

Effects of early palatoplasty on procedural related blood loss and fistula formation in patients with unilateral complete cleft lip and palate: A randomized controlled trial study

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Abstract

Background: Different timelines are preferred for repair surgeries in patients with unilateral complete cleft lip and palate (UCLP). The aim of this study was to evaluate the effects of early palatoplasty on procedural related blood loss (anemia) and fistula formation in patients with UCLP.

Methods: This randomized controlled trial conducted on patients candidate for UCLP repair. Patients in control group underwent cheiloplasty, closure of nasal floor, caudal septum dislocation repair, and primary rhinoplasty in first surgery at age of 28 days-4 months. In second surgery, patients in control group underwent two flap palatoplasty with vomerian flap and intravelar veloplasty, soft palate repair and also myringotomy at age of 9-12 month. In case group, infants underwent cleft lip and nose repair (like control group), hard palate repair in first surgery and then in second surgery, patients underwent soft palate repair with intravelar veloplasty.

Results: Fifteen patients were included in each group. Two patients in primary surgery in the case group and two patients in secondary surgery in the control group were developed to oronasal fistula after palatoplasty ($P= 0.432$). The mean hemoglobin levels in the case and control groups at the primary surgery were 10.32 ± 0.68 and 10.31 ± 0.49 g/dL, respectively ($P= 0.968$) and at the secondary surgery were 11.29 ± 0.54 and 11.37 ± 0.40 g/dL, respectively ($P= 0.666$).

Conclusion: There were no perioperative hemorrhagic events and need to blood transfusion in both groups. Early palatoplasty may as safe as conventional technique in patients with UCLP.

Trial registration number: IRCT20180802040678N5

Introduction

The cleft lip and palate (CLP) are the most common congenital maxillofacial anomaly characterized by the absence of fusion of palatine process during embryogenesis [1–3]. It is a developmental anomaly resulting from both genetic and environmental factor [4]. Patients with cleft lip and palate suffer from impaired of facial and dental development, speech and hearing, and esthetic problems [5]. The unilateral CLP is defined by tissue deficiency and tethering of structures to either side of the cleft [6].

Multiple techniques and different timelines are preferred for repair surgeries in patients with unilateral complete cleft lip and palate (UCLP) which aims to restore anatomy and function of the oromaxillofacial section such as alveolar bone and nasolabial tissue. Hemorrhagic events are an important complication in patients with CLP underwent repair surgery [7, 8]. Moreover, wound dehiscence and fistula formation following cleft repairmen are one of the most frequent complications in these patients [9, 10].

The timing of the CLP repair has been a topic of debate ever since the methods for cleft repair were laid down [11]. The protocols have changed considerably throughout the past several years. Some studies recommended early intervention protocols for improvement of standard care in patients with CLP [12].

Recent study by Kara et al. [13] have implicated no difference in speech outcomes of patients with early and standard cleft palate timing of surgery. Also, Laberge et al. [14] were recommended simultaneous repair of palate, nose and lip in children with CLP at three month of age. However, results of studies are even more controversial [15] and more studies need to clarify the various effects of this technique on patients with CLP.

To the authors' knowledge, only few studies have been conducted on the comparison of early hard palate repair along with cheiloplasty and rhinoplasty in infants with UCLP. As a consequence, clinical trials need for evaluation this surgical method, outcomes and complications of these patients. Therefore, the aim of this study was to evaluate simultaneous early hard palate, lip and nose surgery effects on procedural related blood loss (anemia) and fistula formation in patients with UCLP.

Materials And Methods

Participants

This study was a randomized clinical trial and was conducted of infants with UCLP who were referred for repair surgery to Children's Hospital of Tabriz University of Medical Sciences in Tabriz, Iran, from December 2019 to December 2020.

Infants with typical UCLP diagnosis from birth time meeting the following inclusion criteria were enrolled to the study: normal weight for age at the time of surgery, age of first surgery between 2-4 month, and first visit by same surgeon. Patients were excluded if they had other types of CLP such as atypical or isolated, bilateral or incomplete unilateral CLP and two surgeries did not performed by same surgeon. The trial was registered at Iranian Registry of Clinical Trials (IRCT registration number: IRCT20180802040678N5). The Medical Ethics Committee of Tabriz University of Medical Sciences approved the study protocol (Reference number: IR.TBZMED.REC.1399.422) and informed consent was obtain from parents of infants before enrollment to the study. The protocol of trial was in accordance with the Declaration of Helsinki. Consolidated standards of reporting trials (CONSORT) guidelines were used in this study.

Randomization and Technique

Infants who had eligibility criteria were stratified (1:1) and allocated based on randomized number table in two groups. All surgeries were performed under general anesthesia with oral endotracheal tube in supine position. All the surgery stages in case and control groups were performed by a single surgeon with over 20 years' experience in cleft palate and lip surgery.

Patients in control group underwent cheiloplasty by modified millard's rotation advancement technique, closure of nasal floor, columella (caudal septum) dislocation repair, and primary rhinoplasty in first surgery at age of 28 days-4 months. In second surgery patients underwent two flap palatoplasty with vomerian flap and intravelar veloplasty, soft palate repair and also myringotomy and ventilation tube insertion at age of 9-12 month. In case group, infants underwent cleft lip and nose repair (like control

group), hard palate repair by one layer palatoplasty (somerlad's technique) in first surgery (Figure 1) and then is second surgery, patients underwent soft palate repair with intravelarveloplasty. Also, in case group, patients with oronasal fistula after primary surgery were candidate for fistula repair at secondary surgery. Other technique and timing were same with control group.

Follow-up assessments

The first visit was done as soon as possible after referring to the clinic. Patients with ULCP were candidate for primary surgery in early infancy age. After primary surgery, the patients were visited regularly for evaluating the surgery outcomes. If there was fistula or any complication following hard palate repair in primary surgery, patients were candidates for fistula closure in second surgery. Furthermore, if there was fistula in the second surgery in both groups, patients were candidate for repair surgery.

Laboratory analysis

Blood samples (2cc) were collected in dipotassium ethylenediaminetetraacetic acid (EDTA) tubes. An automatic blood cell counter was used for whole blood cell counts with an Abbott Cell-Dyn 1800 hematology analyzer (Abbott Laboratories, Chicago, IL, USA).

Primary and secondary outcomes

Procedural related blood loss (anemia) and fistula formation after surgeries in primary and secondary surgeries were the primary outcomes of this study. Secondary outcome measure was fistula formation after surgeries.

Statistical analysis

The variables were reported as number (%) or mean \pm standard deviation. A Kolmogorove Smirnov test was done to examine the data distribution. Qualitative and quantitative variables were analyzed using a Chi-square and independent t-test, respectively. All statistical analyses were done using SPSS software version 16.0 (SPSS, Inc., Chicago, IL). $P \leq 0.05$ was considered as statistically significant.

Results

Fifteen patients were included in each group and all of the 30 patients were completed the intervention. All of them were included in the final analysis of the outcomes. Eleven patients in case group and 10 patients in the control group were male ($P = 0.115$). The mean age of the patients at the time of primary surgery in the case and control groups were 1.97 ± 1.13 and 1.67 ± 0.82 month, respectively ($P = 0.763$). At the secondary surgery, the mean age of the patients in the case and control groups were 10.07 ± 1.35 and 10.27 ± 1.06 month, respectively ($P = 0.763$).

The mean hemoglobin levels in the case and control groups at the primary surgery were 10.32 ± 0.68 and 10.31 ± 0.49 g/dL, respectively ($P = 0.968$). The mean hemoglobin levels in the case and control groups at

the secondary surgery were 11.29 ± 0.54 and 11.37 ± 0.40 g/dL, respectively ($P= 0.666$). Moreover, the hematocrit levels in the case and control groups at the primary surgery were 30.80 ± 2.43 and 30.46 ± 1.78 g/dL, respectively ($P= 0.689$). The mean hematocrit levels in the case and control groups at the secondary surgery were 33.59 ± 1.84 and 33.54 ± 1.61 g/dL, respectively ($P= 0.943$). Furthermore, there were no any hemorrhagic events and need to blood transfusion during and after surgery in both groups.

Two patients in primary surgery in the case group and two patients in secondary surgery in the control group were developed to oronasal fistula after palatoplasty. There was no significant difference between groups in fistula formation after surgery ($P= 0.432$). Moreover, two patients in the control group underwent revision surgery for fistula repair.

Discussion

With the recent progress in the CLP repair techniques, the procedures to correct cleft lip and palate allow improvisation in outcome and to achieve even better finesse of surgical result [16]. New techniques and modification of previous techniques are developed in recent years to promote the CLP surgery outcomes. Early palatoplasty in patients with UCLP is a new method that needs more studies to evaluate the outcomes of this technique. Current study findings help to increase the knowledge regarding two important complications of this technique including hemorrhagic events and fistula formation.

The results of this study showed that there was no differences in fistula formation as well as hemorrhagic events in patients with UCLP underwent early palatoplasty. There were two patients in both groups with fistula that needs surgical closure; in the case group the fistula repaired in second surgery but in control group patients underwent revision surgery (third surgery) for cleft repair. Fewer revisions mean less scarring and more predictable results in these patients.

Some previous studies were suggested mean age of three months [14, 17], seven months [18], and nine months [15] for single-stage CLP repair [14, 17]. In the current study, palatoplasty was done in early infancy and was in line with Corbo et al. [17] and Laberge et al. [14] studies but all of three reports studied on different outcomes of early palatoplasty. Moreover, different techniques that used for cleft palate closure in these studies were the main difference between studies.

In line with our study, Noor-ul Ferdous et al. [19] found that simultaneous cleft lip and palate is an easy technique without need to blood transfusion. Although there were seven patients with mild bleeding in mentioned study, we had not any perioperative bleeding events among patients. Furthermore, in our study two patients developed to fistula formation but in Noor-ul Ferdous et al. study no patient developed oronasal fistula. Also, fistula repair in second surgery in one of the important factor in operation time duration and in this study lack of fistula in patients is a main cause of lower time in second surgery than first.

A retrospective study by Hodges et al. [20] on patients with UCLP who underwent combined one-stage CLP repair showed that 7 of 106 patients needs surgical closure of fistula and high blood transfusion rate

(one-third of patients). In contrast, there was not any severe perioperative bleeding in the current study. Moreover, Hodges et al. study was a “all in one” study but we performed this surgery in two stage that cause less complications, especially bleeding and need for blood transfusion. Also the surgery time is longer in one-stage than two stage method [21].

On the other hand, there are some concerns about speech characteristics after synchronous CLP repair [22]. Luyten et al. [23] reported deviations from normal speech development following this surgery technique before six months of age. Accordingly, speech therapy might be recommended in patients with synchronous CLP repair to reduce speech impairment.

The limited number of patients with UCLP was the main limitation of this study. Also, lack of regular orthodontic care was another limitation that has effective role in reducing postoperative complications such as fistula formation.

This randomized controlled trials study showed that early palatoplasty in patients with UCLP may as safe as conventional method based on hemorrhagic events and fistula formation findings in short time. Trials with large group of patients recommended for evaluation of long term outcomes on this technique.

Declarations

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

SAF designed the study. SAF and YJG performed the study. YY analyzed data. YJA and ZHS wrote the primary draft. SAF and YY revised the study. All authors read and approved the final version of the manuscript.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Tabriz University of Medical Sciences (Reference number: IR.TBZMED.REC.1399.422).

Consent to participate

Written informed consent was obtained from the parents.

Consent to publish

The authors affirm that human research participants provided informed consent for publication of the images in Figure 1.

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Figures

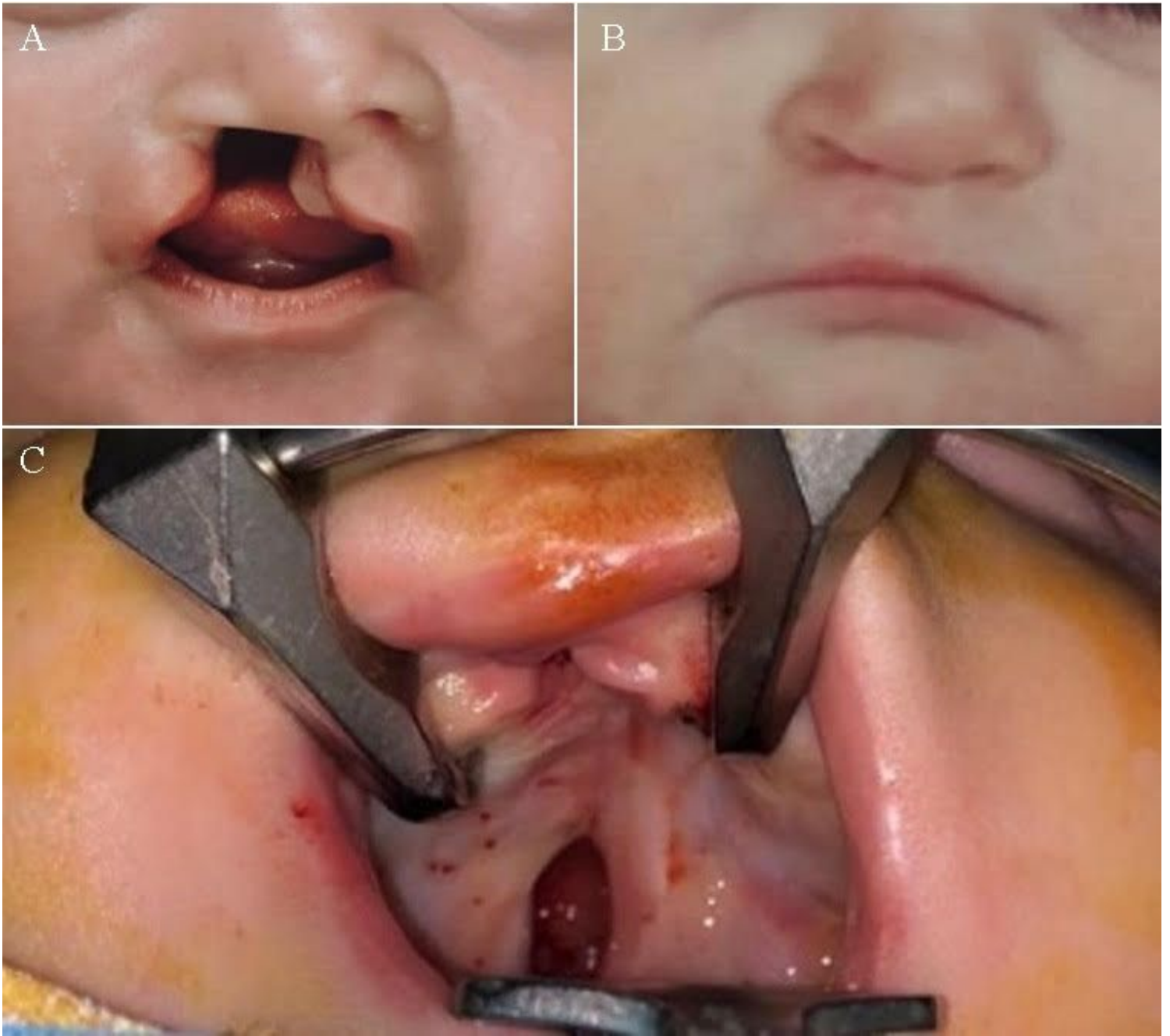


Figure 1

A patient in case group A: Before surgery; B: After cleft lip repair in the first surgery; C: Before second surgery