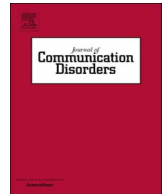


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Journal of Communication Disorders

journal homepage: www.elsevier.com/locate/jcomdis

Speech outcomes following Sommerlad primary palatoplasty: Results of the Ghent University Hospital

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ARTICLE INFO

Keywords:

Cleft palate

Speech

Sommerlad palatoplasty

ABSTRACT

Objective and subjects: Speech outcomes were described for 16 patients with cleft palate (mean age: 5.4 years) following Sommerlad primary palatoplasty performed by a single surgeon of the Ghent University Hospital. These speech outcomes were compared with those of an age and gender matched control group without cleft palate (mean age: 5.3 years).

Methods: Speech intelligibility/distinctiveness, resonance, nasal airflow and articulation, were perceptually evaluated. Additionally, nasalance values and the NSI 2.0 were determined.

Results: In seven patients, speech intelligibility/distinctiveness was disordered. Hypernasality was present in twelve participants, whereas nasal emission and nasal turbulence were perceived in thirteen and five patients respectively. Both perceptual and instrumental speech evaluations were significantly poorer in the patient group in comparison to the control group.

Conclusions: Patients still present with both obligatory and compensatory speech disorders following Sommerlad's palatoplasty. In the future, a Dutch speech assessment protocol will be developed in order to standardize follow-up of these patients and to allow for within-center and inter-center comparisons.

1. Introduction

Clefts of the (lip and) palate are one of the most common congenital abnormalities, with incidence estimated at 1 in 1000 live births (Dixon, Marazita, Beaty, & Murray, 2011). The final goal of the multidisciplinary approach of these patients, is the well-functioning of the patient in society (John, Sell, Sweeney, Harding-Bell, & Williams, 2006), with special attention for speech outcomes, maxillofacial growth and aesthetic outcomes (Leow & Lo, 2008; Sommerlad, 2002). Primary palatal surgery, is one of the first steps in providing the patient with cleft palate optimal care (Andrades et al., 2008). For the closure of the soft and/or hard palate, several techniques have been developed over the years (Agrawal, 2009; Leow & Lo, 2008; Moore, Lawrence, Ptak, & Trier, 1988). The outcome of these techniques is determined by speech results, such as resonance and articulation, and by structural aspects, such as velopharyngeal closure and the presence of postoperative fistulae (Agrawal, 2009).

At the Ghent University Hospital, the Sommerlad technique (Sommerlad, 2003) is frequently used for primary closure of the cleft

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<https://doi.org/10.1016/j.jcomdis.2018.01.004>

Received 29 September 2016; Received in revised form 8 January 2018; Accepted 22 January 2018

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palate. The Sommerlad technique has been described as a more physiological approach, aiming to restore the anatomy of the velum (Sommerlad, 2003). This technique, often described as radical intravelar veloplasty, has the following distinctive components: a radical repositioning of velar musculature (m. levator veli palatini, m. palatoglossus and m. palatopharyngeus), combined with a minimal dissection of the hard palate, a tensor tenotomy, and the repair of the m. levator sling (Sommerlad, 2003). Sommerlad (2003) reported positive results following this technique, showing a decrease in velopharyngeal insufficiency and related resonance disorders.

Several subsequent studies have described the outcomes following Sommerlad's radical intravelar veloplasty (Table 1). These studies often provided speech outcomes following a specific surgical protocol including radical intravelar veloplasty, illustrating the diversity between centers in the surgical approach of patients with cleft palate. Consequently, the results of the studies listed in Table 1 reflect the surgical approach of a specific craniofacial center.

Despite this diversity, all studies reported improved speech following Sommerlad's primary palatoplasty, either concluded based on pre and postoperative measurements (Sommerlad et al., 2004) or by comparing speech results following a surgical approach including Sommerlad's technique with other techniques (e.g. Andrades et al. (2008); Doucet et al. (2013); Dissaux et al. (2016)). On the other hand, some studies only reported descriptive speech results (Yang et al., 2013). Often, speech outcomes were described in terms of prevalence of the parameters hypernasality and nasal airflow, and the competence of the velopharyngeal mechanism. In contrast, no or only limited speech results regarding intelligibility and articulation disorders were reported in most studies, although these parameters are generally acknowledged as important parameters in cleft palate speech assessment (Harding & Grunwell, 1996; Kummer, 2008; Kummer, 2011). Furthermore, a comparison of speech results of patients with cleft palate following Sommerlad's palatoplasty with those of a control group without cleft palate has been seldom reported, despite the knowledge that one of the primary aims of treatment in patients with cleft palate is to normalize speech (Sommerlad, 2002),

The main purpose of this study was to describe speech outcomes following a primary palatal closure using Sommerlad's technique performed by a single surgeon of the Ghent University Hospital, as to date no such information was available yet. More specifically, the aim was to provide detailed speech results regarding speech intelligibility/distinctiveness, resonance, nasal airflow and articulation. In addition, speech results were compared with those of an age and gender matched control group without cleft lip and/or palate in order to evaluate whether speech can be considered within the normal range.

2. Materials and methods

This study followed the Declaration of Helsinki on medical protocol and ethics and the regional Ethical Review Board of the Ghent University Hospital (2014/0979). All parents of the participants signed an informed consent document.

2.1. Participants

The patients were recruited from the craniofacial team of the Ghent University Hospital and were all born with a non-syndromic isolated cleft (lip and) palate. The patient's case history, including surgical information, was retrieved from their medical records and by interviewing the parents. The patient group consisted of ten girls and six boys with a mean age of 5.4 years (standard deviation (SD): 1.2, range: 3.8–8.6 years). Eight patients had a unilateral cleft lip and palate (UCLP), 4 patients presented with a bilateral cleft lip and palate (BCLP) and four patients with a cleft palate (CP) only. In patients with cleft lip, cheiloplasty with primary nasal correction was performed at a mean age of 3 months (SD: 0.9, range: 2–5 months). For incomplete cleft lip, the technique described by Fisher (Fisher, 2005) was used; for complete cleft lip, a modified Millard rotation advancement procedure was performed (no alar base incision, septal flap for closure of the nasal floor and vomerine flap for closure of the anterior part of the hard palate). For bilateral cleft lip, closure was performed according to Fisher (Fisher, 2005); no vomerine flap procedure was done. Clefts of the palate were repaired using Sommerlad primary palatoplasty (Sommerlad, 2003) at a mean age of 12 months (SD: 4.5, range: 7–25 months). Each procedure was performed by a single experienced surgeon (lip closure: N.R., palatoplasty: K.B.). Speech assessment was conducted on average 52 months (SD: 14.9, range: 33–93 months) after primary palatoplasty. At the time of the assessment, none of the patients had received a secondary palatoplasty. Eight patients followed speech therapy (mean duration: 23 months). Six patients had one hour of speech therapy per week, one patient had a half hour per week and another patient one and a half hour per week.

An age and gender matched control group of peers without cleft palate was constructed by convenience sampling and were contacted face to face, by e-mail or phone. This group had a mean age of 5.3 years (SD: 1.1, range: 3.9–8.5 years) which did not significantly differ from the age of the patient group ($U = 134.00$, $z = +0.23$, $p = 0.838$, $r = +0.04$). Participants of the control group had no history of nasal or laryngeal pathology, and no known speech and/or language pathology. All participants of both the patient group and the control group had Dutch as their native language, no cognitive or neuromotor delay, no moderate or severe hearing loss, and were not suffering from a cold or an allergic outburst at the moment of the data collection. Thirteen patients and one participant of the control group received ear ventilation tubes at least once.

2.2. Perceptual assessment of speech

For the evaluation of speech intelligibility/distinctiveness, hypernasality, hyponasality, nasal emission, nasal turbulence and nasal grimace, speech samples were collected consisting of spontaneous speech, counting from 1 to 10, reciting the days of the week, and repetition of the Dutch version of the SNAP test (MacKay & Kummer, 1994; Van Lierde, De Bodt, Van Borsel, Wuyts, & Van Cauwenberge, 2002). Based on this speech sample, these parameters were evaluated following the scoring guidelines and definitions

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