

# Cleft palate repair in Mongolia: Modified palatoplasty vs. conventional technique

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## ABSTRACT

**Context:** Cleft palate repair is preferentially completed between 6 and 18 months of age, facilitating essential speech and language development along with swallowing and feeding reflexes, and avoiding otitis media and hearing loss. In Mongolia patients often present in early adulthood for cleft lip and/or palate management. Wider defects are associated with older age groups and have higher rates of fistula formation and wound dehiscence. These complications encouraged a modified surgical technique for improved outcomes. **Aims:** Objectives of this study were to compare the efficacy of three established palatoplasty techniques with our mongolian technique. **Materials and Methods:** A retrospective review of all palatoplasty cases, in non-syndromic cleft lip and/or palate patients, between January 1992 and November 2008 in Ulaanbaatar, Mongolia was performed. Exclusion criteria included those suffering from an acute or chronic respiratory illness at presentation or in the recovery period. We compared three established techniques with our modified technique. Outcome measures were duration of surgery, length of hospital stay and fistula rate. **Statistical Analysis Used:** Discrete data are reported as *n* (%), while continuous data are summarised as mean±SD. Differences in demographic, surgical and postoperative data were tested by independent *t*-test (continuous data) and Fisher's exact test (discrete data). **Results:** Palatoplasty was performed on 436 patients with an average age of 60 months. The modified palatoplasty technique had reduced surgical time (*P* value <0.01) and hospital stay (*P* value <0.01) and a 96% complication free wound recovery, compared with established techniques. Cleft lip and/or palate patients aged 42 months or older were more likely to be from the countryside. **Conclusions:** 86.9% of patients presenting for cleft palate repair had palatoplasty later than the recommended age. Geographical predilection for children older than six years, were more likely to have cleft palate repair complications. We have shown the modified palatoplasty technique is a more efficient time saving surgical procedure with lower complication rates.

**Keywords:** Cleft lip/palate, fistula rate, modified palatoplasty, wider defect

## INTRODUCTION

Mongolia is located in Central Asia and borders with China and the Russian Federation. It has a territory of 1.5 million square kilometres and a population of 2.6 million.<sup>[1]</sup> The N. Gendenjamts's Memorial Mongolian Maternal and Child Health Research Centre (MMCHRC) located in the country's capital, Ulaanbaatar (UB), is the only paediatric hospital providing a comprehensive paediatric tertiary service for Mongolia. All surgical management of congenital cleft lip and/or palate (CL/P) is

carried out by MMCHRC staff in UB, including adults who present to the adult tertiary hospitals. Surgeons also visit rural provinces for CL/P surgery, but this data set is incomplete.

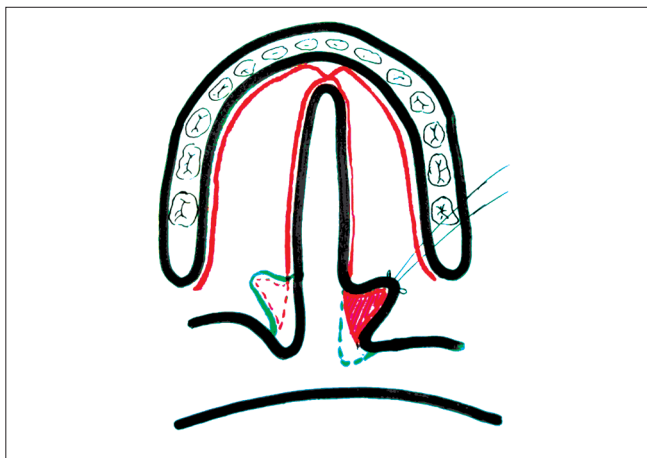
The international prevalence of congenital CL/P has been reported as 1:500-2500 live births, 7.2% of all congenital anomalies.<sup>[2-8]</sup> Syndromic CL/P cases have a reported prevalence of 21-50%.<sup>[8-13]</sup> Of syndromic CL/P cases 32.9-43.5% are associated with muscular and rheumatologic abnormalities, and defects in both the central nervous system (15-29.2%) and cardiovascular

system (24-28.9%).<sup>[9,10,14]</sup> The majority of CL/P patients are non-syndromic;<sup>[9-12]</sup> it is expected they will have near normal development therefore it is more simplistic to study and compare surgical outcomes with this subset of CL/P.

Optimal timing of cleft palate repair remains controversial. The majority of recent literature advocates early repair, between 6 and 18 months of age, facilitating normal speech and language development, and preventing hearing loss.<sup>[15-22]</sup> In Mongolia it is not unusual for patients to present in their late teenage years or early adulthood for CL/P management. Reasons for late presentation are lack of access to medical services for ongoing referral, inadequate surgical services to the remote provinces and the high costs associated with travel. These problems are significant for remote dwelling Mongolian nomadic families, who must self fund the trip to their province's capital and then to Ulaanbaatar for the necessary surgery. Cases presenting later in life to the MMHCRC provide Mongolian surgeons' with the challenge of wider defects which are difficult to manage successfully using traditional palatoplasty techniques. The rates of fistula formation and wound dehiscence forced us to modify established techniques for improved outcomes across all age groups. This modified technique and three widely utilized techniques for CL/P repair will be compared for the non-syndromic CL/P group with a retrospective audit of the MMHCRC Maxillofacial Department. It was our objective to compare the efficacy of these palatoplasty techniques.

## MATERIALS AND METHODS

Ethics approval was obtained from the Mongolian Ministry of Health to perform a retrospective audit of all cases of non-syndromic CL/P, who were treated at the MMCHRC between January 1992 and November 2008. Files were manually reviewed (and the electronic records from 2007 to 2008) for relevant data; CL/P type, surgical management technique and demographic data (age, sex, home of origin (UB or rural province)). More than 10,000 files were reviewed.



**Figure 1a:** Incision markings in the nasal mucosa of soft palate and in the oral side of hard palate 1. Turn the uvula and soft palate to the oral side 2. Do three-angle designed incision in nasal mucosa of soft palate and uvula. And remove three-angle designed mucosa and organizing new wound

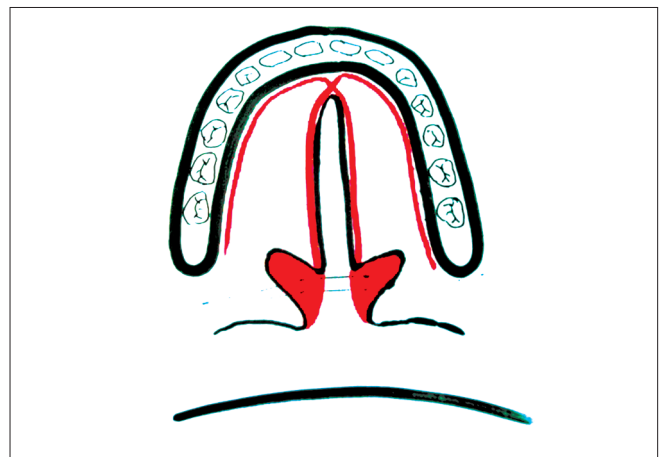
Inclusion criteria were all non-syndromic CL/P cases who presented to the MMCHRC during January 1992 and November 2008 inclusive. No age limit restriction applied. Patients were excluded if they were suffering from any acute or chronic respiratory illness. Patients who subsequently developed an acute illness in the post operative period were also excluded. These exclusions eliminated any potential external reason for failed surgical outcomes (wound dehiscence or infection) or prolonged hospital stay.

Patients of all ages were repaired with one of three techniques; two-flap palatoplasty, Furlow double opposing Z-plasty, and two-stage palatoplasty. These three repairs were compared to our Mongolian technique, in use since 2001. We analyzed and compared the outcomes for length of operating time, length of hospital stay and wound recovery. Full wound recovery was defined as no postoperative wound dehiscence or oro-nasal fistula formation.

Our Mongolian technique is derived from the two-flap palatoplasty repair (von Langenbeck, Wardill-Kilner, and Bardach methods), the deviation in this established technique is in the posterior aspect of the repair. The modification involves a bilateral triangular dissection of the nasal mucosa at the base of the uvula and the soft palate [Figure 1].

The nasal surfaces are brought together after the oral mucosa has been dissected away. Sutures approximating the nasal surfaces, recreate the uvula. The free edges of the cleft are dissected and approximated with sutures in the muscle layer, suturing beginning posteriorly, moving anteriorly and then returning in the reverse direction. This flap provides improved defect coverage, improved healing and wound strength, particularly in wider defects. The hard palate is repaired with a two-flap procedure.

Previously wide defects were repaired in a two stage technique; first stage involved the repair of the soft palate and after 6 months the hard palate was repaired as a second stage procedure. This was the accepted process in Mongolia, until the development of our modified technique.



**Figure 1b:** Creation of uvula by approximating the distal nasal mucosa using raw surfaces (not the edges)

Discrete data are reported as  $n$  (%), while continuous data are summarised as mean  $\pm$  SD. Differences in demographic, surgical and postoperative data were tested by independent  $t$ -test (continuous data) and Fisher's exact test (discrete data). All analyses were conducted using SPSS (Version-16, IBM, IL, USA) for Windows.  $P \leq 0.05$  was taken as significant.

## RESULTS

There were 462 patients who underwent palatoplasty repair during the study period. We excluded 26 patients due to an acute illness in the perioperative period, leaving 436 patients who underwent CP repair for surgical outcome analysis. The majority of these were male 233 (50.6%), from rural regions (59%) who had an age range from 11 months to 120 months [Figure 2] with an average age of 60 months.

A statistically significant association with increasing age and rural

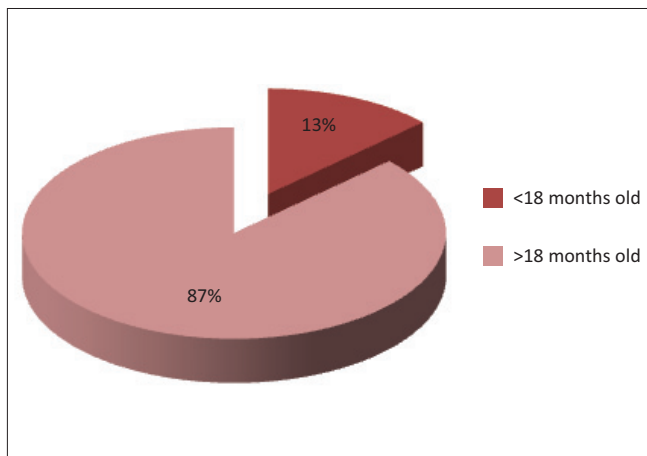


Figure 2: Patients age at time of palatoplasty

residence was found [Figure 3]; CL/P patients aged 42 months or older were more likely to be from the countryside.

We compared the four palatoplasty techniques within the following parameters [Table 1]; operating time, length of hospital stay and complete wound recovery (defined as no development of an oro-nasal fistula or wound dehiscence).

Figure 3 illustrates the correlations with a patient's age and the complication incidence relative to geographical place of origin. The prevalence of fistula was highest at age 73-96 months (6-8 years) for patients from rural origins [Figure 4].

## DISCUSSION

Most patients (86.9%) had palatoplasty older than the recommended age of less than 18 months suggested by current literature.<sup>[15-22]</sup> This correlates with a higher number of CL/P originating from rural regions, who present later, on average 42 months or older, to medical services. Since appropriate timing of surgery is critical to promote the best functional and cosmetic results, medical services for congenital CL/P anomalies must be improved in rural and remote Mongolia or alternatively improvement in the transport of patients to tertiary services within the advised time frames.

Cleft palate repair was described by von Langenbeck in 1861, the technique highlights the importance of separating the oral and nasal cavities, the principle utilized in most repairs today. Bipedicule mucoperiosteal flaps of both the hard palate and the soft palate are used to repair the defect. After their elevation, the flaps are advanced medially to close the palatal cleft. A disadvantage of the von Langenbeck repair is that it does not increase the length of the palate, which results in an inability to close primary and secondary clefts. Kilner and Wardill independently described the V-Y repositioning technique.<sup>[23-25]</sup> This technique is primarily used for repair of incomplete clefts or clefts of the secondary palate.

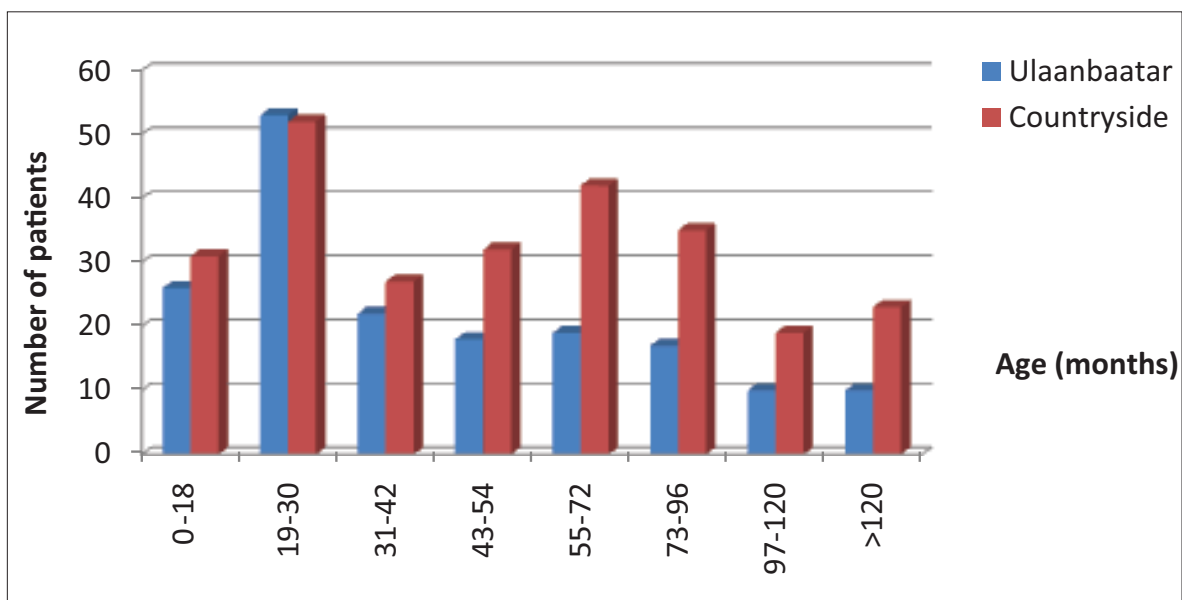


Figure 3: Age and origin of palatoplasty cases

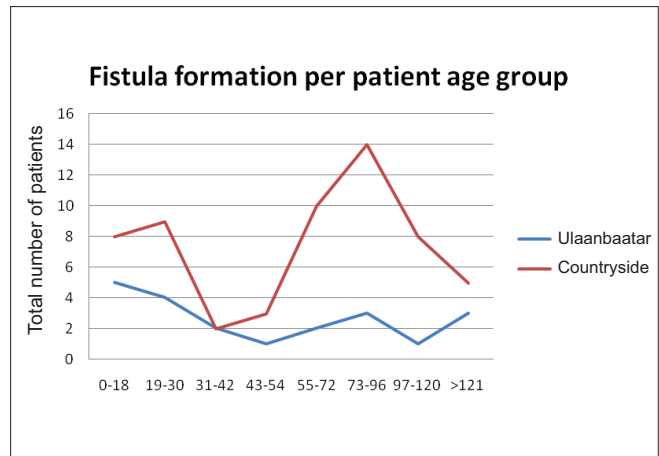
**Table 1: Comparison of surgical techniques**

	Two-flap technique	Furlow technique	Two-stage palatoplasty	New modified technique	P-value
n (%)	191 (43.8%)	52 (11.9%)	8 (1.8%)	185 (43.2%)	
Average operating time (mins)	110	120	100	70	<0.001
Average length of admission (days)	15	15.5	11.4	7.4	<0.001
Complete wound recovery (%)	147 (76.9%)	30 (57.7%)	5 (62.5%)	174 (93.9%)	<0.001

The incisive foramen is the anterior border of the repair, and the uvula is completely divided posteriorly. The theoretical advantage of this technique is that pushing back the flaps adds length to the palate. Bardach described a two-flap palatoplasty, with single mucoperiosteal flaps elevated bilaterally from the palatal shelf. The objective is to complete a two layer mucosal closure (oral and nasal) of the entire cleft with dissection and reorientation of the soft palate musculature as required. Dr. Leonard Furlow described a technique of repairing palatal clefts using opposing mirror image Z-plasties of the oral and nasal mucosa. Palatal muscles included in the posterior flaps of both Z-plasties, are retroposed and overlapped to form a palatal muscle sling. There are three main advantages for this technique over the former palatal pushback techniques. First, palatal lengthening is the geometrical resultant of the Z-plasties. Second, it avoids linear scarring and subsequent contracture. Last, but definitely not least, is the restoration of a muscle sling.<sup>[26,27]</sup> This method is difficult to perform in wide clefts. However, it is considered a good method when the cleft is narrow or if a submucous cleft exists. Modification of these techniques continues to evolve, reflecting patient population and surgical advancement.

The Mongolian technique is similar in principal to Bardach's technique with the bilateral elevation of the mucoperiosteal flaps. However additional wound support especially for the wider clefts is derived from the posterior soft palate flap reinforcement.

The three most documented complications of palatoplasty are velopharyngeal insufficiency, fistula formation, and the retardation of maxillary growth.<sup>[28]</sup> Fistula formation rates are reported between 6 and 42.3% in the literature.<sup>[23,29-33]</sup> They are thought to be due to excessive tension applied to the 'A line' which is the line where the soft and hard palate meet (and are sutured) in the midline. To avoid this, both sides of the cleft should be created under a tension free fashion by completing a thorough dissection from the underlying soft palate musculature and ensure the major palatal blood supply is not disrupted; thereby providing the necessary factors for optimal healing. Wider palatal defects are more challenging to avoid excess tension, and recent reports suggest defects greater than 15 mm have a significantly higher risk of fistula formation.<sup>[34]</sup> It is more likely that with increasing age, the defect will be wider and hence the complication rate will be increased.<sup>[35]</sup> As our patient population has been shown to present

**Figure 4:** Fistula formation rate by age groups

later than ideal, we have had to modify established techniques to manage these difficult defects successfully.

In conclusion, despite an older age of repair compared with the current recommended age of less than 18 months, we have established improved outcomes with our Mongolian technique compared to those concurrently in use. Palatoplasty performed with this method resulted in reduced operating times and length of hospital stay, but perhaps most importantly a significantly lower rate of wound recovery failure. We recommend the use of this Mongolian technique to surgeons working under similar challenging circumstances to the well established techniques currently in use.

We do not have any data detailing outcomes in relation to velopharyngeal competence, development of speech and language postoperatively. We identify the necessity for research conjointly with Speech and Language Therapists to establish the effectiveness of the new modified technique in speech and language development.

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