

The Use of Recombinant Human Erythropoietin Stimulating Factor in Plastic Surgery

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Abstract. Erythropoietin is the most important factor in the regulation of erythropoiesis. This study aimed to evaluate the efficacy of rhuESF for patients undergoing plastic surgical procedures during which notable blood loss is expected (reduction mammoplasty in cases of macromastia and abdominoplasty obese patients) to improve the full blood count and reduce the need for transfusion. The levels of hemoglobin were significantly greater for patients pretreated with erythropoietin and iron than for the control group.

Key words: Blood loss in plastic surgery—Erythropoietin

Erythropoietin (erythropoiesis-stimulating factor [ESF]) is a complex glycoprotein considered to be the most important factor in the regulation of erythropoiesis. The kidney has an important role in the production of erythropoietin in the form of an activator erythropoietin that transforms an inactive circulating protein into active erythropoietin. This acts on stem cells, stimulating their differentiation into erythroid cells [7]. The clinical uses of erythropoietin in the form of recombinant human erythropoietin (rhuESF) are limited to anemia caused by renal failure because the lowest levels of erythropoietin are found in the kidney, and to bone marrow transplants, in which it is able to stimulate the resumption of erythropoiesis. Scientific evidence does not exist to demonstrate the efficacy of exogenous erythropoietin in the therapeutic control of anemia resulting from protein deficiency, pregnancy, chronic infective ill-

nesses, neoplasia, or surgery [5,6]. This study aimed to evaluate the efficacy of rhuESF in the treatment of patients undergoing plastic surgical procedures in which notable blood loss is expected to improve the full blood count and reduce the need for transfusion.

Materials and Methods

The prechosen interventions in our study are among those involving the most blood loss in plastic surgery: reduction mammoplasty in cases of macromastia and abdominoplasty for in obese patients. For these, an intraoperative blood loss of approximately 400 to 600 ml is expected. This is managed sometimes with the transfusion of homologous blood, and in rare cases, autologous blood [1,3,4,9,11,12,14,15].

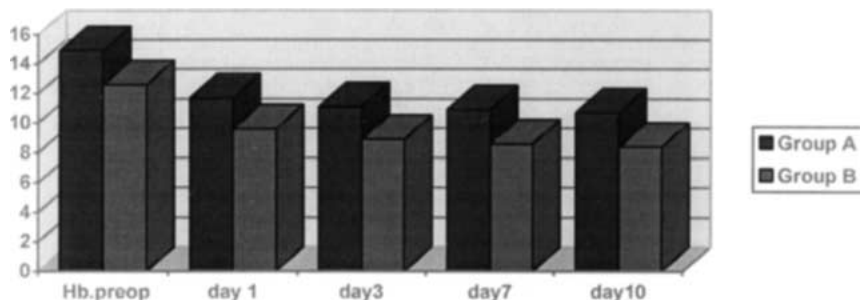
The study involved 30 patients (13 men and 17 women) between the ages of 24 and 62 years (median age, 43 ± 5 years). These patients, weighing 53 to 94 kg, (median, 73.5 ± 5 kg), represented American Society of Anesthesiology (ASA) classes 1 and 2.

The patients were subdivided into two groups, group A and group B, on the basis of their waiting list position. Group A contained 15 patients. Eight of these patients underwent abdominoplasty, and seven were treated with reduction mammoplasty. Because their hemoglobin levels were between 10.8 and 13.0 g/dl (median 11.8 g/dl), they received, 500 mg/24 h of iron orally for 14 days before the intervention, and a single dose of rhuESF 40,000 units on the 14th and 7th days before surgery.

Group B (the control group) contained 15 patients. Eight of these patients underwent abdominoplasty, and seven were treated with reduction mammoplasty. Because their preoperative hemoglobin levels ranged from 11.0 to 13.8 g/dl (median, 12.4 g/dl), they were

Table 1. Numeric and graphic representation of hemoglobin concentrations in the immediate preoperative period and in the days after surgical interventions

	Hb Pre Epo	Hb preop (g.dl)	Day 1 postop	Day3 postop	Day 7 postop	Day 10 postop
Group A	11.8 ± 0.2	14.9 ± 0.5	11.7 ± 0.4	11.1 ± 0.2	10.7 ± 0.5	10.9 ± 0.3
Group B	12.4 ± 0.2	12.6 ± 0.2	9.6 ± 0.3	8.9 ± 0.4	8.4 ± 0.2	8.6 ± 0.64



given 500 mg/24 h of iron orally for the 14 days before their intervention.

The patients excluded from the study included those affected by hematologic disease, serious hypertension, unstable angina pectoris, congestive cardiac failure, or cerebrovascular events during the preceding 12 months.

All the patients underwent a blood test to determine full blood count, reticulocyte, ferritin, transferrin, and iron levels. The same tests were performed during the immediate preoperative period, then on days 1, 3, 7, and 10 postoperatively.

During the intervention, all the patients underwent continuous monitoring of electrocardiogram in lead 2, frequency, systolic blood pressure, diastolic blood pressure, median blood pressure, and hourly urine output.

Statistical analysis was conducted using the Student's *t*-test, and *p* values less than 0.05 were considered significant.

Results

Among the haematologic parameters examined, transferrin, iron, and ferritin levels did not show significant variation between the two groups. The levels of hemoglobin, however, were markedly different.

The patients in group A demonstrated a considerable increase in hemoglobin values preoperatively, from 11.9 g/dl to 14.9 g/dl, and a smaller decrease postoperatively. The average amount of blood transfused was 0 units in group A and 1.6 in group B. There were no side effects particularly attributable to the administration of rhuESF, and furthermore, the postoperative general condition of the patients in group A was better (Table 1) [2,4,12].

Discussion

Blood transfusion, traditionally considered to be a therapeutically effective and essential support for modern medicosurgical practice is increasingly regarded as a procedure to avoid. Despite the adoption of severe measures in the selection of blood donors and the introduction of ever more sensitive tests to detect subjects carrying transmittable infective agents, transfusion therapy absolutely without risks does not exist and probably will not exist in the future. The use of homologous blood can be reduced, not only with the adoption of autotransfusion methods, but also through the use of drugs that can increase the volume of erythrocytes or reduce the intraoperative blood loss. In agreement with the data in the literature, our study confirmed that among the drugs currently available, rhuESF is particularly effective in limiting the requirement of homologous blood transfusions in selected patients among candidates for surgical interventions in which a significant loss of blood is expected. Studies have shown rhuESF to be effective for erythropoiesis stimulation, for expansion of the circulating erythrocytic mass, for increasing the volume of autologous blood that the patient is able to store to reduce the use of allogenic blood, and for improving the outcome experienced by the patients themselves [8,13].

The data obtained in our study, although preliminary, leads us to believe that the use of rhuESF preoperatively is safe and effective for selected plastic surgical interventions: reduction mammoplasty and abdominoplasty. Furthermore, the cost for 40,000 units of rhuESF is about 370 euros, as compared with 500 euros for an auto trasfusion.

Notably, this study found that the substantial increase in hemoglobin values during the preoperative phase allowed optimal management of postoperative anemia, reducing the likelihood of transfusions and increasing the levels of hemoglobin and hematocrit

without increasing the thrombotic risk. Therefore, the reported treatment represents a useful addition to the current techniques for autotransfusion and saving of blood and may be capable of extension to other reconstructive procedures involving notable blood loss.

Summary

32 patients underwent plastic surgical procedures abdominoplasty and reduction mammoplasty for which a significant blood loss was expected. To evaluate the effectiveness of rHuESF in improving full blood count and reducing the need for transfusions, expected. The patients were subdivided into two groups (group A, underwent treatment with rhuESF and iron, and group B served as the control group). Both groups underwent periodic blood tests in the immediate postoperative period. Among the haematologic parameters examined, transferrin, iron, and ferritin levels did not show significant variation between the two groups. However, the levels of hemoglobin were significantly higher among the patients pretreated with erythropoietin and iron than in the control group. Therefore, the use of rHuESF preoperatively is particularly safe and effective for plastic surgical procedures during which significant loss of blood is expected, allowing optimal management of postoperative anemia, reducing the likelihood of transfusions, and increasing the levels of hemoglobin and hematocrit without increasing the thrombotic risk.

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