Recombinant human erythropoietin reduces allogeneic blood transfusion requirements in patients undergoing major orthopedic surgery

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Abstract—Blood loss is a significant problem encountered in patients undergoing total joint arthroplasty, and is considered to be one of the factors affecting the outcome of the operation. Traditionally these patients have been treated with blood transfusions. The introduction of recombinant human erythropoietin (rHuEpo) into clinical practice enabled assessment of its effectiveness to decrease the allogeneic blood transfusion requirement (BTR), thus avoiding or minimizing transfusion-related complications.

Fifteen patients undergoing total hip replacement (THR, 10 patients) and total knee replacement (TKR, 5 patients) in our institute (from January–April 1997), were studied. After signing an informed consent they received daily s.c. rHuEpo (100 IU/kg for those with hemoglobin (Hb) > 13 g/dl, 300 IU/kg for Hb < 13) during the 10 days prior to surgery and the 4 days following the operation. Allogeneic red blood cell (RBC) transfusions were given as needed. Hb levels were measured on days 0, 1, 3 and 7 of the procedure and the BTR was recorded. The results were compared with those of previous patients operated on from January–December 1996. Patients who were eligible for the study but refused to participate served as controls.

The mean Hb level in the study group prior to rHuEpo administration (day −10) was 13.41 g/dl, similar to those of the control group (13.47 g/dl on day 0). However, the mean Hb levels in the rHuEpo treated patients on days 0, 1, 3 and 7 were 14.37, 11.09, 10.99, and 11.2 g/dl, respectively. This way compared with the levels of 13.47 (p = 0.016), 9.88 (p = 0.024), 9.60 (p = 0.004) and 9.97 g/dl (p = 0.007) in the control patients. The difference between the rHuEpo treated patients and the control patients was more significant among the THR patients than among the TKR patients.

Of the 10 rHuEpo-treated THR patients, only a single patient required one allogeneic blood unit, as compared with 23 units transfused to the 30 control patients. None of the rHuEpo-treated TKR

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patients required blood transfusion as opposed to 4 units needed by the 11 control patients. In total, only one allogeneic blood unit was required by the study group which way calculated to an average consumption of 0.066 blood unit per person, compared with 27 blood units used by the 41 controls, i.e. 0.66 blood units per person ($p < 0.001$).

In the patients treated, rHuEpo was very well tolerated with no adverse effects.

*Key words:* Hip replacement; knee replacement; blood transfusion requirement; recombinant human erythropoietin.

**INTRODUCTION**

Major orthopedic surgery, especially total hip replacement (THR) and total knee replacement (TKR), are often associated with significant blood loss, leading to symptomatic anemia [1]. The prognosis and risk of a fatal outcome in these patients has been found to be related to the amount of blood loss and the degree of anemia [2]. The traditional way to treat the anemia has been blood transfusions. However, this approach has been associated with various immediate and late complications [3–5]. This study was undertaken in an attempt to study the efficacy of recombinant human erythropoietin (rHuEpo, Epoetin-alfa) in attenuating the anemia and reducing allogeneic blood transfusion requirements (BTR) of such patients.

**PATIENTS AND METHODS**

Fifteen patients scheduled for elective major orthopedic surgery in the Rabin Medical Center from January 1st–April 30th, 1997, entered the study. Ten patients underwent THR, and 5 patients underwent TKR. The inclusion criteria into the study included hemoglobin (Hb) levels of $<15$ g/dl, normal routine serum biochemistry, including liver and renal function, and normal iron stores (serum ferritin $>50$ ng/dl).

Exclusion criteria were:

1. Clinical or laboratory evidence of dysfunction of any of the following systems:
   - cardiovascular, pulmonary, neurological, gastrointestinal, genitourinary,
   - hematological including blood coagulation.

2. Participation in an autologous blood donation program.

3. Uncontrolled hypertension.

4. History of seizures.

5. Evidence of active blood loss.

6. Coexistent active infectious or neoplastic disease.

7. History of drug or alcohol abuse.