

## Evaluation of Pre- and Post-operative Hemoglobin in Patients with Maxillofacial Injuries

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### Abstract

**Background:** In the past decades, a significant increase has been observed in head and face traumas bleeding during and after surgery is one of the most important and dangerous factors for patients. This study was performed to assess the bleeding amount in patients during maxillofacial surgeries and the necessity of blood transfusion.

**Methods:** In this cross-sectional study, 441 patients were enrolled, of which 83.2% and 16.8% were male and female, respectively. To compare the patients' mean hemoglobin concentration before and after surgery, paired t-test was used. Furthermore, to compare the mean hemoglobin concentration and mean intraoperative bleeding between males and females, independent t-test was used. The significance level was set as 0.05 for all tests.

**Results:** The mean difference of hemoglobin concentration before and after surgery in patients of the study had a significant difference ( $P < 0.001$ ). The amount of blood loss during surgery showed no significant difference between males and females ( $P > 0.050$ ).

**Conclusions:** The results of this study demonstrated that there was a decrease in mean hemoglobin concentration after surgery, and also, the amount of blood loss in patients during surgery was not high enough for blood transfusion. However, it should be considered that to prevent any problem during surgery, assessing patients with anemia before surgical operations is necessary.

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**Keywords:** Pre-operative hemoglobin; Post-operative hemoglobin; Maxillofacial injuries

### Introduction

In the past decades, a significant increase has been observed in head and face traumas (1). Phenomena such as vehicle accidents, traffic accidents, adventures, combat sports, increasing conflicts and violence, and occupational accidents are factors which have caused a dramatic increase in the number of various physical injuries such as head and face traumas (2). For this reason, maxillofacial surgeries have become more common in trauma center hospitals (3). Patients admitted to hospitals with maxillofacial fractures, faced to bleeding problems during surgery because of the severity of their injuries (4). Causes and incidence of facial fractures are variable in different countries. Age and sex of patients, type of maxillofacial fractures, causes and site of fractures, and adjacent organ damages can affect the amount of patients bleeding (5).

Blood loss in patients undergoing surgery causes serious side effects in these patients (6). Despite the use of advanced techniques in surgery and anesthesia, the patients undergoing surgical operations, experience blood loss (7). Anemia also can reduce the quality of life for a long time (8). Hence, serious complications of anemia after surgery should be avoided by blood transfusion method if it is necessary (6). Findings from studies in Iran show that most of maxillofacial fractures were cars and motorcycles accidents, and these events allocate 54% of maxillofacial fractures to themselves and the second factor of fractures was falling from height (9,10). Most fractures occur in mandible and the lowest fractures occur in Maxilla, and mid face is located in the intermediate state in terms of number (11); in Iran, the most sites of maxillofacial fractures were mandibles and maxilla, and common sites of fractures were body, parasymfis, and angle of

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the mandible (9,10). Mandible fractures are the most common fractures of maxillofacial, which consist of more than half of total facial fractures (5). Mandible fractures by many factors, such as temporomandibular joint dysfunction, occlusion situation or the displacement of bone resorption, could be the causes of facial deformities (11). Zygomatic bone fractures are of most important fractures which in the absence of early diagnosis and treatment can lead to abnormalities in function and cosmetic (11). Trauma and traffic events cause different maxillofacial fractures by type and site, and also these events can cause debilitating and multiple injuries. Hence, bleeding before admitting patients to the hospital, during and after surgeries are major factors for the patients which must be evaluated (12). During general anesthesia due to vasodilatation and crossing red blood cells from dilated capillaries, the amount of hemoglobin and hematocrit decreases in peripheral veins falsely about 7-10 percent. This phenomenon is called plasma skimming which prevents unnecessary and hastily transfusions (13,14).

Various researches have been done in the field of causes of maxillofacial fractures, but no study is available in terms of the amount of hemoglobin concentration in patients with maxillofacial fractures in Iran. This survey was done to assess the amount of hemoglobin concentration before and after of surgery in patients with maxillofacial fractures in Shahid Chamran Hospital during the past 5 years (2013-2016). Hence, by doing this study, we could determine the relationship between the results of blood hemoglobin before and after surgery and also complications after surgery. Finally, we evaluated the results in anticipating the need for preparing blood products after surgery.

## Materials and Methods

This study was done as a cross-sectional study. Inclusion criteria were patients referred to Shahid Chamran Hospital, Shiraz, from 2013 to 2016 by various types of maxillofacial fractures resulting from injuries by any reason and also had maxillofacial operations. Exclusion criteria were incomplete medical records and patients with undesirable and unpredictable surgical events. Patients' data were collected using a checklist. These data were included demographic characteristics, reasons and sites of fractures, the amount patient's blood hemoglobin concentration before and after surgeries, the amount of blood loss during surgery, receiving blood products during surgery, and duration of the operation. The amount of blood loss had been measured by volume suction devices and also 4 × 4 gauzes used during surgeries. To analysis data, SPSS software (version 18; SPSS Inc., Chicago, IL., USA) was used. Paired t-test was used to compare the mean hemoglobin before and after the

surgery. Since the distribution of the blood loss amounts in the studied patients did not follow a normal distribution, so the nonparametric test of Mann-Whitney was used to investigate the relationship between independent variables and distribution the amount of blood loss. Furthermore, to investigate the relation between the amount of blood loss and quantitative variables, Kendall correlation coefficient was used. The level of significance was set as 0.050 for all tests.

## Results

In this cross-sectional study, medical records of 441 patients who were admitted to Shahid Chamran Hospital, Shiraz, Iran, during the years of 2007-2012 and had maxillofacial surgery, was assessed. Among patients of study, 367 patients (83.2%) were male and 74 patients (16.8%) were female. The results showed that traffic accident was the most frequent cause of injuries in patients of study, and the most fractures were occurred in mandible site (57.8%). Only 6 patients (1.4%) received blood products during their surgeries (Table 1).

**Table 1.** Descriptive statistics of fracture types and accidents, and the status of receiving blood products during surgical operation

Variable	Levels of variable	Frequency (%)
Type of fracture	Mandible	225 (57.8)
	Lefort 1	18 (4.1)
	Lefort 2	10 (2.3)
	Pan facial	46 (10.4)
	Zmc*/nasal/orbit	100 (22.7)
	Dent alveolar	12 (2.7)
	Total	441 (100)
Type of accident	Traffic accident	292 (66.2)
	Strife	81 (18.4)
	Incident	68 (15.4)
	Total	441 (100)
Blood products receiving	Received	435 (98.6)
	Not received	6 (1.4)
	Total	441 (100)

\* Zygomatic complex fracture

The mean duration time of operations was 2.45 hours ± 0.8. In addition, our results showed that the mean of blood loss during the operation surgeries was 141.79 ± 99.67 cc, and there was a linear relation between time duration of surgery and the amount of blood loss in patients, and this relation was significant statistically ( $P < 0.001$ ) (Figure 1). Furthermore, there was no any significant correlation between age and blood loss during surgery ( $P > 0.050$ ) (Figure 2). Our results show that there was no significant correlation between type of maxillofacial fractures, the cause of injury and gender with mean of blood loss ( $P > 0.050$ ), (Table 2).

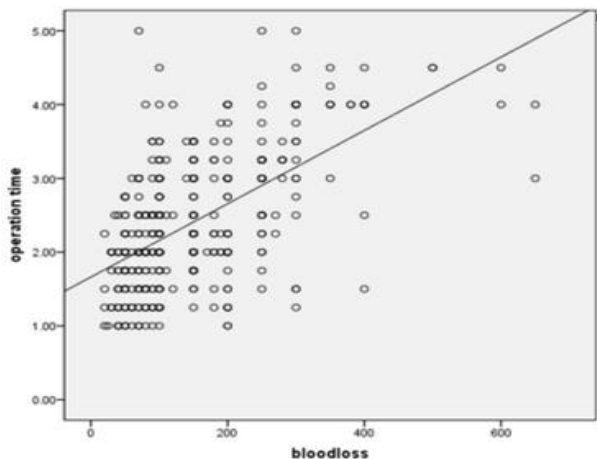


Figure 1. The correlation of between duration of surgery and blood loss

This study demonstrated that mean of hemoglobin was 13.63 mg/dl and 12.31 mg/dl before and after surgery, respectively, that the difference was significant ( $P < 0.001$ ).

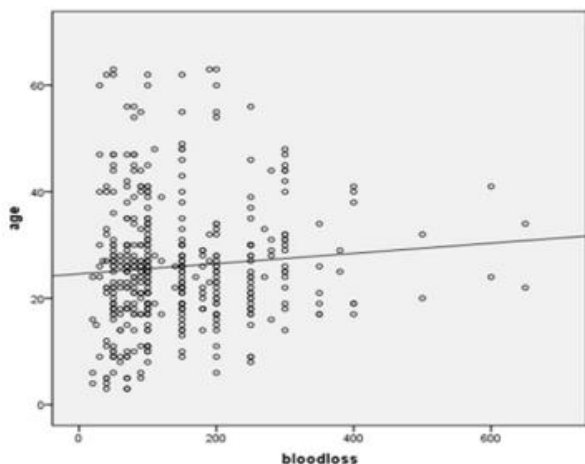


Figure 2. The correlation of between age and blood loss

### Discussion

This study was performed with the aim of assessing the need for blood transfusion in patients undergoing maxillofacial trauma surgery. The findings of this study indicated that maxillofacial trauma surgery and also factors such as age and gender did not have any significant difference in the amount of blood loss. In addition, we observed that the mean hemoglobin concentration decreased after surgery. Mean of blood loss during surgeries in this study was lower than that of surgeries performed on patients with maxillofacial (including orthognathic surgery). The extensive network of vessels in maxillofacial makes the control of bleeding difficult during the surgery. Because of this reason, always bleeding during maxillofacial surgery is a major concern (15,16).

Table 2. Descriptive statistics of blood loss based on type of fracture, accident and sex

Variable	Levels of variable	Mean
Type of fracture	Mandible	79.06
	Lefort 1	76.67
	Lefort 2	55.00
	Pan facial	113.08
	Zmc*/nasal/orbit	87.67
Dent alveolar		68.75
	Total	83.87
Type of accident	Traffic accident	90.69
	Strife	67.50
	Incident	75.45
	Total	83.87
Sex	Male	143.28 (96.78)
	Female	134.39 (113.39)
	Total	141.79 (99.67)

\*Zygomatic complex fracture

In our investigations, we did not find any survey similar to the aim of our study, but Samman et al. (17) showed that there was no need for blood transfusion for orthognathic surgeries, although 27% of maxillary osteotomy patients required blood transfusion, but in contrast, in Moenning et al. (18) study, only 4 patients (0.8%) among 506 patients with orthognathic surgery need blood transfusion. Furthermore, Ueki et al. (19) demonstrated that bleeding during surgical operations in patient under Lefort 1 and osteotomy of mandible ramus surgeries, alone or in combination, was totally lower than the set point for the need of blood transfusion. Panula et al. (20) showed that the mean orthognathic operation time was 162.2 (40-480) minutes, and the difference of hemoglobin concentration mean before and after surgery was significant. The results of Panula et al.'s study were in agreement with our observation in this study, but in a survey performed by Yu et al. (21), the average time of surgical operations was 77.269 minutes which was different with our results. In addition, the amount of bleeding during surgical operations was more than our study. These observed differences can be attributed to the type and time duration of surgical operations. The results of Choi et al.'s (22) study were in accord with our findings. The duration time of surgical operations was similar in both studies. In addition, similar to our results, they showed that there was a significant difference between the mean hemoglobin concentrations before and after surgery. Advances in biologic sciences in the field of maxillofacial surgeries and the use of inducing hypotansion drugs have caused a reduction in the need for blood transfusion and the time of surgery. In current studies, the risk of bleeding in maxillofacial surgery is usually low and the need for blood transfusion is not necessary for these kinds of surgeries (23). Considering the results of our study and since a small percentage of patients under maxillofacial surgery require blood transfusion, and according to the high cost, problems of preparing blood and its products,

and the risk of blood transfusion, it is expected that there is no need for blood transfusion in these patients except in special cases such as large vessel injury during operation, anemia and complicated surgery.

## Conflict of Interests

Authors have no conflict of interests.

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