

Clinical Paper  
Orthognathic Surgery

# Effect of preoperative autologous blood donation on patients undergoing bimaxillary orthognathic surgery: a retrospective analysis

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**Abstract.** The efficacy of preoperative autologous blood donation (PABD) was evaluated according to preoperative haemoglobin (Hb) values. The records of 295 patients who underwent bimaxillary orthognathic surgery between July 2007 and August 2008 were reviewed. The records for autologous blood donation, intraoperative transfusion, and related laboratory studies were also evaluated. The transfusion trigger used during this period was Hb <10 g/dl. A total of 189 patients (64.1%) made a PABD and 106 patients (35.9%) did not. The incidence of allogeneic blood transfusion was significantly lower in the PABD group than in the no PABD group (15.9% vs. 29.2%,  $P = 0.007$ ). This difference was greater in patients with a preoperative Hb <14 g/dl (20.3% vs. 62.5%,  $P < 0.0001$ ), and no difference was found in patients with Hb  $\geq 14$  g/dl (13.3% vs. 14.9%,  $P = 0.83$ ). PABD reduced the incidence of allogeneic blood transfusion in patients undergoing bimaxillary orthognathic surgery, particularly in patients with a preoperative Hb <14 g/dl. PABD could be used to reduce the frequency of intraoperative allogeneic blood transfusion in these patients.

**Key words:** autologous blood transfusion haemoglobin; orthognathic surgery; transfusion.

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Bimaxillary orthognathic surgery is commonly used to correct bimaxillary prognathism or a mid-facial depression. It is associated with a significant risk of blood loss and transfusion due to the high vascularity and poor visualization of the

operative site.<sup>1</sup> Efforts have been made to reduce the use of allogeneic blood transfusion, and the most frequently used methods are hypotensive anaesthesia and preoperative autologous blood donation (PABD). PABD was encouraged in the

1980s due to fear of the transfusion-related transmission of human immunodeficiency virus. However, the use of PABD has decreased since its peak in the 1990s, mainly due to the improved safety of allogeneic blood and the poor cost–benefit

ratio.<sup>2</sup> Induced hypotensive anaesthesia is another method that can reduce intraoperative blood loss and transfusion requirements.<sup>3</sup> However, it is still considered a good option to reduce allogeneic blood transfusion during some surgeries associated with a high risk of intraoperative bleeding, such as cardiac surgery, total hip replacement surgery, and total knee arthroplasty.<sup>4-6</sup> The use of PABD during bimaxillary orthognathic surgery is controversial,<sup>7,8</sup> and the effect of the preoperative haemoglobin (Hb) level on the efficacy of PABD has not been evaluated.

Therefore, this retrospective analysis of patients who underwent elective bimaxillary orthognathic surgery evaluated the effect of PABD on the rate of allogeneic blood transfusion and the effect of the preoperative Hb level on PABD efficacy.

## Methods

This study was approved by the institutional review board of the study dental hospital in Seoul, Korea. The records of all patients who underwent bimaxillary orthognathic surgery at the university dental hospital from July 2007 to August 2008 were reviewed retrospectively. The patients' history of PABD, intraoperative autologous or allogeneic blood transfusion, and changes in Hb were evaluated. All patients scheduled for elective bimaxillary orthognathic surgery who met the inclusion criteria were encouraged to make a PABD. The inclusion criteria for PABD were patient age 15-65 years, Hb >11.0 g/dl, and the provision of informed consent for PABD. It was the institution's policy to obtain written informed consent from the patient or the legal guardians in the case of children, before PABD. Hence, all patients who made a PABD had provided written informed consent for the PABD.

Three units of autologous blood were collected, one unit at a time, with at least a 1-week interval between collections; the last unit was collected >72 h preoperatively. The blood volume collected at any

one time was 320 ml for women and 400 ml for men. The volume collected was reduced appropriately for male patients weighing <50 kg and female patients weighing <45 kg. Patients who made a PABD were encouraged to take oral iron supplements, and preoperative Hb levels were rechecked 1 day before the operation. Before surgical incision, all patients were infiltrated with 1:100,000 epinephrine in 2% lidocaine. Transfusions were done to maintain the target Hb of 10 g/dl. However, it was attempted to delay transfusion until the end of the main procedure while maintaining the blood pressure with an infusion of crystalloids for as long as possible, in order that the transfused blood not be lost by continuing surgery. The estimated blood loss was calculated based on the Hb level and estimated blood volume.<sup>9</sup>

The patients were divided into two groups according to their PABD status. The effect of PABD on intraoperative allogeneic blood transfusion was evaluated. The efficacy of PABD was also evaluated according to the patient preoperative Hb concentrations.

The statistical analysis was performed using IBM SPSS Statistics version 21.0

software (IBM Corp., Armonk, NY, USA). Results were analyzed using the Student *t*-test or the  $\chi^2$  test, and  $P < 0.05$  was considered significant.

## Results

Between July 2007 and August 2008, 295 patients underwent bimaxillary orthognathic surgery. Of these patients, 189 (64.1%) made a PABD and 106 (35.9%) did not; these patients were designated as the 'PABD group' and 'no PABD group', respectively. The demographic data did not differ between the two groups (Table 1).

Patients in the PABD group donated  $2.6 \pm 0.6$  units of blood, and the mean preoperative Hb decreased from  $14.5 \pm 1.5$  to  $12.4 \pm 1.5$  g/dl after PABD. The estimated intraoperative blood loss and postoperative Hb did not differ between the two groups. The incidence of intraoperative allogeneic blood transfusion was lower in the PABD group than in the no PABD group (15.9% vs. 29.2%,  $P < 0.007$ ). However, the overall transfusion rate, including autologous blood, was higher in the PABD group than in the no PABD group (80.4% vs. 29.2%,  $P < 0.0001$ ) (Table 2).

Table 1. Patient characteristics.<sup>a</sup>

	PABD (n = 189)	No PABD (n = 106)
Age, years	24.8 ± 4.2	24.8 ± 5.9
Sex ratio M:F, number of patients	101:88	62:44
BMI, kg/m <sup>2</sup>	21.8 ± 3.1	21.7 ± 3.1
Weight, kg	62.9 ± 12.1	62.3 ± 12.5
Height, cm	169.5 ± 8.5	169.1 ± 9.4
ASA score 1/2/3, number of patients	184/5/0	103/3/0
Operation time, min	456 ± 135	404 ± 127
Operations		
Le Fort I + SSRO or IVSRO	177	101
Le Fort I + II + SSRO or IVSRO	6	3
Le Fort II or III + IVSRO	6	2
Additional procedures <sup>b</sup>	124	68

ASA, American Society of Anesthesiologists; BMI, body mass index; F, female; IVSRO, intraoral vertico-sagittal ramus osteotomy; M, male; PABD, preoperative autologous blood donation; SSRO, sagittal split ramus osteotomy.

<sup>a</sup>Data are presented as the mean ± standard deviation, or number of patients.

<sup>b</sup>Genioplasty, angle shaving, or both.

Table 2. Transfusion-related data.<sup>a</sup>

	PABD (n = 189)	No PABD (n = 106)	<i>P</i> -value
Preoperative or pre-PABD Hb, g/dl	14.5 ± 1.5	14.8 ± 1.6	0.05
Post-PABD, preoperative 1 day Hb, g/dl	12.4 ± 1.5		
Estimated blood loss, ml	1568 ± 757	1457 ± 791	0.24
Postoperative Hb, g/dl	10.5 ± 1.2	10.8 ± 1.4	0.08
No transfusion, number of patients (%)	37 (19.6%)	75 (70.8%)	0.00
Allogeneic blood transfusion, number of patients (%)	30 (15.9%)	31 (29.2%)	0.007
Number of RBC units in allogeneic blood transfusion patients	2.8 ± 1.8	3.4 ± 3.4	0.54

PABD, preoperative autologous blood donation; Hb, haemoglobin; RBC, red blood cells.

<sup>a</sup>Data are presented as the mean ± standard deviation, or number (%).

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