

Management of patients with ectopic pregnancy with massive hemoperitoneum by laparoscopic surgery with intraoperative autologous blood transfusion

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Ectopic pregnancy;
Laparoscopic surgery;
Hemoperitoneum;
Intraoperative
autologous blood
transfusion;
Shock index

Abstract

STUDY OBJECTIVE: To evaluate the feasibility and safety of surgical laparoscopy with intraoperative autologous blood transfusion for ectopic pregnancy with massive hemoperitoneum.

DESIGN: Retrospective analysis (Canadian Task Force classification II-1).

SETTING: Department of gynecology at a general hospital.

PATIENTS: Seventeen consecutive patients with ectopic pregnancy with massive hemoperitoneum.

INTERVENTION: Laparoscopic surgery with salvage device–based intraoperative autologous blood transfusion.

MEASUREMENTS AND MAIN RESULTS: From January 2000 through June 2005, one hundred and twelve women with ectopic pregnancy (interstitial/cornual: 4; isthmic: 18; ampullary: 86; and ovarian: 4) were treated by laparoscopic surgery. Seventeen patients who demonstrated more than 501 g of intraabdominal bleeding were classified as having massive hemoperitoneum and retrospectively analyzed. Site of pregnancy in these 17 patients was interstitial/cornual: 3; isthmic: 5; ampullary: 7; and ovarian: 2. Except for two women with tubal abortion of ampullary pregnancy, all other patients had rupture at the pregnancy site. During laparoscopic surgery, blood pooled in the abdominal cavity was collected by an irrigation and aspiration procedure, and sent to an autologous blood–salvage device to make concentrated red blood cell solution. Processed blood was immediately transfused back to the patient through a leukocyte reduction filter. The mean amount of estimated intraabdominal bleeding, which was calculated by the difference between the volumes of aspirated and irrigated fluids, was 1362.1 ± 491.4 g, and the mean volume of reinfused processed blood was 680.6 ± 209.5 g. No patient received banked blood at any time. The degree of hemoperitoneum was well correlated with the shock index calculated by dividing the heart rate by systolic blood pressure at triage ($r = 0.72$; 95% CI 0.37–0.89; $p = .001$). In all cases of massive hemoperitoneum, there was no need for laparotomic conversion, and homologous blood transfusion was avoided.

CONCLUSIONS: Even in women with ectopic pregnancy with massive hemoperitoneum, laparoscopic surgery can be safely conducted by experienced laparoscopists with intraoperative autologous blood transfusion if hemodynamic stability is achieved by perioperative management.

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With advances in diagnostic procedures including highly sensitive urinary human chorionic gonadotropin (hCG) tests and transvaginal ultrasonography,¹ early diagnosis of ectopic pregnancy with minimal symptoms became possible, and laparoscopic surgery has become widely applicable in these cases.² However, due to either lack of medical con-

sultation by patients or delay in diagnosis, cases of massive hemoperitoneum still occur as life-threatening emergencies, and treatment by laparotomy with a high incidence of homologous blood transfusion is traditionally chosen for such patients.²

Along with progress in laparoscopic surgical technique and expertise, improvement in perioperative management of the hemodynamic condition by anesthesiologists has facilitated laparoscopic surgery of women with ectopic pregnancy with massive hemoperitoneum.^{3,4} However, even in such cases, it has been difficult to avoid homologous blood transfusion in laparoscopic treatment.^{3,4} A recent report showed that if intraoperative autologous blood transfusion⁵ is used, laparoscopic surgery can be performed successfully even in patients with massive hemoperitoneum due to ovarian bleeding or ectopic pregnancy.⁶ However, data on the clinical outcomes of exclusive autotransfusion in the management of such cases are limited.⁷

In the present study, the reliability of a salvage device-based autologous blood transfusion⁵ in achieving successful laparoscopic surgery for ectopic pregnancy in patients with massive hemoperitoneum was retrospectively analyzed in relation to the clinical characteristics.

Materials and methods

Preoperative management of the patient

When a patient with an ectopic pregnancy was transferred to the emergency department of our hospital, the anesthesiologist in the intensive care unit assessed and managed the patient's hemodynamic condition, while a gynecologic examination was performed. If hemoperitoneum was suspected on ultrasonography⁸ and hemodynamic instability⁹ was assumed, large-bore venous access was obtained, and rapid fluid resuscitation was initiated with placement of a Foley catheter. While rapid fluid administration was performed, the patient's hemodynamic status was evaluated, and the patient was classified as a responder, transient responder, or nonresponder. Laparoscopic surgery was conducted primarily for responders and transient responders. The patient was brought immediately to the operating room. It usually took 20 to 40 minutes for these procedures. Preoperative informed consent, including the possible requirement of homologous blood transfusion and laparotomic conversion, was obtained from the patient and family. If the patient was assumed to have difficulty in understanding her condition due to symptoms such as severe pain or hemodynamic instability, explanation was given only to her family.

Surgical procedure

Under general endotracheal anesthesia, gasless laparoscopic surgery was performed by the abdominal wall-lift

method as previously described.^{10,11} Briefly, the abdominal wall was lifted using a subcutaneous lift system, and a 5-mm Optiview port (Ethicon Japan, Tokyo, Japan) was placed at the superior edge of the umbilicus to introduce the 5-mm laparoscope. Two other Optiview ports were placed laterally under direct vision: a 5-mm port on the left side and 12-mm port on the right side at the level of the umbilicus. Pooled blood was removed by an irrigation and aspiration procedure to obtain the laparoscopic view for identification of bleeding site. In patients treated by salpingectomy or adnexectomy, ligaments and vessels were cut by Ligasure Atlas (Tyco Healthcare Japan, Tokyo, Japan). In patients with interstitial/cornual pregnancy, Harmonic scalpel (Ethicon Japan, Tokyo, Japan) was used for cornual resection or cornuostomy after local injection of diluted vasopressin. Hemostasis was achieved by suturing with CTB-1 (Ethicon Japan, Tokyo, Japan), and a local intramyometrial methotrexate (MTX) injection was added to decrease the risk of persistent ectopic pregnancy (PEP). In cases of ovarian pregnancy, products of conception were removed by blunt dissection, and hemostasis was achieved by suturing ovarian tissue with 3-0 polyglactin sutures. The excised tissue was put into an Endopouch Retriever (Ethicon Japan, Tokyo, Japan) and removed from the body either through posterior colpotomy or a 12-mm port. The surgical wound was closed by Dermabond (Ethicon Japan, Tokyo, Japan) after subcutaneous suturing. To decrease the risk of perioperative deep venous thrombosis and pulmonary embolism, intermittent pneumatic compression leggings were applied with a Venodyne DVT system (Microtek Medical, Columbus, MS) intraoperatively and continued until the patient became fully ambulatory.

After surgery, the patient was admitted to the intensive care unit for postoperative management overnight. If hemodynamic stability was achieved, the patient was moved to the gynecology ward on postoperative day 1. The patient received daily intravenous injections of iron supplement to treat anemia. The patient was discharged from the hospital after confirming the decrease in serum hCG titer as well as elevation in hemoglobin (Hb) value above 7 to 8 g/dL.

Intraoperative autologous blood transfusion procedure

The C.A.T.S. Continuous Autotransfusion System, developed by Fresenius Kabi (Bad Hamburg, Germany), was used for intraoperative blood salvage. Blood pooled in the abdominal cavity was collected by irrigation and aspiration, then transferred to the autotransfusion reservoir of the C.A.T.S. AT1 autotransfusion set with 120-micron filter to collect, defoam, filter, and store blood before processing. Stored blood was centrifugally separated to make concentrated red blood cell solution, and processed blood was immediately transfused back to the patient through a leukocyte-reduction filter.¹²

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