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Disseminated Intravascular Coagulation Following Midtrimester Abortions

PAUL F. WHITE, PH.D., M.D.,* VICKI COE, M.D.,† WILLIAM A. DWORSKY, M.D.,‡ ALAN MARGOLIS, M.D.§

In obstetric anesthesia, disseminated intravascular coagulation (DIC) has been associated with placental abruption,[1] amniotic fluid embolism,[2] gram-negative sepsis,[3] severe preeclampsia/eclampsia,[4] the dead fetus syndrome,[5] and saline-induced abortion.[6] We describe three patients who developed clinical and laboratory evidence of DIC after elective, outpatient midtrimester abortions under general anesthesia.

Reports of Three Cases

Patient 1. A 27-year-old woman, G_4P_{3003}, had an elective therapeutic abortion (TAB) by dilation and evacuation (D & E) at 21 weeks gestation. Preoperative hematocrit (HCT) was 33.3%. Anesthesia was induced with 4 mg/kg thiopental, iv, followed by intermittent boluses of 25 mg ketamine iv (total dose = 125 mg) in combination with 70% nitrous oxide via a face mask. The surgical procedure lasted 33 min and the anesthetic course was uneventful. Following extraction of the fetus, persistent bleeding was noted at the tenaculum site, and a suture was inserted to provide hemostasis. Total estimated blood loss (EBL) was 300 ml. In the recovery room, 0.9% saline (NS), 1,000 ml with 20 units (U) of pitocin were given iv. Approximately 1.5–2.0 h later, heavy bleeding was observed when the patient began to ambulate. Methylergonovine (Methergine®), 0.2 mg, im, was administered; however, bleeding persisted and the patient returned to the operating room. Anesthesia was induced with 2 mg/kg thiopental, iv, in combination with 0.5 mg/kg ketamine, iv. Speculum examination revealed generalized oozing from the cervix. Coagulation studies were obtained and the results are summarized in table 1. A plain glass, red rubber stoppered tube (which contained no procoagulants), containing whole blood remained unclotted at 30 min. A presumptive diagnosis of DIC was made, and 10 U cryoprecipitate, 3 U packed erythrocytes (PRBC), and 5 U fresh frozen plasma (FFP), were given with a progressive decrease in the amount of cervical bleeding. Results of subsequent coagulation studies are summarized in table 1. The patient remained hospitalized for two days without further complication.

Patient 2. A 15-year-old woman, G_1P_{0000}, underwent elective TAB by D & E at 22 weeks gestation. Preoperative HCT was 35.5%. Anesthesia was induced with 4 mg/kg thiopental, iv, and maintained with intermittent ketamine boluses, 25 mg, iv (total dose = 300 mg), and 70% nitrous oxide via a face mask. After a difficult extraction¶ (EBL 300–500 ml) lasting 35 min, the patient was taken to the recovery room where she received 1,000 ml NS with 20 U pitocin, iv. Scant bleeding was noted for 1.0–1.5 h, after which bleeding became quite heavy. Methylergonovine, 0.2 mg, im, was administered. The patient was returned to the operating room 30 min later because of persistent bleeding. Anesthesia was induced with a combination of 2 mg/kg thiopental and 0.5 mg/kg ketamine, iv, and maintained with 70% nitrous oxide via a face mask. Diffuse cervical oozing was present without a specific bleeding site. Coagulation studies were obtained and the results are summarized in table 1. A vaginal pack was inserted and remained in place for 45 min. The diagnosis of DIC was made, the patient was treated with 2 U FFP, and there was a subsequent decrease in the amount of cervical bleeding. Total EBL for second procedure was 200–250 ml. Results of subsequent coagulation studies are summarized in table 1. She had an unremarkable postoperative course and was discharged the following day.

Patient 3. A 33-year-old woman, G_8P_{7007}, at 20 weeks gestation with a presumptive diagnosis of placenta previa, was scheduled for an elective TAB by D & E. Preoperative HCT was 31%. Anesthesia was induced with 4 mg/kg thiopental, iv, followed by a fentanyl infusion (2–10 μg/min) in combination with 70% nitrous oxide via a face mask. Following removal of the cervical lamineria, profuse bleeding developed, which persisted after removal of the placental and fetal tissues. Methylergonovine, 0.2 mg, im, was administered along with 40 U pitocin, iv. Coagulation studies were obtained and the results are summarized in table 1. As a result of uncontrollable bleeding (1,500–2,500 ml) over a 20- to 30-min period, an emergency total abdominal hysterectomy was performed (total fentanyl dose for the entire case was 750 μg). Transient hypotension was treated with fluid resuscitation (4,000 ml crystalloid) and blood replacement (type-specific PRBC, 4 U). In addition, the patient received platelet concentrates, 4 U, and FFP, 4 U. Although generalized oozing was noted during the early stages of the hysterectomy, bleeding was negligible at the time of closure. The trachea was extubated and the patient was taken to the Surgical Intensive Care Unit in stable condition with a diagnosis of resolving DIC. Results of subsequent coagulation studies are summarized in table 1. Her postoperative course was unremarkable and she was discharged on the fifth postoperative day.

Discussion

We described three cases of clinical DIC following elective midtrimester abortions in healthy outpatients. Although DIC is associated with several obstetric complications, it has not been reported following midtrimester abortion by D & E under general anesthesia.

* Assistant Professor, Chief Outpatient Anesthesia Service, Department of Anesthesia, Stanford University.

† Research Fellow, Department of Anesthesia, Stanford University.

‡ Clinical Assistant Professor, Department of Gynecology and Obstetrics, Stanford University.

§ Professor, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco.

Received from the Departments of Anesthesia and Gynecology and Obstetrics, Stanford University Medical Center, Stanford, California, and the Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco, San Francisco, California. Accepted for publication August 4, 1982.

Address reprint requests to Dr. White: Department of Anesthesia, Stanford University Medical Center, Stanford, California 94305.

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¶ The cervix was inadequately dilated because the surgeon was able to insert only *one* lamineria tent preoperatively.

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TABLE 1. Hematologic Studies in Patients Developing Signs of DIC during or Immediately After a Midtrimester Abortion

	Intraoperatively	2–4 h	4–8 h	12–18 h	24–32 h	48–72 h
Patient 1						
Platelets × $10^3/m^3$	184	172	152	138	155	185
HCT (%)	29.2	26.5	27.8	33.1	34.7	35.7
PT (% of normal)	18%	26%	48%	60%	78%	≥100%
PTT (% of normal)	29%	59%	78%	94%	≥100%	≥100%
Fibrinogen (mg %)	24	53	126	159	173	176
FSP (+ dilution)	>160	NA	NA	>40*	10–40	10–40
Patient 2						
Platelets × $10^3/m^3$	NA	NA	151	166	198	
HCT (%)	32.9	24.1	25.3	26.5	28.6	
PT (% of normal)	18%	25%	37%	56%	≥100%	
PTT (% of normal)	38%	54%	NA	77%	≥100%	
Fibronogen (mg %)	56	70	159	182	NA	
FSP (+ dilution)	NA	NA	>40*	80–160	10–40	
Patient 3						
Platelets × $10^3/m^3$	153	215	NA	NA	298	
HCT (%)	17.7	24.5	25.8	30.1	32.5	
PT (% of normal)	21%	28%	33%	74%	≥100%	
PTT (% of normal)	32%	58%	66%	≥100%	≥100%	
Fibrinogen (mg %)	82	109	NA	NA	500	
FSP (+ dilution)	>40*	10–40	NA	NA	NA	

* The laboratory did not check dilutional values greater than 1:40.

Common to all three cases were fetal gestational age greater than 20 weeks, difficult fetal and/or placental extractions, and evidence of clinically significant hemorrhage (in Patients 1 and 2 it was delayed 1–2 h post-evacuation; in Patient 3, uncontrollable bleeding developed intraoperatively). Coagulation abnormalities included elevated fibrin split products (FSP), decreased platelet levels and serum fibrinogen levels, and prolonged prothrombin time (PT) and partial thromboplastin time (PTT) values. In all cases, the generalized oozing abated following administration of coagulation factors (Cases 1 and 2 required no further surgical therapy.)

The presumed mechanism for obstetrically related DIC is release of placental tissue thromboplastin and/or amniotic fluid (which contains a procoagulant) into the maternal venous circulation, activating the coagulation and fibrinolytic cascades. A late midtrimester placenta is large and can be difficult to extract. Separating the placenta from the uterine wall by curretage transects many venous sinuses, which might allow tissue thromboplastin and amniotic fluid into the maternal circulation, placing these patients at risk for developing DIC.

During the last year, we have performed approximately 250 midtrimester abortions at Stanford University Hospital. Of these, 10–12% were estimated to be at least 20 weeks gestation. This particular population of young women (*i.e.*, >20 weeks gestation) appear to be at an increased risk of developing clinical DIC following elective D & E procedures. Recently, we noted that in ten additional patients undergoing late second trimester abortions (>19 weeks gestation) at our institutions, FSP values were elevated (positive in the 10–40 dilution range) without other laboratory or clinical evidence of DIC. We would speculate that the use of larger amounts of pitocin (*e.g.*, 80–100 U) in patients undergoing late midtrimester abortions would further increase uterine muscle tone,[7] and might result in more effective constriction of uterine vessels, thereby decreasing the absorption of thromboplastin and amniotic fluid. In addition, to provide optimal cervical dilatation for the extraction procedure, a minimum of three thick lamineria tents should be inserted into the cervical canal 12–24 h prior to a late midtrimester abortion. In Patient 2, it was possible to insert only a single lamineria. This contributed to a difficult extraction and probable cervical trauma.

The ultimate outcome of DIC is determined by the dynamic interactions occurring between various pathologic processes and compensatory mechanisms (*i.e.*, depletion *vs.* repletion of coagulation factors and platelets). Initial therapy consists of treating the underlying disorder and any existing complications (*e.g.*, shock). Although anticoagulant therapy with heparin has been used with success in treating on-going consumption coagulopathies, we felt it was unnecessary in these three cases. The presumed stimulus (*i.e.*, amniotic fluid and/or tissue thromboplastin) was self-limited. By removing all fetal and placental tissues, the primary therapeutic objective had been achieved. Therefore, procoagulants

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were given to replace factors that had been consumed. Replacement of consumed factors should *not* "fuel the fire" if the underlying cause has been appropriately treated and/or removed.

The anesthesiologist providing care for this group of patients should be aware of the possibility of developing clinically significant DIC in this setting (*i.e.*, gestations >20 weeks, difficult extractions). Because these procedures are routinely performed on an outpatient basis, we feel that this patient population, which is apparently at increased risk to develop clinically significant bleeding during the early postoperative period, should remain under close observation in the recovery room for a minimum of 2–3 h. During this time, blood loss should be monitored carefully. Abnormal or increasing bleeding merits a longer observation period, and coagulation studies should be obtained to rule out DIC.

If the coagulation studies are abnormal, prompt administration of appropriate procoagulants may alleviate the need for a second operation. In both Patients 1 and 2, further surgical intervention was unnecessary, and administration of procoagulants terminated the hemorrhagic episodes. Perhaps both patients could have been spared a second anesthetic had their coagulation abnormalities been recognized earlier and appropriate treatment initiated. Additionally, the availability of blood bank products should be considered when administering anesthesia to advanced midtrimester abortion patients. We recommend that all patients undergoing late midtrimester abortions have blood sent to the hospital blood bank preoperatively for a type and screen. Although the D & E procedure is a relatively minor surgical procedure, the development of DIC is a life-threatening complication, and early recognition can lead to appropriate interventions.

In conclusion, patients undergoing a *late* midtrimester TAB by D & E appear to be at increased risk for development of DIC. Based on our three case reports, we have the following recommendations. The period of recovery room observation should be a minimum of 2–3 h. Coagulation status should be assessed early when any signs of increased bleeding are noticed. If coagulation studies are abnormal, therapy with procoagulants should be promptly administered. The availability of blood and coagulation factors should be checked before anesthetizing this group of patients. Finally, awareness of the possibility of developing DIC following a technically difficult extraction should result in a more rapid diagnosis and prompt initiation of appropriate therapy.

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