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EFFECT OF GRAFT MATERIAL ON RED BLOOD CELL LOSS FOLLOWING AORTIC SURGERY

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It has been suggested that red blood cell loss after abdominal aortic grafting is influenced by the type of synthetic graft used. A prospective randomized study was done to compare red blood cell loss during the peri-operative period in patients receiving Dacron (Meadox Woven Double Velour) and PTFE (Gore-Tex) grafts. A total of 25 patients (13 Dacron, 12 PTFE) were studied including 21 with abdominal aortic aneurysms, and 4 with aorto-iliac occlusive disease. Red cell volume (RCV) was measured

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using ^{51}Cr-labeled autologous red cells on the day prior to surgery, 1 to 2 hours after surgery when the patients were hemodynamically stable, and 24 hours after surgery. In addition to measurements of ^{51}Cr red blood cell volume and the volume of intraoperatively salvaged washed red blood cells, the length of storage of the units of homologous liquid preserved red blood cells at 4 degrees C prior to transfusion were recorded.

The mean intraoperative red cell loss ($\pm$SD) for the Dacron group was 892 ± 543 ml and for the PTFE group 842 ± 403 ml (p=NS). Patients in the Dacron group received intraoperatively 2.2 ± 1.6 (units$\pm$SD) with a range of 0-4 units of homologous liquid preserved red blood cells and patients in the PTFE group received 1.2 ± 1.2 with a range of 0-3 units of homologous liquid preserved red blood cells (p=NS). The mean total red blood cell loss ($\pm$SD) was 1055 ± 649 ml for the Dacron group, and 978 ± 503 ml for the PTFE group (p=NS).

Despite inherent differences in graft material, there were no significant differences in intraoperative or postoperative red blood cell loss, or in the number of homologous units of liquid preserved red blood cells transfused.

EFFECT OF GRAFT MATERIAL ON RED BLOOD CELL LOSS FOLLOWING AORTIC SURGERY

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ABSTRACT

It has been suggested that red blood cell loss after abdominal aortic grafting is influenced by the type of synthetic graft used. A prospective randomized study was done to compare red blood cell loss during the peri-operative period in patients receiving Dacron (Meadox Woven Double Velour) and PTFE (Gore-Tex) grafts. A total of 25 patients (13 Dacron, 12 PTFE) were studied including 21 with abdominal aortic aneurysms, and 4 with aorto-iliac occlusive disease. Red cell volume (RCV) was measured using ^{51}Cr-labeled autologous red cells on the day prior to surgery, 1 to 2 hours after surgery when the patients were hemodynamically stable, and 24 hours after surgery. In addition to measurements of ^{51}Cr red blood cell volume and the volume of intraoperatively salvaged washed red blood cells, the length of storage of the units of homologous liquid preserved red blood cells at 4 degrees C prior to transfusion were recorded.

The mean intraoperative red cell loss (±SD) for the Dacron group was 892±543 ml and for the PTFE group 842±403 ml (p=NS). Patients in the Dacron group received intraoperatively 2.2±1.6 (units±SD) with a range of 0-4 units of homologous liquid preserved red blood cells and patients in the PTFE group received 1.2±1.2 with a range of 0-3 units of homologous liquid preserved red blood cells (p=NS). The mean total red blood cell loss (±SD) was 1055±649 ml for the Dacron group, and 978±503 ml for the PTFE group (p=NS).

Despite inherent differences in graft material, there were no significant differences in intraoperative or postoperative red blood cell loss, or in the number of homologous units of liquid preserved red blood cells transfused.

INTRODUCTION

Approximately 30 years ago Dacron was introduced as a prosthetic graft in aortic reconstructive surgery.[1] Although Dacron is known for the ease with which it handles during the construction of anastomoses, its efficacy with respect to infection, pseudoaneurysm formation, and rate of thrombotic occlusion has not been ideal.

Expanded polytetrafluorethylene (PTFE) grafts were introduced in the early 1970's, mainly for use in peripheral bypass surgery.[2] In 1980 a bifurcated PTFE aortic prosthesis was developed, and its use as an aortic prosthesis has increased over the decade.

Lord et al reported no significant differences in measured blood loss between patients receiving Dacron and PTFE.[3] Recently, Cintora et al[4], reported significantly greater transfusion requirements when Dacron grafts were used than when the PTFE grafts were used; however, this was a retrospective study and the indications for transfusion were not defined.

At the University Hospital, Boston University Medical Center, a prospective randomized study was done to compare the effects of Dacron and PTFE prosthetic grafts on red blood cell loss during replacement of the abdominal aorta. Patients were randomized in a prospective fashion from January 1988 to June 1989. Comparisons were made of the dacron (woven double velour) and the PTFE grafts placed in aortic position, with emphasis on red blood cell loss

attributable to the graft itself.

The purpose of our prospective randomized study was to compare the effects of Dacron and PTFE prosthetic grafts on perioperative red blood cell loss following replacement of the abdominal aorta. The red blood cell volume of the patients was measured using ^{51}Cr labeled autologous fresh red blood cells on the day prior to surgery, 1 to 2 hours following the surgery when the patients were hemodynamically stable, and 24 hours after the surgical procedure. The volume of autologous intraoperatively salvaged washed red blood cells, as well as the length of storage at 4 C of homologous red blood cells and the number of units transfused were recorded.

MATERIALS AND METHODS

After obtaining informed consent consistent with the requirements of the Institutional Review Board for Human Studies, 26 patients were randomized in a prospective fashion: 13 received Dacron grafts (Meadox Woven Double Velour, Meadox Medicals, Inc., Oakland, NJ) and 13 received PTFE grafts (Gore-Tex, W.L. Gore and Associates, Flagstaff AZ). All patients were monitored pre-operatively in the surgical intensive care unit. A Swan-Ganz catheter was placed, and the cardiac output was measured by thermodilution. All other measurements including heart rate, central venous pressure, pulmonary artery pressures, pulmonary capillary wedge pressure, mean arterial pressure, and hematocrit were determined by standard procedures. Hemodynamic measurements were recorded during surgery, and during the 24-hour post-operative period.

Red cell volumes (RCV) and total blood volumes (TBV) were measured on the day prior to surgery, 1 to 2 hours after surgery when the patients were hemodynamically stable, and 24 hours after the surgical procedure. The red cell volume was measured by the dilution of ^{51}Cr-labeled autologous fresh red blood cells in the patient's blood volume 10 and 20 minutes after injection.[5,6] The total blood volume was calculated from the ^{51}Cr red blood cell volume and the total body hematocrit (peripheral venous hematocrit multiplied by 0.89).[5,6,7]

Three microcuries of ^{51}Cr (Chromitope sodium, Squibb)

were injected into the patient to measure the preoperative red blood cell volume, 8 microcuries of ^{51}Cr were injected into the patient to measure the red blood cell volume 1 to 2 hours after the surgical procedure, and 20 microcuries of ^{51}Cr were injected into the patients to measure the red cell volume 24 hours after surgery. The theoretical red blood cell volumes were estimated from the body surface area and from specific factors for males and females to estimate the red blood cell volume and the plasma volume.[5] For males the body surface area was multiplied by 1020 to estimate the theoretical red cell volume and by 1536 to estimate the theoretical plasma volumes. For females, the body surface area was multiplied by 806 to estimate the theoretical red cell volume and by 1414 to estimate the theoretical plasma volume.

Gore-Tex suture was used in both the PTFE and the Dacron graft anastomoses. Heparin was administered intravenously (100 U/kg) 3 minutes prior to aortic clamping, and was reversed with protamine sulphate using activated clotting time.

Blood lost during the surgical procedure was collected using a Cell Saver (Haemonetics Co., Braintree, MA) and the washed autologous red blood cells were reinfused. The volume of salvaged blood collected and the volume of washed red blood cells and the hematocrit of the washed red blood cells were measured. Homologous liquid preserved red blood cells were transfused intraoperatively and postoperatively for hemodynamic instability and when the hematocrit of the

patient was less than 25 V% and the hemoglobin concentration was less than 8.0 gm%. The patients were transfused with ABO and Rh compatible homologous red blood cells during the surgery and during the 24 hour postoperative period. A 450 ml volume of blood was collected in 63 ml of citrate phosphate dextrose (CPD) anticoagulant. The red blood cell concentrate was prepared, and a 100 ml volume of the ADSOL additive solution, containing adenine, glucose, mannitol, and sodium chloride was added, after which the red blood cell ADSOL solution was stored at 4 degrees C with a hematocrit value of 55 to 60 V% for as long as 42 days.[8] The length of storage of the red blood cell concentrates in ADSOL was recorded for each of the units transfused. The number of units transfused to each patient during the operative period and the 24-hour postoperative period were recorded. The 24 hour posttransfusion survival of the homologous red blood cells was estimated from the length of storage at 4 degrees C prior to transfusion from our previous publication.[8]

The red blood cell loss during surgery was calculated from the ^{51}Cr red blood cell volumes measured prior to surgery and 1 to 2 hours after the surgical procedure, from the volume of autologous red blood cells reinfused following intraoperative salvage, and from the length of storage of the homologous red blood cells in ADSOL additive solution at 4 degrees C amd number of units transfused.

The red blood cell loss that occurred during the postoperative period was calculated from the ^{51}Cr red blood

cell volumes measured 1 to 2 hours and 24 hours after the surgical procedure and from the length of storage of the homologous red blood cells and the number of units transfused.

Statistical analyses were carried out with the Statistical Analysis System (SAS) licensed to Boston University. Differences between groups were tested for significance using the unpaired t-test, with a p value of <0.05 considered significant.

RESULTS

Comparisons of operative risk factors including age, sex, coronary artery disease, diabetes, hypertension, and smoking are shown for the two groups of patients in Table 1. Table 2 reports the diagnoses and operative procedures and type of graft used in each group. The mean operative time (minutes ± SEM) was similar between the two groups (Dacron: 242.3 ± 13.1; PTFE: 247.3 ± 11.5).

Thirteen patients received Dacron grafts and 13 patients received PTFE grafts. One patient who received a PTFE graft was omitted from the analyses because no pre-operative red cell volume was measured. Of the 13 patients in the Dacron group, ten were operated on for aneurysmal disease (AAA) and three for aorto-iliac occlusive disease (AIOD). In the PTFE group there were 11 AAA and one AIOD. In the Dacron group ten patients underwent a retroperitoneal procedure and three a transabdominal procedure. In the PTFE group 10 patients underwent a retroperitoneal procedure and 2 patients a transabdominal procedure. There were ten tube grafts and three bifurcated grafts placed in the dacron group; eight tube grafts and four bifurcated grafts were placed in the PTFE group (Table 2).

Pre-operative, 1 to 2 hour postoperative and 24-hour postoperative hemodynamic evaluation of the patients is shown in Table 3. No significant differences in the 5 measurements were observed between the 2 groups at the 3

periods that were studied.

The comparisons of pre-operative red cell volume and total blood volume between the groups are reported in Table 4. The red cell volume for the Dacron dacron group (1389 ± 336 ml) was significantly lower (p 0.02) than the PTFE group (1760 ± 408 ml), however, the difference in total blood volume was not statistically significant (Dacron: 4313 ± 780 ml, PTFE: 4799 ± 819 ml). Pre-operative hematocrit values, theoretical RCV and TBV, as well as red blood cell volume deficits and total blood volume deficits are also shown. When the ^{51}Cr measured red blood cell volume was compared to the theoretical red blood cell volume, a 26% red blood cell deficit in the Dacron group and a 9% red blood cell deficit in the PTFE group was observed (Table 4).

The volume of autologous shed blood collected intraoperatively using the Haemonetics Cell Saver was similar for the two groups of patients (Dacron: 1053 ± 826 ml, PTFE: 1067 ± 547 ml, p=NS). The number of units of homologous red blood cell concentrates transfused per patient was not significantly different (Dacron: 2.2 ± 1.6 units, PTFE: 1.2 ± 1.2 units, p=NS), although more homologous blood was transfused in the Dacron group because of the decreased preoperative red blood cell volume in these patients (Table 4).

The mean intraoperative red cell volume loss was 892 ± 543 ml for dacron, and 842 ± 403 ml for PTFE, (Table 5). The intraoperative red cell volume loss was not significantly different between the two groups.

The leakage of red cells from the graft during the 24 hour post-operative period was not significantly different between the

two groups (Dacron 163 ± 181 ml, PTFE: 136 ± 149 ml, p=NS) (Table 6).

The number of patients treated with dacron and PTFE grafts that were transfused intraoperatively and postoperatively, the length of storage at 4 degrees C of the ADSOL preserved homologous red blood cells, and the number of units transfused are reported in Tables 7 and 8.

The estimated 24-hour posttransfusion survival of the ADSOL preserved red blood cells stored at 4 degrees C for 3 weeks was about 80%, representing an increase in red blood cell volume in patients of about 150 ml per unit transfused.[8]

Table 9 reports the loss of red blood cells during the surgery and during the 24-hour postoperative period. There were no significant differences in the red blood cell loss during the surgery or during the 24 hour postoperative period whether the patient was treated with dacron or PTFE grafts. The volume of washed red blood cells obtained from intraoperative salvage was also similar for the patients treated with the Dacron and PTFE grafts.

DISCUSSION

For the past several years we have used PTFE grafts during surgery for repair of the abdominal aorta. Clinically we thought our patients required less blood transfusions than when Dacron grafts were used. A prospective randomized study was done to determine whether the graft influenced the blood loss during the intraoperative and postoperative periods. Red blood cell volume was measured using ^{51}Cr labeled fresh autologous red blood cells prior to, 1 to 2 hours after surgery, and 24 hours after surgery.

The indications for transfusion of the red blood cells were hemodynamic instability of the patient, a hemoglobin level of less than 8 gm% and a hematocrit of less than 25 V%. The length of storage of the homologous liquid preserved red blood cells at 4 degrees C and the number of units transfused C were recorded.

The patients randomized in a prospective manner were comparable with respect to the risk factors associated with peripheral vascular and atherosclerotic heart disease. The two groups were similar with respect to their diagnoses, operative approaches and types of grafts used. Neither was there any difference in mean operative time.

The Dacron group was transfused with an average of 2.2 units of homologous liquid preserved blood during surgery

while the PTFE group received an average of 1.2 units. There were no differences in the volume of autologous shed washed red blood cells returned to the patients or in the intraoperatively collected blood between the groups. When the measured red cell volumes were compared to the theoretical red cell volumes based on height and weight, the Dacron group had a significantly greater red blood cell deficit (26%), compared to the PTFE (9%) group. The preoperative total blood volume for the patients treated with Dacron grafts was reduced by 10% whereas the total blood volume for patients treated with the PTFE was reduced by 2% (Table 4). More red blood cell transfusions were required to maintain hemodynamic stability intraoperatively in the patients treated with Dacron grafts who had the unexplained significantly reduced preoperative red blood cell volumes.

Gore-Tex suture was used in both the PTFE and Dacron anastomoses. This technique was used to reduce the operative variables in the study and to minimize the suture hole bleeding in the PTFE grafts. It was not felt that this provided any advantage to the PTFE group since the volume of red blood cells obtained by the intraoperative salvage that was reinfused did not differ between the two groups of patients.

There was no significant difference in red blood cell loss in the patients during replacement of the abdominal aorta with either woven dacron or PTFE grafts.

SUMMARY

The perioperative red blood cell loss associated with the use of Dacron grafts to replace the abdominal aorta was compared with the loss associated with the PTFE graft. Twenty-five patients were randomized in a prospective fashion to either Dacron or PTFE. Red blood cell loss was estimated by labeling the measurement of the red cell volume using ^{51}Cr labeled autologous fresh red cells prior to, and 1 to 2 hours and 24 hours after the surgical procedure. In addition, the length of storage of homologous liquid preserved red blood cells at 4 degrees C and the number of units transfused were documented. Despite inherent differences in graft material, there were no significant differences between the two groups in intraoperative or postoperative red cell loss or in the number of units of homologous liquid preserved blood transfused.

BIBLIOGRAPHY

1. Soyer, T., Lempinen, M., Cooper, P., Norton, L., Eiseman, B. A new venous prosthesis. **Surg.**, 1972, 72:864-872.

2. DeBakey, M.E., Crawford, E.S., Cooley, D.A., Morris, G.C., Royster, T.S., Abbott, W.P. Aneurysm of abdominal aorta. Analysis of results of graft replacement therapy one to eleven years after operation. **Ann. Surg.**, 1964, 160:622-639.

3. Lord, R.S.A., Nash, P., Raj, B.T., Stary, D.L., Graham, A.R., Hill, D.A., Tracy, D., King, H.G. Prospective randomized trial of polytetrafluorethylene and Dacron aortic prosthesis. I. Perioperative results. **Ann. Vasc. Surg.**, 1988, 2:248-254.

4. Cintora, I., Pearce, D.E., Cannon, J.A. A clinical survey of aortobifemoral bypass using two inherently different graft types. **Ann. Surg.**, 1988, 208:625-630.

5. Valeri, C.R., Cooper, A.G., Pivacek, L.E. Limitations of measuring blood volume with iodinated I 125 serum albumin. **Arch. Intern. Med.**, 1973, 132:534-538.

6. Valeri, C.R. and Altschule, M.D. The Hypovolemic Anemia of Trauma. The Missing Blood Syndrome, Boca Raton, Florida, CRC Press, 1981.

7. Najean, Y., Deschrywer, F. The body venous hematocrit ratio and its use for calculating total blood volume from fractional volumes. **Eur. J. Nucl. Med.**, 1984, 9:558-560.

8. Valeri, C.R., Pivacek, L.E., Palter, M., Dennis, R.C., Yeston, N., Emerson, C.P., Altschule, M.D. A clinical experience with ADSOL-preserved red blood cells. **Surg. Gynec. Obstet.**, 166:33-46, 1988.

TABLE 1

COMPARISONS OF OPERATIVE RISK FACTORS

RISK FACTOR	DACRON (N=13)	PTFE (N=12)
MEAN AGE (years)	69.7	64.9
SEX (males)	10	11
(females)	3	1
CAD	8	3
DIABETES	3	2
HYPERTENSION	7	4
SMOKING	13	12

TABLE 2

COMPARISONS OF DIAGNOSES, OPERATIVE APPROACH, AND TYPE OF GRAFT USED BETWEEN THE GROUPS

	DACRON (N=13)	PTFE (N=12)
DIAGNOSIS		
AAA	10	11
AIOD	3	1
OPERATIVE PROCEDURE		
RETROPERITONEAL	10	10
TRANSABDOMINAL	3	2
TYPE OF GRAFT USE		
TUBE	10	8
BIFURCATED	3	4

TABLE 3

COMPARISONS OF PRE-OPERATIVE (A), 1 TO 2 HOUR POSTOPERATIVE (B) AND 24-HOUR POSTOPERATIVE (C) HEMODYNAMIC PARAMETERS

(MEAN±SEM)

	DACRON (N=13)			PTFE (N=12)		
	A	B	C	A	B	C
PCWP (mmHG)	11.6±0.7	11.9±0.9	11.5±1.5	9.9±0.8	10,9±1.3	12.5±1.0
CO (l/m)	5.6±0.3	5.7±0.4	6.5±0.4	5.8±0.3	7.0±0.3	7.1±1.4
CVP (mmHg)	10.2±0.9	7.0±0.8	7.7±1.0	8.2±1.0	9.1±1.0	8.8±1.1
MAP (mmHg)	101.8±3.2	85.6±2.7	83.5±3.0	102.6±5.2	91.4±3.0	89.8±3.2
HR (b/m)	73.2±2.9	92.0±1.9	92.2±2.0	78.8±3.3	92.3±4.0	92.0±4.1

PCWP=Pulmonary capillary wedge pressure, CO= cardiac output, CVP= central venous pressure, MAP = mean arterial pressure, HR= heart rate

TABLE 4

PRE-OPERATIVE BLOOD VOLUME

	DACRON	PTFE	p value
THEORETICAL RED CELL VOLUME (ml)			
MEAN:	1866	1934	NS
SD:	313	256	
TOTAL BLOOD VOLUME (ml)			
MEAN:	4755	4873	NS
SD:	654	568	
MEASURED ^{51}CR RED CELL VOLUME (ml)			
MEAN:	1389	1760	0.02
SD:	336	408	
MEASURED ^{51}CR TOTAL BLOOD VOLUME (ml)			
MEAN:	4313	4799	NS
SD:	780	819	
RED CELL VOLUME DEFICIT (%)			
MEAN:	25.9	9.3	0.006
SD:	11.4	14.7	
TOTAL BLOOD VOLUME DEFICIT (%)			
MEAN:	9.6	1.7	0.044
SD:	8.0	10.3	
HEMATOCRIT (V%)			
MEAN:	35.8	40.3	0.01
SD:	4.1	3.9	

NS= not significant

TABLE 5

BLOOD VOLUME 1 TO 2 HOURS AFTER SURGERY

		DACRON	PTFE	p value
THEORETICAL RED CELL VOLUME (ml)				
	MEAN:	1866	1934	NS
	SD:	313	256	
MEASURED ^{51}CR RED CELL VOLUME (ml)				
	MEAN:	1241	1519	NS
	SD:	346	353	
TOTAL VOLUME COLLECTED IN CELL SAVER (ml)				
	MEAN:	1053	1067	NS
	SD:	826	547	
RED CELL VOLUME COLLECTED IN CELL SAVER AND REINFUSED (ml)	MEAN:	422	427	NS
	SD:	331	219	
CALCULATED INTRAOPERATIVE RED CELL VOLUME LOSS (ml)				
	MEAN:	892	842	NS
	SD:	543	403	
HEMATOCRIT (V%)				
	MEAN:	38.0	38.0	NS
	SD:	5.2	3.7	

NS = not significant

TABLE 6

BLOOD VOLUME 24 HOURS AFTER SURGERY

	DACRON	PTFE	p Value
THEORETICAL RED CELL VOLUME (ml)			
MEAN:	1866	1934	NS
SD:	313	256	
MEASURED ^{51}CR RED CELL VOLUME (ml)			
MEAN:	1217	1496	0.02
SD:	296	272	
24 HOUR POSTOPERATIVE RED CELL VOLUME LOSS (ml)			
MEAN:	163	136	NS
SD:	181	149	
HEMATOCRIT (V%)			
MEAN:	33.5	37.3	.006
SD:	3.1	2.9	

NS = not significant

TABLE 7

THE LENGTH OF STORAGE OF THE ADSOL PRESERVED RED BLOOD CELLS TRANSFUSED INTRAOPERATIVELY

	DACRON	PTFE
# UNITS TRANSFUSED PER PATIENT		
MEAN:	2.2	1.2
SD:	1.6	1.2
RANGE:	0-4	0-3
# PATIENTS:	13	12
t-Test, p:	NS	
AGE OF BLOOD TRANSFUSED, DAYS AT 4 C		
MEAN:	11.6	11.6
SD:	3.7	4.3
# OF UNITS:	28	14
t-Test, p:	NS	

RED CELLS TRANSFUSED

4 C STORAGE	# OF PATIENTS	# OF UNITS	# OF PATIENTS	# OF UNITS
7-11 DAYS	5	16	4	8
12-17 DAYS	5	12	4	6
TOTAL	10	28	8	14

NS = not significant

TABLE 8

THE LENGTH OF STORAGE OF THE ADSOL PRESERVED RED BLOOD CELLS TRANSFUSED 24 HOURS POSTOPERATIVELY

	DACRON	PTFE
# UNITS TRANSFUSED PER PATIENT		
MEAN:	0.9	0.8
SD:	1.6	1.5
RANGE:	0-5	0-4
# PATIENTS:	13	12
t-Test, p:	NS	
AGE OF BLOOD TRANSFUSED, DAYS AT 4 C		
MEAN:	10.8	21.8
SD:	4.1	7.8
# OF UNITS:	12	9
t-Test, p:	0.001	

RED CELLS TRANSFUSED

4 C STORAGE	# OF PATIENTS	# OF UNITS	# OF PATIENTS	# OF UNITS
7-11 DAYS	2	7	0	0
12-17 DAYS	2	5	2	5
30 DAYS	0	0	1	4
TOTAL	4	12	3	9

NS = not significant

TABLE 9

INTRAOPERATIVE AND POSTOPERATIVE RED BLOOD CELL LOSS

		DACRON n=13	PTFE n=12	T-test p
^{51}Cr Red Cell Volume Prior to Surgery (ml)	MEAN:	1389	1760	0.02
	SD:	336	408	
Homologous Red Cell Volume Transfused During Surgery (ml)	MEAN:	323	175	NS
	SD:	243	179	
Autologous Red Cell Volume Transfused During Surgery (ml)	MEAN:	422	427	NS
	SD:	331	219	
Expected Red Cell Volume Immediately Following Surgery (ml)	MEAN:	2133	2362	NS
	SD:	507	597	
^{51}Cr Red Cell Volume 1-2 Hours Following Surgery (ml)	MEAN:	1241	1519	NS
	SD:	346	353	
Red Cell Volume Loss During the Surgical Procedure (ml)	MEAN:	892	842	NS
	SD:	543	403	
Homologous Red Cells Transfused During the 24 Hour Postoperative Period (ml)	MEAN:	138	113	NS
	SD:	240	232	
Expected Red Cell Volume 24 Hours After Surgery (ml)	MEAN:	1379	1632	0.048
	SD:	261	341	
^{51}Cr Red Cell Volume 24 Hours After Surgery (ml)	MEAN:	1217	1496	0.022
	SD:	296	272	
Red Cell Volume Loss During the 24 Hour Postoperative Period (ml)	MEAN:	163	136	NS
	SD:	181	149	
Total Red Cell Volume Loss (ml)	MEAN:	1055	978	NS
	SD:	649	503	

NS = not significant