



## Surgical impact and speech outcome at 2.5 years after one- or two-stage cleft palate closure



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### ABSTRACT

**Objective:** In the ongoing discussion about timing of palate closure, it is said that early closure is favorable for speech development, but can interfere with maxillary growth. On the other hand, beneficial results on both after one-stage palate closure have also been presented. The assumption that one-stage palate closure leads to less surgical impact on the child probably contributed to the choice for this procedure in most cleft centers. However, no previous research has verified this assumption. The aim of the present study is to compare surgical impact and speech outcome at 2.5 years of age between children who underwent either one- or early two-stage palate closure.

**Methods:** Patients underwent either one-stage palate closure between 2007 and 2010 at a median age of 10.8 months (group 1,  $n = 24$ ) or early two-stage closure before 2007 at median ages of 10.4 and 18.2 months, respectively (group 2,  $n = 24$ ). Surgical impact was compared between the two groups by means of duration of surgery, length of hospital stay and number of post-operative complications. Speech outcome was compared by means of resonance problems, nasal air emission, articulation and intelligibility, all assessed at a median age of 2.5 years.

**Results:** The one-stage closure group showed significantly shorter duration of surgery and length of hospital stay ( $p < 0.001$  and  $p = 0.001$ , respectively) and significantly better articulation ( $p = 0.029$ ) than the early two-stage closure group.

**Conclusion:** One-stage palate closure is preferable over early two-stage palate closure with regard to surgical impact and speech development. More extensive, prospective studies, in which maxillary growth is taken into account, should be conducted.

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### 1. Introduction

There is still no consensus about the optimal timing of palate closure, even though the debate has been going on for over 90 years. Early closure of the soft palate is favorable for speech development, whereas early closure of the hard palate is said to interfere with maxillary growth. Therefore, a two-stage palate closure – with early closure of the soft palate and delayed closure of the hard palate (at the age of 12–14 years) – was first put into practice by Schwegkendiek in 1951 and this – or a similar – procedure has been advocated by many since then [1].

It did not take long, however, before various authors argued for an “early” hard palate closure, at 12–24 months of age, in contrast to this delayed closure [2,3]. In the last 20 years, several publications even showed beneficial results of a one-stage closure before the age of 1.5 years on both speech development and maxillary growth [3–6]. Nowadays in most cleft centers worldwide, a one-stage procedure is used for cleft palate closure [7,8]. In fact, in a recent survey of surgeon members of the American Cleft Palate–Craniofacial Association, 96% of respondents perform a one-stage repair [8]. Common sense leads to the assumption that one-stage palate closure should have less surgical impact on the child. This theory, however, has never been studied and consequently never been verified. The present study aims to compare surgical impact, i.e. duration of surgery, length of hospital stay and short-term complications, and speech outcome at 2.5 years of age between children who underwent either one-stage palate closure or early two-stage palate closure.

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## 2. Patients and methods

### 2.1. Patients

In this retrospective observational cohort study, 48 patients were included. Inclusion criteria were as follows: complete unilateral or bilateral cleft lip and palate (UCLP and BCLP) or isolated cleft palate (ICP), treatment by our Cleft Lip and Palate Team since birth, and a completed speech assessment by this team at approximately 2.5 years of age. Exclusion criteria were as follows: clefts that would have been closed in a one-stage procedure anyway (clefts of the soft palate only), unfinished palate closure by 30 months of age, loss to follow-up (because of no appearance, migration or death), language other than Dutch as a mother tongue, insufficient language comprehension (language comprehension quotient  $\leq 80$ ), and impossibility to speak (e.g. because of a tracheal cannula). Twenty-four out of 64 patients, who underwent a one-stage palate closure between April 2007 and December 2010, fit the criteria to form group 1 (Fig. 1). To these patients, 24 patients were matched by frequency matching based on gender and cleft type to form group 2. Appropriate matches were selected chronologically from a list of two-stage palate closures starting with the most recently born match that was found for each category and that fit the criteria from April 2007 back to the year 2000.

### 2.2. Surgical procedures

Subjects in group 1 underwent lip closure at 3–6 months of age and one-stage palate closure at a median age of 10.8 months (range: 8.5–18.5). Subjects in group 2 underwent lip closure at 3–6 months of age and early two-stage palate closure at a median age of 10.4 months (range: 8.8–13.1) and 18.2 months (range: 13.0–21.6), respectively. In both groups, similar surgical techniques were used. Intravelar veloplasty was used in all soft palate repairs. Depending on the width of the cleft, a von Langenbeck technique, a two-flap palatoplasty or a hybrid palatoplasty was chosen for mucosal closure of the soft and hard palate in both groups. Three senior plastic surgeons mainly performed the one- and two-stage closures, with one senior surgeon in each group and a third senior surgeon operating patients in both groups. Data were obtained

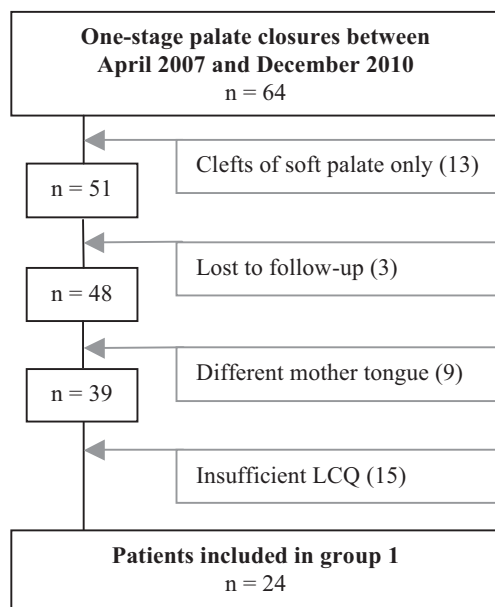


Fig. 1. Exclusion process group 1.

from plastic surgery records and operation registration. Duration of surgery is defined as time of incision until time of closure of the plastic surgical procedure in all cases.

### 2.3. Speech assessment

According to the Cleft Lip and Palate Team protocol in our clinic, all children with a cleft palate were examined by one of a group of four experienced speech pathologists of the Otorhinolaryngology department at approximately 2.5 years of age. The language comprehension quotient (LCQ) was measured using the Reynell or Schlichting Test for Language Comprehension and used as an exclusion criterion [9,10]. Language production was tested by classifying spontaneous speech according to the Groningen Diagnostic Speech Norms that were defined to detect children with a language disorder (Table 1). Spontaneous speech was also analyzed for resonance problems, nasal air emission and intelligibility. Subsequently, an articulation test was performed, in which the number of correctly produced initial consonants was counted.

### 2.4. Statistical analyses

Statistical analyses were performed using IBM SPSS Statistics 20 for Windows. A comparison of outcome variables between the two different treatment groups was made using a Student's *t*-test, a Mann–Whitney *U*-test or a Fisher's exact test. A paired *t*-test was used to compare the duration of the first and second surgery within the two-stage group. A subgroup analysis of cleft type was performed in all significant outcome variables with a one-way ANOVA or Kruskal–Wallis test. A two-sided *p* value of  $<0.05$  was considered statistically significant.

## 3. Results

Twenty-four patients were included in each group. Each group consisted of 16 males and 8 females. In both groups 20 patients had a cleft lip and palate (12 left UCLP, two right UCLP and six BCLP), while four patients had an isolated cleft palate.

### 3.1. Comparison of surgical factors

Table 2 presents the outcome of the comparisons of duration of surgery, length of hospital stay and short-term complications. Data from the first and second operations of group 2 separately, and the addition of these two operations, were compared with data of the operation of group 1. The duration of the one-stage palate closure was significantly shorter than the total duration of the two operations together in the two-stage palate closure ( $p < 0.001$ ). The second operation of the two-stage procedure took significantly longer than the first ( $p < 0.001$ ). The total postoperative hospital

Table 1  
Groningen diagnostic speech norms.

Age <sup>a</sup>	Spontaneous language expressions
<0;9	Babbling
0;9–1;0	Jargon
1;0–1;6	Babbling, with occasionally an understandable word
1;6–2;0	Some words; one-word utterances
2;0–2;6	Two-word utterances
2;6–3;0	Two to three-word utterances
3;0–3;6	Three to five-word utterances; intelligibility about 50%
3;6–4;6	Simple, no compound sentences, word sequence errors; intelligibility about 75%
4;6–5;6	Simple, no compound sentences, normal word sequence, morphological errors; intelligibility more than 75%
>5;6	Grammatically correct sentences, also compound; intelligibility good

<sup>a</sup> Ages are displayed in 'years;months'.

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