Intraoperative Autologous Blood Transfusion for Hemoperitoneum Resulting From Ectopic Pregnancy or Ovarian Bleeding During Laparoscopic Surgery

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ABSTRACT

Objective: Our purpose was to evaluate the efficacy and safety of intraoperative autologous blood transfusion during laparoscopic surgery for hemoperitoneum in benign gynecologic disease.

Methods: The Cell Saver, Haemo Lite 2, an intraoperative autologous blood salvage device, was used in laparoscopic surgery on 18 patients with ectopic pregnancies or ovarian bleeding who had a large hemoperitoneum with/without severe anemia and hypovolemic shock.

Results: The blood loss was 1186±789 mL, and the volume of reinfused processed blood was 661±405 mL in ectopic pregnancy cases. The blood loss was 716±219 mL, and the volume of reinfused processed blood was 496±138 mL in ovarian bleeding. Laparoscopic surgery was performed and homologous blood transfusion was not required in any patient. No adverse reactions or procedural difficulties associated with the autologous blood transfusions occurred.

Conclusions: Intraoperative autologous blood transfusion enabled the performance of laparoscopic surgery for large hemoperitoneum caused by ectopic pregnancies or ovarian bleeding without a homologous blood transfusion.

Key Words: Intraoperative autologous blood transfusion, Hemoperitoneum, Cell Saver, Laparoscopic surgery.

INTRODUCTION

Intraoperative autologous blood transfusion (IABT) is the technique of salvaging and subsequently reinfusing blood spilled into the operative field. It is already used for ectopic pregnancies1,2 or ovarian bleeding3 with hemoperitoneum instead of a homologous blood transfusion, although the previous experience has been limited to laparoscopic surgery for patients in good condition or undergoing an open laparotomy. Herein, we report retrospectively the efficacy and safety of the IABT technique during laparoscopic surgery for large hemoperitoneum caused by benign gynecologic disease.

SUBJECTS AND METHODS

The subjects were 18 patients with suspected large hemoperitoneum resulting from ectopic pregnancies or ovarian bleeding, who underwent urgent laparoscopic surgery with a carbon dioxide pneumoperitoneum at the Department of Obstetrics and Gynecology of our hospital during a 31-month period. All patients provided informed consent for the procedure.

For the patients with hypovolemic shock, their general condition was improved by acute liquid transfusion before surgery.

With the patient under general anesthesia and in the lithotomy position, an approximately 12-mm incision was made below the umbilicus, and a primary 12-mm blunt cannula was inserted with the open technique.4 After confirmation through a laparoscope, carbon dioxide pneumoperitoneum was made in the high pelvic position. A 5-mm trocar was inserted into the right or left lower abdomen, followed by the suctioning of accumulated blood (Figure 1). After diagnostic laparoscopy, laparoscopic surgery was performed with an additional trocar. Before the end of the surgery, the peritoneal cavity was irrigated and suctioned thoroughly with saline solution. The suctioned and processed blood described below was reinfused during and after surgery.

The Cell Saver, Haemo Lite 2 (Haemonetics Corporation, Braintree, Massachusetts) (Figure 2).5 was used for IABT. The accumulated blood in the peritoneal cavity was suctioned by adding heparinized saline solution via
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a double-lumen tube into a reservoir containing a 140-µm filter, which removed gross debris. The filtered blood was then transferred into a centrifuge and washed with 1000 mL of saline solution.

Following the removal of plasma, heparin, free hemoglobin, and cellular debris, 200 to 250 mL of 60% hematocrit of processed blood was obtained and packed for reinfusion for 10 to 15 minutes per cycle. From centrifugation, irrigation and packing were automated, the procedure was simply repeated when the accumulated blood increased during surgery. After the diagnosis was established, the processed blood was immediately reinfused through a leukocyte reduction filter (Blood Transfusion Filter: Nihon Pall, Tokyo, Japan)6 in all of the patients.

Antibiotics were administered intravenously for 3 days. The efficacy and the adverse reactions to autologous blood transfusion were studied retrospectively.

RESULTS

The 11 patients who had positive urine pregnancy tests (human chorionic gonadotropin: hCG >25 mIU/mL) were diagnosed with ectopic pregnancies, and the 7 patients with negative urine pregnancy tests were diagnosed with ovarian bleeding. The characteristics of the patients are shown in Tables 1 and 2.

None of the patients required homologous blood transfusions. The patients with more than 1000 mL of blood loss were administered heat-processed albumin during surgery or postoperatively.

Adverse reactions to autologous blood transfusion, such as allergic reactions, infection, bleeding tendencies, or embolisms, were not found in any of the patients who received reinfusion. No procedural difficulties of autologous blood transfusion were observed. All of the patients were able to walk the day after surgery and were discharged within 7 days of receiving therapy for anemia. No persistent pregnancies or short-term recurrences of ovarian bleeding occurred.
DISCUSSION

Ectopic pregnancy and ovarian bleeding can now be detected at earlier stages because of improvements in pregnancy tests and transvaginal echography. Therefore, laparoscopic surgery is usually performed for patients in good general condition, and without severe anemia or hypovolemic shock. However, some patients still experience a lot of bleeding into the peritoneal cavity and sometimes need blood transfusions.

Autologous blood transfusion has become increasingly used to avoid the side effects of homologous blood transfusions including allergic reactions or infections. Three types of autologous blood transfusion exist: hemodilution, predeposit, and salvage types. The hemodilution and predeposit types could not be used for hemoperitoneum patients, though the salvage type IABT was very suitable for such patients.

IABT is already used for ectopic pregnancies or ovarian

| Table 1. |
| Cases of Ectopic Pregnancy (N=11) |
| No | Age | Operation* | Operative Time (min) | Blood Loss (mL) | Processed Blood (mL)† | Pre Hb (g/dL)† | Post Hb (g/dL)† | Pre TP (g/dL)† | Post TP (g/dL)† |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 38 | L-salpingectomy | 130 | 670 | 482 | 11.5 | 9.6 | 8.1 | 5.9 |
| 2 | 36 | L-salpingectomy | 100 | 600 | 246 | 11.5 | 9.0 | 7.2 | 5.5 |
| 3 | 27 | R-salpingectomy | 125 | 2600 | 1250 | 11.5 | 7.5 | 6.4 | 4.3 |
| 4 | 26 | L-salpingotomy | 150 | 1900 | 1400 | 9.9 | 7.4 | 7.0 | 5.1 |
| 5 | 31 | R-salpingectomy | 135 | 600 | 498 | 11.1 | 10 | 7.5 | 5.8 |
| 6 | 19 | R-salpingotomy | 110 | 600 | 230 | 12.7 | 12.1 | - | 6.1 |
| 7 | 21 | L-milking | 70 | 600 | 250 | 14.7 | 11.1 | 8.3 | 5.6 |
| 8 | 31 | R-salpingectomy | 70 | 600 | 504 | 11.5 | 12.8 | 11.3 | 7.8 | 5.9 |
| 9 | 24 | R-salpingectomy | 110 | 2440 | 1000 | 10.7 | 7.6 | 6.0 | 4.2 |
| 10 | 31 | R-salpingectomy | 115 | 1500 | 726 | 6.9 | 8.1 | - | 4.8 |
| 11 | 36 | R-salpingectomy | 115 | 940 | 703 | 10.7 | 9.8 | 6.5 | 5.2 |

*L=left; R=right.  
†Pre=preoperative; Post=postoperative; Hb=hemoglobin; TP=total protein.

| Table 2. |
| Cases of Ovarian Bleeding (N=7) |
| No | Age | Operation* | Operative Time (min) | Blood Loss (mL) | Processed Blood (mL)† | Pre Hb (g/dL)† | Post Hb (g/dL)† | Pre TP (g/dL)† | Post TP (g/dL)† |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 28 | R-adnexectomy | 105 | 600 | 506 | 11.7 | 9.6 | 7.9 | 5.8 |
| 2 | 32 | R-adnexectomy | 75 | 700 | 477 | 13.8 | 11.4 | 7.5 | 5.4 |
| 3 | 34 | R-adnexectomy | 105 | 1200 | 752 | 9.2 | 9.2 | - | 5.1 |
| 4 | 30 | R-adnexectomy | 100 | 710 | 504 | 14.6 | 12.1 | 7.7 | 5.8 |
| 5 | 23 | L-coagulation | 75 | 600 | 280 | 10.7 | 9.1 | 6.9 | 5.5 |
| 6 | 25 | R-cystectomy | 95 | 600 | 454 | 9.3 | 9.0 | 7.0 | 6.2 |
| 7 | 33 | R-cystectomy | 70 | 600 | 499 | 9.1 | 8.8 | 7.8 | 6.2 |

*L=left; R=right.  
†Pre=preoperative; Post=postoperative; Hb=hemoglobin; TP=total protein.
bleeding with hemoperitoneum instead of homologous blood transfusion, but previous experience has been limited to laparoscopic surgery for patients in good condition\textsuperscript{2,3} or having open laparotomy.\textsuperscript{1} Recently, the use of IABT has been reported in laparoscopic surgery for spleen trauma.\textsuperscript{7,8} We applied IABT in cases of large hemoperitoneum caused by benign gynecologic diseases like ectopic pregnancy and ovarian bleeding.

The advantages of IABT compared with those of homologous transfusions include immediate preparation without cross-match testing as well as cost-effectiveness.\textsuperscript{9,10} Most of the accumulated blood in the peritoneal cavity was unclotted and at least half of this blood could be reinfused. The survival time of red cells processed by the Cell Saver was no different from that of normal red cells.\textsuperscript{11,12} The color of the processed blood is bright red like arterial blood because oxygen saturation increases during processing, such as centrifuging and irrigation. Carbon dioxide pneumoperitoneum did not cause problems for the gas analysis of processed blood.\textsuperscript{2} IABT made it possible to avoid homologous blood transfusion or to decrease its use.

The disadvantage of IABT is that it decreases blood protein in proportion to the volume of blood loss. To prevent pulmonary edema from arising from hypoproteinemia, heat-processed albumin was used for patients whose blood loss exceeded 1000 mL.

Antibiotics were administered to cover the risks of contamination, such as bacteria in the processed blood. Despite this precaution, the frequency of bacterial contamination in laparoscopic surgery was theoretically lower than that in laparotomy.

Coagulation factors are not generally decreased in the case of hemoperitoneum compared with external bleeding. Thus, coagulation factors were not required.

**CONCLUSION**

IABT enabled the performance of laparoscopic surgery for patients with large hemoperitoneum caused by ectopic pregnancies or ovarian bleeding without a homologous blood transfusion. Homologous blood transfusion and the side effects from autologous blood transfusions were not considered proof of the efficacy and safety of IABT.

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