INTRODUCTION

Placenta percreta is a subtype of placenta accreta in which the placenta invades the entire uterine wall and affects the adjacent organs. The incidence of placenta accreta ranges from one in 530 to one in 2,500 deliveries, and its incidence has been increasing due to an increase in cesarean sections (1). Cesarean sections with placenta percreta is mostly performed under general anesthesia. However, it is a condition with a high surgical risk and generally requires an obstetric hysterectomy to control massive hemorrhage. It has been reported to have a mortality rate up to 7% (2). We report a case of placenta percreta with massive hemorrhage where a cell salvage device (Cell Saver®; Haemonetics Japan) and a rapid infuser (LEVEL 1 SYSTEM 1000®; Smith Medical Japan Ltd.) were life saving and effective.

CASE PRESENTATION

The patient was a 39-year-old woman who was 157 cm in height and 58 kg in weight. She had four previous children, two of which had been delivered
by cesarean section. She was diagnosed with placa-
enta percreta by magnetic resonance imaging with
a high suspicion that there was invasion into the
muscularis of the bladder (Figure 1). Therefore, ce-
sarean section was planned at 33 weeks of gestation.
However, at 27 weeks of gestation, she underwent an
emergency cesarean section due to vaginal bleeding
and an intrauterine infection. We planned a cesarean
section without exfoliating the placenta and cesar-
ean hysterectomy. Pre-operative laboratory data are
shown in Table 1. General anesthesia was induced
using propofol, remifentanil, and rocuronium and an-
esthesia was maintained using propofol, fentanyl,
and remifentanil. Figure 2 shows the anesthetic
chart including hemodynamics and laboratory data.
During the surgery, because the uterine surface was
highly vascularized due to the placenta percreta,
the decision was made to avoid surgical resection
of the placenta and to directly dissect the uterine
base with a vertical incision and perform a com-
plete hysterectomy and partial cystectomy. How-
ever, hemostasis became difficult because the blad-
ner invasion by the placenta was abundant. Bleeding
was ultimately controlled following bilateral intern-
al iliac artery embolization. Furthermore, we used
catecholamines (dopamine and norepinephrine),
a cell salvage device (Cell Saver® ; Haemonetics
Japan) and a rapid infuser (LEVEL 1 SYSTEM
1000® ; Smith Medical Japan Ltd.) for hemodynamic
stabilization. Intra-operative bleeding was 47,000 mL
and total anesthesia time was 12 h and 47 min. A
total of 120 units of red blood cells, 90 units of fresh
frozen plasma, and 100 units of platelets were trans-
fused. After the surgery, the patient was transferred
to the intensive care unit and was extubated 9 hours
later. Post-operative laboratory data are also shown
in Table 1. She was discharged on the 32th post-
operative day without major complications.

The baby (898 g) was born 7 min after the opera-
tion had started and was intubated immediately after
birth with Apgar scores of 1 and 5 at 1 minute and
5 minutes, respectively. The baby was extubated 17
days after birth and discharged after the 95th day.

Table 1. Vital sign and laboratory data before and after opera-
tion

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hour</td>
<td>6 hours</td>
</tr>
<tr>
<td>HR (beat/min)</td>
<td>111</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>82</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>34</td>
</tr>
<tr>
<td>SpO2 (%)</td>
<td>98</td>
</tr>
<tr>
<td>Hb (g/dL)</td>
<td>9.5</td>
</tr>
<tr>
<td>Plt (× 1000/μL)</td>
<td>155</td>
</tr>
<tr>
<td>PT-INR</td>
<td>0.92</td>
</tr>
<tr>
<td>APTT (s)</td>
<td>28.2</td>
</tr>
<tr>
<td>Fibrinogen (mg/dL)</td>
<td>484</td>
</tr>
<tr>
<td>BUN (mg/dL)</td>
<td>6</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>0.46</td>
</tr>
<tr>
<td>Sodium (mEq/L)</td>
<td>133</td>
</tr>
<tr>
<td>Potassium (mEq/L)</td>
<td>3.5</td>
</tr>
<tr>
<td>Chloride (mEq/L)</td>
<td>101</td>
</tr>
</tbody>
</table>

HR=Heart rate, SBP=Systolic blood pressure, DBP=Diastolic
blood pressure, SPO2=Saturation of peripheral oxygen, Hb=Hemoglobin, Plt=Platelets, PT-INR=Prothrombin time and
international normalized rate, APTT=Activated partial thromboplastin
time, BUN=Blood urea nitrogen.

Figure 1. Magnetic resonance imaging of the plevis revealed invasion into the bladder by the placenta (red arrow).
DISCUSSION

Placenta percreta is a rare subtype of placenta accreta in which the placenta invades the entire uterine wall and affects the adjacent organs (Table 2). It is a condition with a high surgical risk and generally requires an obstetric hysterectomy. Placenta accreta has been reported to have up to a 7% mortality rate as well as intra-operative and post-operative morbidity associated with massive blood transfusions, infection, ureteral damage, and fistula formation (2). Prior delivery by cesarean section is a risk factor for placenta accreta. According to a report by Sumigama et al. (3), among 59,008 deliveries, 408 cases were diagnosed as placenta previa; of these, 18 cases were placenta increta and 5 of placenta percreta. Mean intra-operative blood loss was 3,630 ± 2,216 mL (increta) and 12,140 ± 8,343 mL (percreta). One patient with placenta percreta died of hemorrhage (3).

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Method of diagnosis</th>
<th>Amount of transfusion (Red blood cells)</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbas et al (11)</td>
<td>2000</td>
<td>ultrasound</td>
<td>22</td>
<td>hysterectomy, bladder repair, bilateral internal iliac artery ligation</td>
</tr>
<tr>
<td>Abbas et al (11)</td>
<td>2000</td>
<td>ultrasound</td>
<td>15</td>
<td>hysterectomy, bladder repair, bilateral internal iliac artery ligation</td>
</tr>
<tr>
<td>Caliskan et al (12)</td>
<td>2003</td>
<td>ultrasound</td>
<td>13</td>
<td>hysterectomy, bladder repair, bilateral hypogastric artery ligation, abdominal packing</td>
</tr>
<tr>
<td>Takai et al (13)</td>
<td>2005</td>
<td>ultrasound, MRI, cystoscopy</td>
<td>35</td>
<td>hysterectomy, bladder repair, bilateral internal iliac artery ligation</td>
</tr>
<tr>
<td>Shawish et al (14)</td>
<td>2007</td>
<td>ultrasound, MRI, cystoscopy</td>
<td>5</td>
<td>hysterectomy, bladder repair</td>
</tr>
<tr>
<td>Matsuhara et al (15)</td>
<td>2009</td>
<td>ultrasound, MRI</td>
<td>8+2(autologous)</td>
<td>hysterectomy, bladder repair, bilateral internal iliac artery balloon catheters occlusion</td>
</tr>
<tr>
<td>Parva et al (16)</td>
<td>2009</td>
<td>ultrasound, MRI</td>
<td>2</td>
<td>hysterectomy, bladder repair, bilateral internal iliac artery balloon catheters occlusion</td>
</tr>
<tr>
<td>Sijanovic et al (17)</td>
<td>2011</td>
<td>no diagnosis before surgery</td>
<td>20</td>
<td>hysterectomy, bladder repair, bilateral hypogastric artery ligation</td>
</tr>
<tr>
<td>Reitman et al (18)</td>
<td>2011</td>
<td>ultrasound</td>
<td>3</td>
<td>hysterectomy, bladder repair, uterine artery ligation</td>
</tr>
<tr>
<td>Vahdat et al (19)</td>
<td>2012</td>
<td>ultrasound</td>
<td>20</td>
<td>radical parametrectomy, bilateral internal iliac artery ligation, abdominal packing</td>
</tr>
<tr>
<td>Sultan et al (20)</td>
<td>2012</td>
<td>ultrasound</td>
<td>16</td>
<td>hysterectomy, bladder repair</td>
</tr>
</tbody>
</table>
In 1997, Dubois et al. reported that temporary balloon occlusion of the bilateral internal iliac artery is a method to control bleeding during cesarean hysterectomy for placenta percreta (4). However, in this emergency case, the patient presented with vaginal bleeding and had an intrauterine infection, preventing any pre-operatively planning. Ultimately, bilateral internal iliac artery embolization was performed intra-operatively to control hemorrhaging and achieve hemodynamic stability. Ideally, multidisciplinary pre-operative planning with the departments of obstetrics and gynecology, radiology, and anesthesiology will be optimal in future cases.

A decrease in fibrinogen is one of the leading factors involved in postpartum massive hemorrhage. Bleeding of > 2,000 mL; can result in dilutional coagulopathy. When massive hemorrhage occurs, fibrinogen is the first coagulation factor that becomes depleted resulting in coagulopathy. This is because other coagulation factors can deplete up to 80% of normal concentrations before coagulopathy is observed, whereas fibrinogen can only lose up to 60% of normal concentrations (100 mg/dL) before coagulopathy (5). Fresh frozen plasma (FFP) is used to increase the fibrinogen concentrations. However, when massive hemorrhaging persists, administration of FFP cannot be expected to effectively supplement the fibrinogen concentrations (6). Moreover, there is a report that administration of a large quantity of FFP is associated with acute lung injury (7). In this case, although the patient did not develop acute lung injury, we should prepare a cryoprecipitate by concentrating FFP to 10 times, when massive hemorrhage was expected (8).

Cell Saver is a cell salvage device used during surgery to avoid allogeneic transfusions and the elevation of serum potassium concentration. Cell salvage has been used in obstetrics to a limited degree because of the fear of amniotic fluid embolism although the exact mechanism is still unclear. In contrast, leukocyte depletion filtering of cell-salvaged blood obtained from cesarean section reduces amniotic fluid components to a concentration equivalent to maternal venous blood (9). This device has been reportedly used safely in > 400 cases (4, 10). In this case, the patient did not develop an amniotic fluid embolus. Moreover, Cell Saver reduced the need for allogeneic transfusions and avoided the elevation of serum potassium concentration. During surgery the patient’s serum potassium concentration increased up to 7.6 mmol/L, but returned to a normal concentrations after using this device.

We describe a difficult case of placenta percreta with massive hemorrhage, where transfusions alone were not sufficient to maintain hemodynamics. The use of a cell salvaging device and rapid infuser, which are not routinely available during these procedures were required to maintain hemodynamic stability. Ultimately, it is critical to have multidisciplinary pre-operative discussions regarding strategic planning and potential complications in difficult cases such as these. Furthermore, pre-operative preparation of a Cell Saver and LEVEL 1 SYSTEM 1000 with appropriate staffing is essential in cases where massive blood loss is expected.

REFERENCES


