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Assessing the Amount of Blood Losses and the Blood Needed in different types of Orthognathic Surgery (Corrective Jaw Surgery)

Masoud Mohammadpour[1]*, Sepideh Zandpazandi[2] and Sayedtaha Esfahani[3]

[1]*Department of medicine& dentistry Moscow, Peoples' Friendship University of Russia (RUDN), Russian Federation, Russia*

[2]*Sechenov First Moscow State Medical University, Moscow, Russian Federation, Russia*

[3]*Department of dentistry, Kurdistan University of Medical Science, Iran*

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***Corresponding author:** Masoud Mohammadpour, Department of medicine& dentistry Moscow, Peoples' Friendship University of Russia (RUDN), Russian Federation, Russia

Abstract

Jaw surgery, also known as orthogenetic (or-thog-NATH-ik) surgery, corrects irregularities of the jawbones and realigns the jaws and teeth to improve the way they work. Making these corrections may also improve your facial appearance. Orthognathic surgeries play a large role They have hospital surgeries for blood loss, factors Numerous such as duration of surgery, surgical method, technique Anesthesia, homeostasis and surgeon skills on blood loss They are effective during surgery. In this study, all the conditions required in such surgeries were investigated. In addition, its results can be effective in the process of dental surgeries.

Keywords: Blood loss; bimaxillary surgery; Orthognathic surgery; Hemoglobin; Dentistry

Introduction

Orthognathic Surgery (Corrective Jaw Surgery) involves moving the bones of the upper or lower jaw or both. The jaws are lengthened or shortened, moved up or down, in or out, resulting in a more harmonious bite and facial appearance. Orthognathic surgery is needed when jaws and teeth do not meet correctly [1]. Orthognathic surgery for the treatment of facial skeletal deformities that result in significant malocclusion is considered medically necessary if the medical appropriateness criteria are met [2]. Maxillofacial orthognathic surgery is widely practiced globally, and it is well established because of its capacity to correct many dentofacial deformities [3]. although surgical precision is important, clinicians should also pay attention to other parameters such as the operating time and intra-operative blood loss. Interested in the expected operating time and anticipated need for homologous transfusion [4,5]. A more accurate prediction of operating time and blood loss could help the surgeon and anesthesiologists improve perioperative management. Guidelines should be drawn up for the cross matching of blood units to prepare for elective orthogenetic procedures [6,7]. Patients would then be better informed about the likelihood of a transfusion occurring before they undergo the surgery [8-10].

In medicine and maxillofacial and dental surgeries, "extensive blood loss" refers to the loss of 25% or more of the body's total blood volume. Among the causes of extensive bleeding are trauma and surgery, among which blood loss during surgery accounts for a larger share [10,11]. Extensive blood loss can endanger a person's life, so that if this lost volume is not compensated, insufficient blood flow will eventually lead to irreversible functional impairment of the body's organs. Therefore, if the patient experiences extensive blood loss during orthognathic surgery, it should be replaced in proportion to the volume of blood lost by injecting blood products; otherwise, it can be problematic for the patient. On the other hand, the amount of blood loss during orthognathic surgery is very different, so that in the study of Rummasak et al. This amount was calculated from 200 ml to 3550 ml. Also, in the study of Rammer et al. [12]. this amount was obtained from zero to 4600 ml. Despite extensive research in the field, studies have so far investigated single factors of importance for intraoperative blood loss. Increasing knowledge of the various interplays between these factors may provide a broader understanding of intraoperative blood loss (Figure 1), [6,13,14].

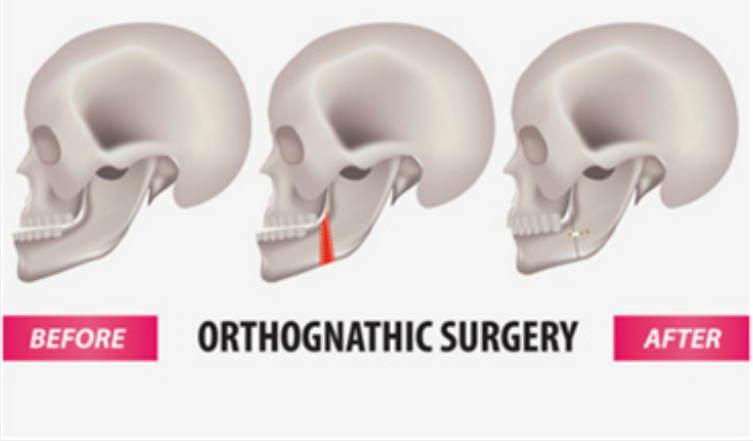

Figure 1: Schematic of Orthognathic Surgery.

This would improve preoperative patient information and assist staff in the planning and performance of surgical procedures. Therefore, accurate estimation and prediction of blood loss during orthognathic surgery is very important. The more accurate this estimate, the more prepared the surgical staff is to deal with potential risks during surgery and give the surgeon and anesthesiologist the prognosis for the necessary treatments [15]. The patient himself is aware of the possibility of blood transfusion before surgery, since it seems that no studies have been done to compare the amount of blood loss during different types of orthognathic surgeries despite the importance of the issue, so in this study, the rate of blood loss during various types of orthognathic surgery in patients from March 2019 to April 2021 in Shahid Beheshti Hospital, Iran. They underwent orthognathic surgery, which was evaluated and compared by the professors' surgical team.

Material and Methods

According to similar studies and using the formula for determining the sample size to compare the two means, 11 patients in each group were calculated with 5% confidence and 80% power. According to the 5 existing groups, a total of 55 patients were included in the study. However, for more certainty and the possibility of dropping samples, 95 patients were included in the study and 3 patients were excluded from the study during surgery. 92 patients requiring orthognathic surgery (54 females and 38 males) were included in the study regardless of the type of surgery in one group of maxillofacial and duodenal. All of these patients underwent orthodontic treatment. A respected colleague of anesthesiologists performed all surgeries in the hospital of the School of Dentistry and Anesthesiology. The researcher completed files for all patients before surgery, including name, age, sex, date of surgery, medical history, history of use, and drug sensitivity.

The amount of blood loss, which is calculated below, was also entered in the file prepared by the researcher. He was also informed that the patient's information was confidential. Inclusion criteria included no history of hemorrhagic disease, no effective drug for coagulation and completion of orthodontic treatment in patients requiring orthognathic surgery. Patients with coagulation disorders in preoperative evaluation, complications during surgery (any problems that lead to excessive surgical prolongation), and abnormal increase in pressure during surgery due to differences in the amount of blood loss during surgery compared to the patient Healthy were excluded from the study. An oral and maxillofacial surgeon and a respected colleague of anesthesiologists with the same conditions, under induction anesthesia, performed all surgeries in patients who were eligible to participate in the study.

The anesthesia technique was controlled by lowering blood pressure; the rate of blood loss in these patients ocularly. The amount of bleeding was calculated based on the number of blood-stained gases and the amount of bleeding in the suction according to the following method: The amount of blood loss in these patients was calculated ocularly based on the amount of bleeding based on the number of blood-stained gases and the amount of bleeding in suction according to the following method: The number of 3-inch × 3inch blood-stained gases and the amount of suctioned blood volume were recorded separately for each patient surgery [6,16]. Each 3.3-bloodstained gas contains 12 milliliters of blood, so the number of blood-stained gases multiplied by 12 milliliters was added to the volume of suctioned blood, since this volume included the volume of lavage fluid in the surgical site. The volume of fluids consumed was also reduced and the result was equal to the amount of actual blood loss of the patient. In the end, all patients were identified and statistically evaluated based on the amount of bleeding by dividing the number of operations (one or two jaws), different types of jaw surgeries (Class II and Class III), age and sex. Data were described by means and mean deviation and comparisons were by test Mann-Whitney was performed ($\alpha = 0.05$).

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Results

The operating time was calculated for each type of orthognathic procedure as the duration from the start time, when the local anesthetic solution was injected, to the end time, when the oral mucosal wound was closed. The intra-operative EBL for each procedure was calculated by weighing the surgical gauze swabs and measuring the contents of the suction bottle (with adjustments made for saline irrigation used) [17]. The hemoglobin level and hematocrit value (packed-cell volume) were obtained on the preoperative day and first postoperative day. Surgical procedures. Were categorized as either maxillary or mandibular and were further subdivided for the analysis [18]. All data were analyzed using the Statistical Package for Social Science (Windows version 10; SPSS Inc., Chicago, The United States). The two-tailed Pearson correlation test was used to assess the bivariate correlation between EBL and operating time, and the change of hematocrit value. A probability level of $P<0.05$ was accepted as being significant. Results In this study, the number of patients was 95, three of whom were excluded due to vascular injury during surgery. 92 patients including 54 women and 38 men with a mean age of 22±2.65 years were included in the study. Table 1 shows that the mean bleeding in class II is slightly higher than class III (Table 2). In addition, the amplitude of dispersion and median in class III is higher than class II. Mann-Whitney test showed that the amount of bleeding in the two groups was not significantly different (P=0.432). The results show that the mean, amplitude and median of bleeding in patients with double surgery the jaw was longer than that of people with single jaw surgery. Due to the abnormal distribution of data, Mann-Whitney test showed that the rate of bleeding in patients with maxillofacial surgery was significantly higher than those with maxillofacial surgery (P <0.001).

Table 1: Mean, standard deviation, minimum, maximum and median bleeding and statistical test results in two types of skeletal problems.

Skeletal class	Number	Average	Standard deviation	The least	Most	Middle	Test statistics	Man-Whitney test result
class I	17	370.28	189.04	168	632	230	Z=0.741	P=0.432
class II	75	346.88	188.51	101.01	760	330	Z=0.741	P=0.432

Table 2: Mean, standard deviation, lowest, highest, and median in class II and III subjects by type of maxillofacial surgery and statistical test result.

Type of surgery	Skeletal class	Number	Average	Standard deviation	The least	Most	Middle	Test statistics	Man-Whitney test result
A jaw	class II	9	198.88	20.35	168.00	230.00	197.00	Z=2.50	P=0.007
Two jaws	class III	29	158.01	60.13	92.00	300.00	138.00	Z=2.50	P=0.007
A jaw	class II	8	582.75	48.43	501.00	629.00	590.00	Z=2.07	P=0.050
Two jaws	class III	48	480.12	135.72	290.00	750.00	456.00	Z=2.07	P=0.050

Discussion

One of the most important problems of orthognathic surgeries is blood loss during surgery. This study was performed to measure the amount of bleeding in different types of orthognathic surgeries so that it can introduce orthognathic surgeries with high risk of bleeding as a source. In this study, the amount of bleeding in single-jaw surgeries, regardless of the jaw, was operated and the direction of jaw movement was significantly less than double-jaw surgeries [1,19]. The need for cross-matched blood units for orthognathic surgery in healthy individuals with an expected blood loss of less than 500 mL is debatable. It is not essential, or even desirable, to replace all blood lost during the surgery because an adult patient with normal cardiopulmonary function can compensate for up to a 20% loss of circulating blood volume. Physicians have a duty to reduce the amount of blood units wasted and to prepare realistic guidelines on how much blood should be cross matched for elective orthogenetic procedures [4,7]. The authors of a study that assessed the need for preoperative autologous blood donation in patients undergoing orthognathic surgery noted the low frequency of transfusion in lower-jaw surgery and concluded that the need for blood transfusion is unlikely [20]. Hence, we believe it is unnecessary to cross match blood for adult patients of ASA physical status I who are to undergo single- or double-jaw osteotomies. A TTS policy is adequate for these patients. In general, it should be said that in terms of the effect of factors such as age, sex, etc., this study was not different from other studies, both in terms of implementation and results. The highlight of this study was the effect of the type of surgery on the amount of bleeding, which showed that surgery in class II patients is more likely to bleed than in class III or double jaws.

Conclusion

This study confirms the positive relationship between intra-operative blood loss and the length of operating time when using induced hypotensive general anesthesia. This information can be used to reassure patients about the amount of blood likely to be lost during surgery and the low rate of transfusion-associated with the technique. The amount of bleeding varies among different types of Orthognathic surgeries depending on the type of surgery and the number of operations (single or maxillary). These factors are effective in estimating the amount of blood loss, determining, and predicting the necessary measures to replace the lost volume.

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Blood transfusions are usually not needed for single jaw surgeries. In patients with Class II problems and the direction of jaw movements is different from Class III patients, the risk of bleeding and the need for blood replacement will be higher.

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