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Original Article

Minimally invasive versus standard approach in LeFort 1 osteotomy in patients with history of cleft lip and palate

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ABSTRACT

Objective: Compare literature-reported efficiency and complications of the standard maxillary advancement surgery with those of a minimally invasive mucosal approach in patients with CL/P requiring Le Fort 1 osteotomy.
Design: Meta-analysis vs. retrospective analysis of 18 consecutive cases.
Setting: Department of maxillofacial surgery at a tertiary-level public general hospital.
Participants: The meta-analysis encompassed Medline, Embase and Cochrane, years 1990 to 2014, inclusive. The local series concerned all squeletally mature adolescents with non-syndromic CL/P who underwent orthognathic surgery between 30 April 2004 and 27 January 2012.
Interventions: Minimally invasive approach and perioperative orthodontics including intermaxillary fixation for 3 months after surgery.
Main outcome measure(s): Assessment of complications. Standard lateral cephalograms were taken before surgery, then < 1 week and 12 months after surgery. Delaire's cephalometric analysis was performed and the position of the maxilla was recorded.
Results: There were no significant differences between the literature and our series regarding sex and type of deformity ($P = 0.634$ and 0.779, respectively). The mean horizontal and vertical relapse rates were 0.61 and 1.17 mm (vs. 1.29 and 1.48 mm in the meta-analysis) and the overall complication rate was 22.2% (vs. 12.76% but $P = 0.271$). There was a significant difference regarding the palatal fistula rate (0 here vs. 21.43% in meta-analysis, $P = 0.028$).
Conclusions: The minimally invasive approach showed trends toward less relapse and less complications than conventional approaches. This technique seems adapted to the management of patients with CL/P sequelae. Other benefiting groups are underway.

1. Introduction

In most patients born with cleft lip and/or palate (CL/P), multiple surgical interventions are required to obtain satisfactory functional and aesthetic outcomes.

Early surgeries such as pharyngeal flaps or sphincter pharyngoplasty may have long-term impacts on maxillary growth restriction leading to midface and maxillary hypoplasia and class III malocclusions [1]. In 1993, Da Silva Filho and al. [2] showed that adults with operated CL/P have smaller maxilla than control patients. At end of puberty, a significant proportion of patients born with complete unilateral or bilateral CL/P (10 to 20%) require a maxillary advancement surgery to correct midface retrusion and improve aesthetic facial proportions [3].

The aim of Le Fort 1 osteotomy is to correct maxillary hypoplasia and achieve a class I occlusion. Specific surgical issues

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in Le Fort 1 osteotomy for cleft patients are multiple scars, poor prediction of vascular supply and planning of the extent of the advancement, as the behavior of soft tissues is particularly unpredictable.

Surgical relapses and related complications were reported in several reviews of long-term results and complications in patients born with a cleft who underwent primary repair in childhood and had dysmorphoses with class III malocclusion in adolescence that required orthognathic surgery. There were many types of complications whose frequencies were relatively low [4]. Indeed, alveolar cleft, palatal cleft and multiple surgeries may compromise the vascularity of the maxilla, retard the process of healing and favors the onset of infections and the occurrence of relapse. Furthermore, gingival recession and rhyzarlyse were often reported. A recent meta-analysis with systematic review by Yamaguchi et al. (2016) [5] reported a complication rate (12.76%): 126 in 1003 patients treated with conventional mucosal incision design and maxillary osteotomy.

The conventional mucosal incision designs had to be changed. In 1985, Cadenat et al. (1985) [6] described a minimally invasive vertical mucosal approach that did not undergo a long-term evaluation. More recently (2013/2014), another alternative surgery, a minimally invasive mucosal Le Fort 1 approach (MILF) was designed for patients with history of cleft lip and palate [7]. The approach aims at preserving the soft tissue pedicle to minimize vascular ischemia of the displaced segments. It is this approach that is evaluated here.

The aim of the present study is to compare the efficiency and complications of the latter alternative surgery to those stemming from the systematic review of Yamaguchi et al. (2016) [5].

2. Methods

2.1. Reference population

We used the following parameters extracted from a previously published meta-analysis referencing 26 articles and analysing the outcomes of Le Fort 1 osteotomy in patients with cleft lip and palate [5]:

- patient demographics;
- types of surgical procedures, horizontal and vertical stability assessment;
- complication rates.

2.2. Patient group

We included all patients diagnosed with non-syndromic CL/P who underwent MILF at the service de chirurgie maxillofaciale et stomatologie (Croix-Rousse Hospital, Hospices Civils de Lyon) between April 2004 and January 2012.

Eighteen teenagers (10 girls and 8 boys) born with either unilateral ($n = 13$) or bilateral CLP ($n = 5$) underwent orthognathic procedures by a single surgeon (AG). All patients had benefited from perioperative orthodontics using arch wires. At the time of surgery, all were skeletally mature as evidenced by the closure of the epiphyseal growth plate on hand X-rays. After surgery, all patients had intermaxillary elastics fixation for 3 months.

2.3. The MILF operative technique

The technique consisted in a modified standard Le Fort 1 osteotomy (Fig. 1A–C). The modifications concerned the placement and sizes of soft-tissue (mucosal) incisions that allowed direct exposure for dissection, osteotomy, disimpaction, bone grafting, fistula closure and plate/screw application. One advantage of this MILF is that it does not cause circulation injury to the osseous, dental, or musculomucosal flaps.

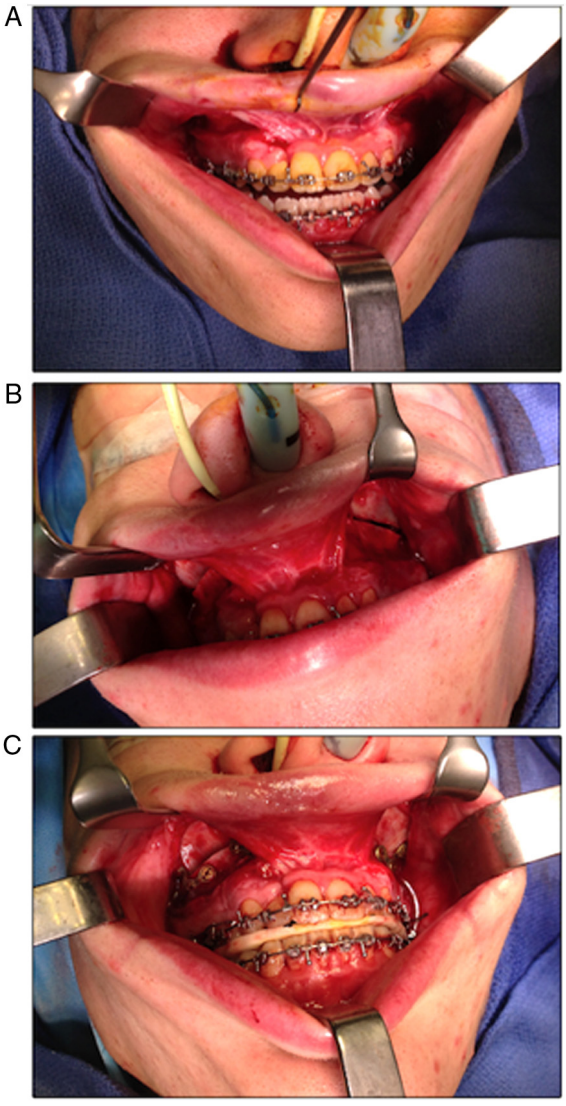

Fig. 1. A. The modifications concerned the placement and sizes of soft-tissue (mucosal) incisions. B. These incisions did not change piezotome osteotomy techniques. C. Maxilla fixation with four miniplates.

These incisions did not change piezotome osteotomy techniques. Pterygomaxillary disimpaction was performed with a curved osteotome. Down-fracture was made with Rowe disimpaction forceps, the maxilla mobilized into the preplanned position and then placed into intermaxillary fixation via an occlusal splint. For this, prefabricated interocclusal splints were used intraoperatively in all patients to facilitate correct placement of the jaws.

The closure of any residual cleft-dental gaps was carried out through the routine differential maxillary segmental repositioning. After maxilla fixation with four miniplates, additional cortico-cancellous bone grafts were wedged between the zygomatic pillar (zygomatic buttress) and the canine pillar (piriform aperture) on both sides. In the series, 16 out of 18 underwent simultaneous autogenous cortico-cancellous bone grafting.

Finally, the incisions were sutured closed. All patients underwent nasotracheal intubation at the beginning of the procedure and were extubated at its end.

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