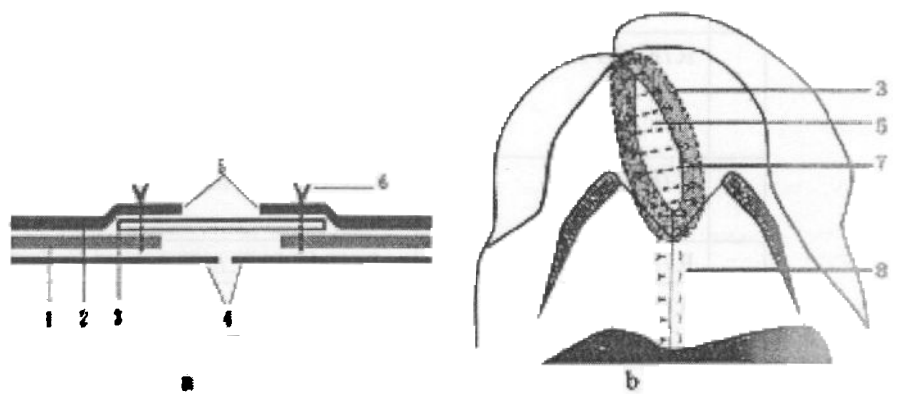


**Figure 2**  
The absorbable membrane (the white arrow) was implanted.

**Figure 3 (a, b)**

The surgical technique

1. The hard palate bone
2. The oral mucoperiosteum
3. The absorbable membrane
4. The gap between the nasal mucoperiosteum. It could be completely closed by suture in most cases.
5. The gap between the oral mucoperiosteum. It should be minimised by 7.
6. The suture. It fixed the 1, 2 and 3 together.
7. The suture
8. The soft palate and uvula were closed with the technique introduced by Laurence [7].



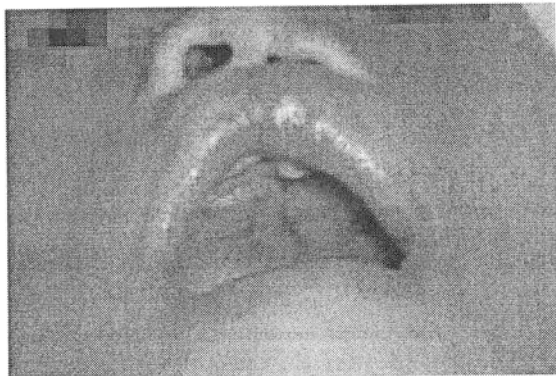
## Results and discussion

There was no obvious complication for all 32 patients. The gap area gradually decreased 1-2 months after the operation, and the colour of membranes turned to be chalky. The primary heal-

ing was obtained in 27 patients and the secondary healing in 3 patients. The healing tissue that closed the gap comprised the normal mucoperiosteum and scar tissue (figure 4). The PDLA membrane

**Figure 4**

The patient six months after the operation



completely degrades *in vivo* in 6–10 months according to its instruction manual and the results of animal experiment by our research team. The degradation of the membrane could not be observed in the present study because of the closure of the gap. Further studies, however, are necessary to observe the membrane by non-invasive examination.

PDLLA with favourable biocompatibility, biomechanical strength and biodegradable rate has been successfully applied in Guided Tissue Regeneration [11–13]. The result of the present study demonstrated that the absorbable PDLLA membrane was effective to guide regeneration of the mucoperiosteal tissues in the defects. The mucoperiosteal tissue continued to migrate along the surface of the PDLLA membrane from both sides of the wound until they eventually closed the gaps completely in 3 months.

The gap did not close in another 2 patients 3 months after the operation. The membranes were found mobile at the cleft sites and then were taken out by another operation. The fistula between oral cavity and nasal cavity appeared 6 months after the operation. The mobility of the membrane might contribute to the failure of the 2 patients. The fixation of the membrane in this surgical technique is

essential. The mucoperiosteal tissues cannot migrate along the mobile membrane.

Excellent speech was found in eleven (37%) of the 30 patients (the primary and secondary healing) without any nasal grimace or articulation errors of simple words. Thirteen (43%) patients had good speech with slight nasal turbulence and slight nasal emission, but had no nasal grimace or articulation errors of simple words. Speech of six (20%) patients was assessed as poor. They had abnormal resonance, nasal grimace, articulation errors and severe turbulence.

To some extent, the Laurence's surgical technique can push back the soft palate to improve the velopharyngeal closure. The speech assessment results of the present study were acceptable in the 12th post-operative month. Surgical repair of the hard palate cleft with absorbable PDLLA membrane without extensive mobilisation of the mucoperiosteum decreases the hard palate area involved. This method possibly favours the facial growth and achieves good results like obtained by the two-stage surgical approach. When comparing the two surgical procedures the one-stage method is actually economical and convenient. However, it is not clear whether the scar tissue will severely interfere with the facial growth. In the further follow-up, the long-term speech assessment and the examination of dental arch formation and facial growth should be carried out to provide convincing results.

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