Dextran 70 Embolization
Another Cause of Pulmonary Hemorrhage, Coagulopathy, and Rhabdomyolysis

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Thirty-two percent dextran 70 is a highly viscous polysaccharide liquid used for uterine distention during hysteroscopy. Although generally safe, this agent has been recognized recently to cause noncardiogenic pulmonary edema, renal insufficiency, and intravascular coagulopathy. We report a case of acute 32 percent dextran 70 embolization, associated with intravascular coagulopathy, bilateral lung infiltrates, and rhabdomyolysis, recognized initially by hemoptyis and pleuritic chest pain while the patient was in the recovery room following a hysteroscopic procedure. Pulmonary, anesthesiology, and critical care physicians should be aware of these potential complications of hysteroscopic surgery.

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Hysteroscopy is a frequently used and accepted diagnostic and therapeutic gynecologic technique, typically performed utilizing 32 percent dextran 70 in 10 percent dextrose in water (Hyskon Division, Pharmacia Laboratories, Piscataway, NJ) as an intrauterine distending medium, instilled under pressure.1 It is considered an ideal agent as a distending medium for hysteroscopy because it is electrolyte free, nonconducting, biodegradable, and optically clear. Dextran 70 is a mixture of glucose polymers with an average molecular weight of 70,000 daltons; 90 percent of the molecules have a molecular weight of 25,000 to 125,000 daltons.2 According to the manufacturer, 32 percent dextran 70 has a kinematic viscosity of 220 centistokes, which is approximately 150-fold greater than that of plasma. Because of these properties, entrance to the intravascular compartment is normally minimal.

Anaphylaxis, noncardiogenic pulmonary edema, and coagulopathy after intrauterine instillation have been reported.3,4 The nature of the observed pulmonary edema remains debated. This report describes a patient who had development of hemoptyis, acute pleuritic chest pain, rhabdomyolysis, and intravascular coagulopathy associated with intravasation of 32 percent dextran 70 solution.

CASE REPORT

A 24-year-old previously healthy woman with secondary infertility was admitted to the hospital for diagnostic laparoscopy and hysteroscopy. Results of a comprehensive infertility evaluation were within normal limits except for a hysterosalpingogram diagnostic of Asherman’s syndrome (secondary infertility due to intrauterine adhesions and synechiae) with proximal occlusion of both fallopian tubes. The patient had no history of coagulopathy or allergy and was receiving no medications prior to surgery. Results of preoperative physical examination were normal: hemoglobin, 14.0 g/dl; platelets, 190,000/µl; and albumin, 4.3 g/dl (normal, 3.5 to 5.0).

The 120-min procedure was performed with the patient in Trendelenburg’s position under general anesthesia; muscle relaxation facilitating orotracheal intubation was achieved with 120 mg of succinylcholine, and ventilation was mechanically maintained. Approximately 30 min after beginning the procedure, 1,150 ml of 32 percent dextran 70 solution was injected transcervically via syringe under manual pressure; 600 ml of this was later recovered. Under visual laparoscopic control, the fallopian tubes were found to be initially nonpatent without intraperitoneal extravasation of the solution instilled. A total of 1,000 ml of crystalloid solution was infused intraoperatively. Blood loss was minimal.

While in the recovery room, the patient had development of respiratory distress, acute pleuritic chest pain, hemoptyis, and vaginal and venous cannulation-site bleeding. She was transferred to the ICU for further stabilization and evaluation. At arrival to the ICU, the heart rate was 100/min, blood pressure was 100/60 mm Hg, respiratory rate was 20/min, and temperature was 36.8°C. The right atrial pressure by examination was 5 cm H2O. Results of the cardiac examination were normal; diffuse crackles were audible over both upper lung fields. Arterial blood gas analysis while receiving 55 percent supplemental oxygen by mask revealed a PaO2 of 80 mm Hg, PaCO2 of 43 mm Hg, and pH of 7.39. The hemoglobin was 9.0 g/dl, platelet count was 57,000/µl, albumin was 2.2 g/dl, partial thromboplastin time was 47.7 s (normal, 26 to 41), prothrombin time was 13.5 s (normal, 10.9 to 12.8), fibrinogen was 132 mg/dl (normal, 195 to 365), fibrin split products were 10 to 40 ng/L (normal <10), and creatine kinase was 267 U/L (normal, 38 to 176) with a peak of 2,182 U/L on the following day (100 percent MM fraction). Fibrin monomers were not detected in the serum. Myoglobinuria was identified. The electrocardiogram was normal. A chest roentgenogram (Fig 1, left) revealed bilateral patchy infiltrates in the upper lung fields. Patchy nonsegmental mismatched perfusion defects were visualized by radioactive ventilation-perfusion lung scan (Fig 1, right). The patient received supportive respiratory care and did not require reintubation. Diuretic response to 20 mg of intravenous furosemide was minimal; urinary output was subsequently maintained with hydration. Impedance plethysmography and Doppler ultrasound venous examinations of both lower extremities showed normal findings. The hemoptyis subsided within 6 h; coagulation parameters normalized within two days. The patient remained in the ICU for 48 h and was discharged from hospital on the third postoperative day.

At a follow-up visit 10 days later, the patient was entirely asymptomatic. A repeated chest roentgenogram, radioactive ventilation-perfusion lung scan, and pulmonary function testing—spirometry, lung volumes, and diffusing capacity for carbon monoxide (DCO)—were normal. She conceived within six weeks of surgery and had a successful intrauterine pregnancy.

DISCUSSION

Dextran 70 has been used as intravenous plasma volume expanders since their introduction in the late 1940s.8 The high molecular weight and colloidal osmotic pressure effects of dextran preparations account for both their efficacy and many of the side effects.9 Reported complications associated with intravenous dextran solutions include allergic reactions, hypervolemia, renal insufficiency, and disseminated intravascular coagulopathy.10-11 Our patient was treated in the ICU without central venous or pulmonary artery cannulation. The distribution of the pulmonary infiltrates, lung scan findings, and absence of electrocardiographic or cardiac isoenzyme abnormalities, however, confirmed the clinical impression of a noncardiac cause of the pulmonary gas exchange and radiographic abnormalities.

Pulmonary edema following intravenous dextran 40 infu-
sion has been attributed to a direct toxic effect on pulmonary capillary endothelium. There have been eight reported cases of pulmonary edema associated with hysteroscopic use of 32 percent dextran 70. The 500-mL maximum instillation volume of 32 percent dextran 70 recommended by the manufacturer was exceeded in all but one case and probably played a role in the genesis of our patient’s morbidity. Dextran 70 has a water-retaining capacity of 27 mL/g in vitro; 100 mL of 32 percent dextran 70 has a calculated volume expansion capacity of 860 mL. Recently, Mangar et al. demonstrated intravasation of 32 percent dextran 70, measuring serum levels during hysteroscopy. Although no patient had development of pulmonary edema, they concluded that fluid overload resulted from the dextran osmotic effects. In a different report, an elevated pulmonary wedge pressure during positive end-expiratory pressure ventilation was recorded. Despite this, however, we and others noted no jugular venous distention on initial examination to corroborate the presence of significant intravascular engorgement and suspect that the osmotically induced vascular space expansion may have been delayed due to the viscous nature of the solution. Leake et al. reported two cases of 32 percent dextran 70-induced noncardiogenic pulmonary edema, although intravascular pressure monitoring was similarly not performed. The observed slow resolution of the pulmonary infiltrates over six to seven days as well as a residual DCO abnormality up to 11 days postoperatively in otherwise healthy young women provides further evidence against a simple fluid overload mechanism. Thiesen and Müttel demonstrated osmotically induced intense ultrastructural alterations after perfusion of venous endothelium with hyperosmolar sorbitol. We postulate a similar endothelial injury associated with pulmonary embolization of hyperoncotic 32 percent dextran 70 solution (Fig 2), in addition to vascular space expansion.

Disseminated intravascular coagulopathy as a complication of hysteroscopy utilizing 32 percent dextran 70 and improvement with supportive care has been reported in three previous cases. The coagulopathy in our patient was not as severe, and all laboratory parameters normalized within 24 h. It is hypothesized that the oncotic alteration results in an abnormal interaction between damaged endothelial cells and platelets as well as release of thromboplastin from alveolar tissue.

Rhabdomyolysis can be caused by a variety of toxins.
drugs, physical exercise, and infection. In addition, a pure hyperoncotic state can cause experimental rhombodys- 
omy in conjunction with disseminated intravascular coagulop- 
athy. Our patient had a peak creatine kinase value of 2,182 
U/L (a 12-fold rise) 24 h postoperatively and myoglobinuria 
consistent with rhombodysmy. Neither succinylcholine, a 
preoperative intramuscular injection, nor the insertion of 
the insufflation needle during laparoscopy should increase 
creatine kinase values to this level.

This case describes the complications arising from pulmon- 
ary embolization of 32 percent dextran 70 as a distending 
medium during hysterectomy associated with arterial desat- 
uration, disseminated intravascular coagulation, hemoptyis, 
and rhombodysmy. As pulmonary artery catheterization 
was not believed to be clinically necessary, recovery of 
dextran from the pulmonary circulation was not performed. 
The diagnosis of dextran embolization was made based on 
clinical findings (pleuritic chest pain with hemoptyis), the 
distribution of (dependent) pulmonary infiltrates, and doc-
umented perfusion defects by radionuclide scintigraphy. 
The likelihood of occurrence may be related to the volume 
used and instillation pressure.2,7 Pulmonary and critical care 
physicians as well as gynecologists and anesthesiologists 
should be aware of these potential complications of this 
hysteroscopy medium.

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Expiratory Collapse of the Trachea 
Presenting as Worsening Asthma*

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A 50-year-old woman with lifelong asthma had nearly total 
expiratory collapse of her distal trachea. The signs and 
symptoms were similar to those of asthma except for a 
pronounced upper airway component to her wheezing and 
the immediate onset of dyspnea on exertion. Surgical repair 
led to significant improvement in symptoms and resolution 
of tracheal collapse on expiration. Ultrafast computed 
tomography was a valuable adjunct to bronchoscopy in 
diagnosis and management. Expiratory collapse of the 
trachea should be considered in the differential diagnosis 
of wheezing and intractable reactive airway disease.

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Reversible airflow obstruction in adults is usually caused 
by reactive airway disease (asthma), but “everything 
that wheezes is not asthma.” One condition that masquerades 
as asthma is expiratory collapse of the trachea. As described 
by Herzog,1 these patients have “flabbiness” and prolapse of 
the dorsal membranous portion of the trachea into the lumen 
during expiration, causing marked airflow obstruction.4 Men 
over 40 with chronic bronchitis or emphysema are most 
often affected. Symptoms may occur suddenly and include 
cough, extreme expiratory difficulty, and stridor. Collapse 
of the airway during cough prevents adequate expectoration

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