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## Autologous blood transfusion following total knee arthroplasty: is it always necessary?

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**Abstract** A retrospective study of 85 patients undergoing primary total knee replacement (TKR), who also received autologous blood transfusion (ABT) to compensate for the perioperative blood loss. In our series 16.4% of the patients needed allogenic blood transfusion. Of the remaining 83.4% only 49.5% received autologous transfusion. Autologous transfusion was withheld in 34.1% of cases either because the blood volume was inadequate or because the collection time exceeded the recommended time limit. The mean haemoglobin (Hb) level with or without autologous transfusion was 10 g, raising the question of the necessity of using autologous transfusion in primary total TKR.

**Résumé** Etude rétrospective de 85 patients ayant eu une prothèse totale de genou avec transfusion autologue. Chez 16,4% des patients, une transfusion homologue a été nécessaire. Parmi les 83,4% de patients restant, seulement 49,5% ont reçu une transfusion autologue. La transfusion autologue ne fut pas possible dans 34,1% des cas soit à cause du volume inadéquate soit à cause du dépassement de la date de péremption. Avec ou sans transfusion autologue le taux moyen d'hémoglobine était de 10 g, posant la question de l'intérêt des transfusions autologues dans la chirurgie du remplacement primaire prothétique du genou.

### Introduction

Blood transfusion following joint arthroplasty is a common practice. The demand for allogenic blood transfusion following arthroplasty procedures has put a strain on

blood banks to meet the requirements. As a result, alternatives to allogenic blood transfusion have been introduced to cover blood loss following knee arthroplasty. Autologous blood re-infusion is one of the methods that currently being used to replace blood loss following surgery without relying on allogenic blood. In our unit (GHH), the use of autologous blood transfusion (ABT) was introduced in 1999 to decrease banked blood consumption for knee arthroplasty operations. A review of literature revealed that the introduction of autologous blood re-infusion has decreased the consumption of banked blood [1–3, 6, 7, 10, 13–15, 17, 19]. However, re-infusion carries risks and is reported to be associated with dilutional coagulopathy, disseminated intravascular coagulation, re-infusion of anticoagulants, and renal insufficiency. Moreover, there is concern that the quality of the blood re-infused into the patient is not useful in raising the haemoglobin (Hb) level. This would render the practice of autologous blood re-infusion unnecessary and potentially hazardous due to the small but well recognised risk of ABT reaction. The aim of this study is to assess the effectiveness of autologous blood in reducing the need for allogenic blood and the impact of re-infusion on postoperative Hb levels.

### Patients and methods

A retrospective review of 100 consecutive total knee replacements (TKR) admissions to the Good Hope Hospital (GHH) admitted in the period 2000–2001. The data collected included age, sex, pre- and postoperative Hb, pre- and postoperative packed cell volume, volume of autologous transfusion and the number of homologous blood bank transfusions.

### Results

Eighty-five sets of case notes were available for review. The mean postoperative Hb level was  $10 \pm 1.14$ . Among the

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**Table 1** Summary of results

Parameters	Results	Range
Preoperative Hb (mean)	13.27±1.037	9.5–16.1
Postoperative Hb (Mean)	10±1.14	5.9–13.5
Mean Hb drop	3.2±0.90	
Volume of autologous transfusion	369 ml	

*Hb* haemoglobin

patients, 16.4% needed homologous blood (a total of 26 units transfused), with Hb less than 8 g. Of the remaining 83.6%, 49.5% received autologous blood, in 34.1% of the cases ABT was not performed, as the blood volume collected was inadequate, but no homologous blood was given. The results of this study showed a transfusion rate of 6% and an average of 0.1 units per procedure. Our findings are summarised in Table 1.

## Discussion

In this study, the use of autologous blood was helpful in reducing the use of allogenic blood following knee arthroplasty (6% compared with the national average of 39.7%). Our results are in agreement with published series (Table 2). Our results are comparable to those of Sinha et al. [15], who showed that homologous blood use can be reduced with the use of autologous transfusion following TKR. They reported an 80% drop in the rate of homologous blood transfusion with the use of ABT. In our view, however, the effect of ABT on the postoperative Hb level is questionable. The volume needed to raise the blood Hb level was difficult to obtain in the majority of TKR patients. In effect, ABT made us accept lower postoperative Hb levels, thereby avoiding homologous blood transfusion.

The main problem with ABT following TKR is the collected blood volume. Rizzi et al. [11] and Ulmas et al. [18] studied the volume of the blood collected after TKR. The mean volume of RBCs lost during the first 6 h after TKR was equal to 67% of a unit of blood. Eighty percent of patients lost the equivalent of no more than two-thirds of a unit of blood. Only 5.9% of the patients studied had RBC

losses in excess of one unit of blood. Ulmas et al. [19], studied the practice of autologous transfusion following TKR on 161 patients using the Solcotrans system (washed). In the study, the mean quantity of packed red cells salvaged after washing was 149 g in primary TKR. It was established that the theoretical increase in Hb concentration from the volume salvaged is 0.47 g/dl. As a result, 3.4 Solcotrans Plus devices were used to obtain a 1 g/dl increase in Hb concentration. These findings were confirmed by Mauerhan et al. [8], who showed that the use of an autologous re-infusion system in the presence of adequate blood collection made no statistical difference to the postoperative Hb level.

These findings raised the question of the quality of the collected blood and the survivorship of the RBCs after collection. Gronborg et al. [4] studied the RBCs collected after TKR. A fraction of the blood was radiolabelled with chromium-51 before re-infusion. The activity of chromium was measured over a 40-day period, with frequent venous blood samples. The time from 100% to 50% activity of the isotope (<sup>51</sup>Cr) was 21 days, equal to that reported for banked blood. These results suggest that the main problem is quantity and not quality.

The results of our study showed similar findings to the published series. The average volume collected in our series was 369 ml. This volume was clearly inadequate to cause any impact on the postoperative Hb. We feel the routine use of ABT is not helpful in the majority of cases. We believe that alternative measures should be followed to minimise the use of blood transfusion. These measures include the withdrawal of anti-inflammatory medication 2 weeks prior to operation, haemostasis and the use of regional anaesthesia. We believe that prudent use of homologous blood, by following strict blood transfusion protocols, would help minimise the use of excessive homologous blood [5, 9, 12, 16].

## Conclusions

Autologous blood transfusion reduces the need for banked blood, but from the analysis of current studies and a literature review it is not clear whether it has any impact on increasing the Hb level. A prospective study is needed to evaluate the effect of postoperative cell salvage on Hb.

**Table 2** Literature review

Reference	Number of patients	Hb		System	Volume (ml)	Banked blood (%)
		Preoperative	Postoperative			
[3]	142	13.5	10.5	Solcotrans	152	36
[7]	40	13.2	11.4	Solcotrans	520	17.5
[6]	22	13.2	10.5	Solcotrans	920	28
[1]	50	13	9.9	Solcotrans	420	0
[13]	50	14.5	10	Haemonetics	349	16
[15]	50	12.8	10.4	Betatrans	566	10
[17]	113	13.8	10.3	Haemonetics	NA	10.4

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