

Uterine Inversion: A Life-Threatening Obstetric Emergency

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Background: Acute puerperal uterine inversion is a rare but potentially life-threatening complication in which the uterine fundus collapses within the endometrial cavity. Although the cause of uterine inversion is unclear, several predisposing factors have been described. Maternal mortality is extremely high unless the condition is recognized and corrected.

Methods: MEDLINE was searched from 1966 to the present using the key phrase "uterine inversion." Nonpuerperal uterine inversion case reports were excluded from review except when providing information on classification and diagnostic techniques. A summarized case involving uterine inversion and a review of the classification, etiology, diagnosis, and management are reported.

Results and Conclusions: Although uncommon, if left unrecognized, uterine inversion will result in severe hemorrhage and shock, leading to maternal death. Manual manipulation should be attempted immediately to reverse the inversion. Tocolytics, such as magnesium sulfate and terbutaline, or halogenated anesthetics may be administered to relax the uterus to aid in reversal. Intravenous nitroglycerin provides an alternative to the tocolytics and offers several pharmacodynamic advantages. Treatment with hydrostatic pressure may be attempted while waiting for medications to be administered or for general anesthesia to be induced. In the most resistant of inversions, surgical correction might be required. (J Am Board Fam Pract 2000;13:120-3.)

Uterine inversion during the acute postpartum period is a relatively rare complication. Severe postpartum hemorrhage and shock result from the uterine fundus collapsing. If unrecognized, this obstetric emergency could cause serious morbidity or death. The reported incidence of uterine inversion varies considerably in the literature. Most commonly, the frequency is reported to be approximately 1 in 2000 deliveries; however, a range of 1 in 4000 to 1 in several hundred thousand can be found.^{1,2} Maternal mortality has been reported to be as high as 15%.³

Treatment options for this obstetric complication are also quite varied. Several pharmacologic methods, as well as manual and surgical options, have been described for correcting an inversion. The most important aspect of treatment remains immediate recognition and prompt attention to its management. Following is a case report of complete uterine inversion with a discussion of classification, etiology, diagnosis, and methods of treatment for this life-threatening obstetric event.

Methods

Using "uterine inversion" as the key phrase, MEDLINE was searched from 1966 to the present. Articles pertaining strictly to nonpuerperal uterine inversions were excluded from review, with the exception of those providing information on classification and diagnostic techniques. A case involving complete uterine inversion complicated by persistent postpartum hemorrhage and resulting in hysterectomy is described. A review of the classification, etiology, diagnosis, and management is reported from the available literature.

Case Report

A 22-year-old woman, gravida 4, para 2, abortus 1, came to the hospital with premature rupture of membranes but no contractions at 35 weeks' gestation. A sonogram done to confirm dates at 17 weeks additionally showed a posterior, low-lying placenta. Her prenatal care began at 7 weeks. At 28 weeks, however, she changed providers from obstetric management to her family physician. Her prenatal course was otherwise unremarkable. The patient's obstetric history included postpartum hemorrhage after her third pregnancy, attributed to retained placenta. Management required dilation and curettage and transfusion of 2 units of packed red blood cells.

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An obstetrician was consulted to address management of the preterm premature rupture of membranes. The decision was made to augment labor, and the patient began the second stage of labor within 3 hours of starting oxytocin. A 2410-g male infant, who had Apgar scores of 8 and 9, was delivered uneventfully. Four minutes later, the placenta was delivered, but it was adherent to a completely inverted uterus. The placental membranes promptly filled with blood, which produced a large mass effect at the vaginal introitus and made manual reduction impossible without initially removing the placenta. The obstetrician was called for assistance, and the patient was taken to the operating room for manual removal of the placental membranes and reduction of the inversion after starting general anesthesia with halothane.

The patient was transferred to the recovery room and monitored closely for symptoms of shock related to the massive blood loss experienced from the inversion. Prophylactic antibiotics were started, and 5 L of intravenous fluids with oxytocin, 4 units of packed red blood cells, and 3 ampules of carboxymethylcellulose tromethamine were used throughout the patient's immediate postoperative period. Reevaluation by the consultants for persistent bleeding and continued symptoms of shock resulted in the decision to perform an emergency hysterectomy. Findings at time of surgery included an incomplete inversion of the uterus that was not diagnosed preoperatively on abdominal examination.

Postoperatively the patient was observed in the intensive care unit. She was given fresh frozen plasma, blood transfusions, and colloidal fluids in attempts to stabilize her blood pressure and prevent disseminated intravascular coagulation. By the next morning she was hemodynamically stable and was transferred to a medical unit. Because of a persistently low platelet count and low hematocrit levels, however, she required further transfusions of packed red blood cells and platelets. The patient was released from the hospital on day 5.

A pathology report of the placenta was not obtained, but the uterine specimen from the hysterectomy showed evidence of placenta accreta in the fundus of the uterus.

Discussion

Classification

Uterine inversion is classified not only by the degree of inversion but by the time of onset as well.

The uterine fundus that has inverted and lies within the endometrial cavity without extending beyond the external os is called an incomplete inversion. Complete inversion describes an inverted fundus that extends beyond the external os.⁴ A prolapsed inversion is one in which the inverted uterine fundus extends beyond the vaginal introitus.³ A total inversion, usually nonpuerperal and tumor related, results in inversion of the uterus and vaginal wall as well.⁴ In terms of onset of the inversion, acute describes the event occurring before cervical ring contraction. If the cervical ring has contracted, a subacute inversion has occurred. The inversion is classified as chronic if 4 weeks have elapsed before the event.^{2,4-6}

Etiology

Why uterus inversion occurs is unclear. The most likely cause is strong traction on the umbilical cord, particularly when the placenta is in a fundal location, during the third stage of labor.⁷ Other factors might include excessive fundal pressure; relaxed uterus, lower uterine segment and cervix; placenta accreta, particularly involving the uterine fundus; short umbilical cord; congenital weakness or anomalies of the uterus; and antepartum use of magnesium sulfate or oxytocin.^{5,7,8} Other reports suggest primiparity and rapid emptying of the uterus after prolonged distention as possible predisposing factors.⁴⁻⁶

Diagnosis

Diagnosis of uterine inversion is usually based on clinical signs and symptoms. When there is complete inversion, the diagnosis is most easily made by palpating the inverted fundus at the cervical os or vaginal introitus, as in the case described above. In incomplete inversion, palpating the fundal wall in the lower uterine segment and cervix might be required for diagnosis. Profuse bleeding, absence of uterine fundus, or an obvious defect of the fundus on abdominal examination, as well as evidence of shock with severe hypotension, will further provide the clinician with diagnostic clues.^{5,9}

Although clinical symptoms will provide the diagnosis in most cases, radiographic methods to diagnose inversion have also been described in the literature. Hsieh and Lee¹⁰ describe the sonographic findings of uterine inversion discovered incidentally in an acute incident. In the transverse images was visualized "a hyperechoic mass in the

vagina with a central hypoechoic H-shaped cavity." Longitudinal images showed a U-shaped "depressed longitudinal groove from the uterine fundus to the center of the inverted part." Magnetic resonance imaging (MRI) of inversion has also been reported. The appearance of the uterus is similar to that found in sonographic imaging; however, MRI findings are much more conspicuous.³ Thus radiographic imaging can help when the diagnosis is uncertain after examination, and the patient is sufficiently stable clinically to undergo such evaluation.

Treatment

Treatment of uterine inversion consists of manual manipulation of the uterus and pharmacologic agents to assist in uterine relaxation for correction. Further agents are then given to cause uterine contraction to prevent reinversion and to decrease blood loss. If these methods fail, surgical intervention might be necessary.

Once inversion is recognized, all oxytocic agents should be withheld until correction has been established. Manual correction of inversion through the vagina, known as the Johnson maneuver, consists of pushing the inverted fundus through the cervical ring with pressure directed toward the umbilicus.⁸ Controversy exists about whether the placenta should be removed before repositioning the uterus. It is commonly suggested that removal of the placenta before correction will result in increased blood loss and worsening hemodynamics.^{2,8}

To assist the clinician in maneuvering the uterus, myometrial relaxation is implemented by various medications. Most commonly used is magnesium sulfate or terbutaline, because they are readily available on most obstetric floors. These medications will not only relax the uterus but will also relax a cervical contraction ring. Reports on the use of intravenous nitroglycerin for uterine relaxation also exist. Benefits cited for the use of low-dose nitroglycerin include quicker onset of uterine relaxation; quick dissipation of the effect, obviating the need for reversal; and less effect on hemodynamics than magnesium sulfate.¹¹ In the event that correction is not established with tocolytic agents, general anesthesia with halothane may be induced to provide uterine relaxation. This approach can be particularly useful when the patient is hemodynamically unstable, because halothane

anesthesia has fewer potential adverse effects on hemodynamics than do the β -adrenergic tocolytics.⁹

Hydrostatic pressure, cited commonly in the British literature, is another method used to reposition the uterus when inversion has occurred. In this method, first described by O'Sullivan in the *British Medical Journal* in 1945, a bag of warmed fluid is hung on a pole used for intravenous fluids above the level of the patient and allowed to flow, via tubing, into the vagina. The pressure of the water, held in place by the clinician's hands, results in correction of the inversion. Momani and Hassan² reported successful correction in five cases of inversion within a 7-year period using this method. More recently, Ogueh and Ayida¹² described a new technique of hydrostatic pressure. Citing difficulty in maintaining an adequate water seal to generate the pressure required, the authors suggest attaching the intravenous tubing to a silicone cup used in vacuum extraction. By placing the cup within the vagina, an excellent seal is created, and adequate hydrostatic pressure for inversion correction is thus produced. Although success with this technique is cited in the literature, there has been no discussion of the theoretical risk of air or amniotic fluid embolus.

When all attempts at manual reduction of the inversion are unsuccessful, surgical correction might be necessary. Although several procedures have been described, the two most commonly cited are the Huntington and Haultaim procedures. The Huntington procedure requires a laparotomy to locate the cup of the uterus formed by the inversion. Clamps are placed in the cup of the inversion below the cervical ring, and gentle upward traction is applied. Repeated clamping and traction continues until the inversion is corrected. In the Haultaim procedure, an incision is made in the posterior portion of the inversion ring, again through the abdomen, to increase the size of the ring and allow repositioning of the uterus.⁹

Summary

In summary, uterine inversion can be a life-threatening obstetric complication. Although uncommon, if unrecognized, severe hemorrhage and shock will lead to maternal death. Manual manipulation aided by tocolytic or halogenated anesthetic agents is often successful in correcting the inversion. In the most resistant of inversions, surgical correction through the abdomen might be needed.

In any case, the best prognosis is achieved by prompt recognition of the condition and immediate attempts to correct the inversion. Thus, it is important that physicians providing obstetric care be aware of the common signs of inversion so that the diagnosis can be determined and treatment initiated immediately.

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