Research Article ISSN 2835-6276

American Journal of Medical and Clinical Research & Reviews

Acute puerperal uterine inversion

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Received: 30 Nov 2023; Accepted: 05 Dec 2023; Published: 15 Dec 2023

Citation: Felis S. Acute puerperal uterine inversion. AJMCRR 2023; 2(12): 1-9.

ABSTRACT

Uterine inversion is often accompanied by postpartum hemorrhage and hypovolemic shock. Morbidity and mortality occur in 41% of cases. Early recognition and management are of utmost importance. Successful treatment depends on timely recognition. Management should include resuscitation of maternal hypovolemic shock and repositioning of the inverted uterine fundus. Uterine inversion is a rare but potentially life-threatening obstetric emergency.

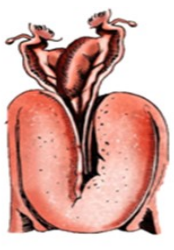
Keywords: uterine inversion, postpartum hemorrhage, hypovolemic shock, inverted uterine fundus repositioning.

Definition and epidemiology

Acute puerperal uterine inversion is an obstetric emergency condition that occurs when the uterine fundus collapses within the endometrial cavity (Figure No. 1) after fetal expulsion, within 24 hours of delivery.

It is a rare event, the incidence of which appears to be stable over time (1) and varies by geographic location, with values reported between 1:2000 and 1: 20,000 deliveries (2).

A



B

Figure 1: Uterine Inversion

In case of inversion, the uterine fundus seen from the outside loses its convex shape and deepens inside the uterine cavity, thus the typical "crater" appearance of the uterine fundus is visible (A). In frontal section, the introflexion of the "inverted glove finger" fundus across the entire body of the uterus and the cervical canal can be seen, which is still dilated in Figure B.

Classification

The classification of acute puerperal inversion is based on the level reached by the uterine fundus during its introflexion. The classification establishes the severity of the problem and divides uterine inversion into four grades (Figure No. 2):

- 1st degree (incomplete inversion): the inversion of the uterine fundus extends within the uterine cavity and may reach up to but not through the cervix.
- 2nd degree (incomplete inversion): the inversion extends inside the cervical canal.
- 3rd degree (complete inversion): introflexion of the uterine fundus goes beyond the cervical canal and extends to the vagina
- 4th degree (complete inversion): the entire uterus and vagina are inverted and visible outside the genitals

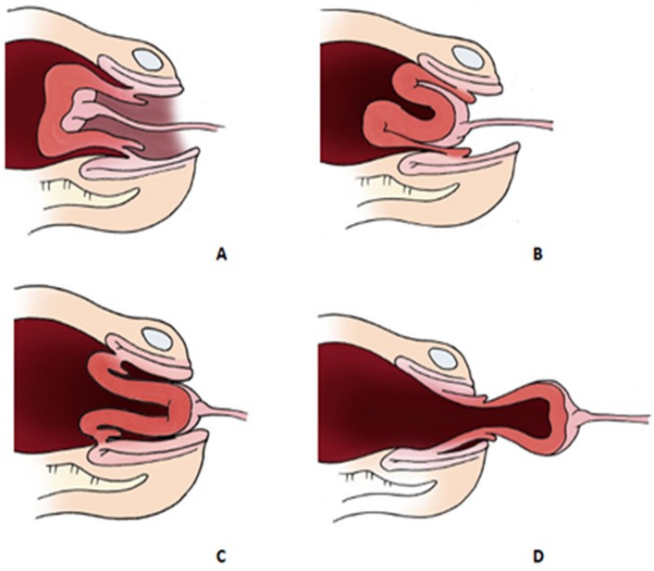


Figure 2: Degrees of acute puerperal uterine inversion

A. Grade 1: introflexion of the uterine fundus remains within the uterine body

B. 2nd degree: the fundus inversion travels through the uterine cavity, reaches the cervix and passes through it.

C. 3rd degree: the completely inverted uterine fundus goes beyond the cervix extends into the vagina.

D. 4th degree: the completely inverted uterus and vagina exit the genitals

Risk factors

The main predisposing factor for uterine inversion is inappropriate management of stage III labor (1-4): overly forceful tractions on the funiculus can drag the uterine fundus into the uterine cavity, especially in the case of fundic insertion of the placenta; the same can happen if traction of the funiculus is applied in the presence of an incompletely contracted uterus or if excessive transabdominal pressures are exerted on the uterine fundus. Placental characteristics are also potential risk factors; in fact, uterine inversion is more likely to occur in cases of placentas with notes of accretism. However, it should be remembered that in about half of the cases of uterine inversion there are no specific risk factors present (1). According to the latest literature reviews, large multiparity, fetal macrosomia, and twin pregnancy are also not to be considered predisposing (1).

Caesarean section is also not a protective factor against uterine inversion. Therefore, choosing to perform an elective cesarean section does not reduce the risk of fundus invagination (1).

Diagnosis

The most classic clinical onset of acute uterine inversion is postpartum hemorrhage, present in about 94% of cases (2): hemorrhage occurs because the invagination of the uterus does not allow for proper myometrial contraction and thus the vascular ports at the placental bed remain open. It is estimated that about ¼ of patients with acute puerperal inversion require hemotransfusion (1).

The clinical presentation is summarized in Table 1, and the differential diagnosis between uterine inversion and other obstetrical disorders is summarized in Table 2.

Table 1

Clinical picture	OR (IC95%)
Postpartum hemorrhage	20.5 (18.9-22.3)
Need for hemotransfusion	29.8 (27.1-32.8)
Maternal hypotension	17.2 (13.0-22.7)
Shock	76.9 (54.1-109.4)

Table No. 1 Maternal clinical conditions in acute puerperal uterine inversion

(Taken from Coad et al. Risks and consequences of uterine inversion. Am J Obstet Gynecol 2017. OR= odds ratio. CI= confidence interval)

Table 2

Clinical sign	Possible causes
Postpartum hemorrhage	Uterine atony Uterine rupture Coagulopathy
Mass leaking from the genitals	Genitals prolapse Expultion of myoma Partially retained placenta

Table No. 2 Differential diagnosis: pathologies that may cause clinical signs like those present in acute puerperal uterine inversion.

In case of total inversion, the diagnosis is simple because of the unequivocal visual appearance of a large bleeding mass extending outside the genitalia (Figure No. 3).

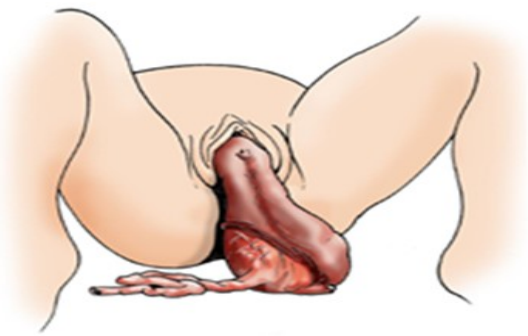


Figure 3: Total complete uterine inversion

In acute total puerperal uterine inversion, a large bleeding mass may be visualized extending outside the genitals; portions of the placenta are also often present.

In cases of complete inversion, palpation of the maternal abdomen also fails to appreciate the uterine fundus. Subjective symptomatology is characterized by sudden, stabbing pain in the abdomen, with a filling sensation extending toward the vagina (2). Subjective symptomatology may be accompanied by a picture of shock. Cardiovascular collapse is rapid and greater than expected because of the amount of blood loss, as it is also related to vagal stimulation (2). Shock therefore may initially be neurogenic and then hemorrhagic.

In cases of incomplete uterine inversion, diagnosis is more difficult; maternal symptomatology is more nuanced and is characterized by lower-grade, typically mild but persistent metrorrhagia associated with diffuse but not excruciating abdominopelvic pain (2). On abdominal palpation, a concave deformation of the uterine fundus is appreciated, which appears cupped (Figure No. 4). On internal palpation, an irregularity can be appreciated within the uterine cavity, consisting of the indovate uterine fundus and qund then appreciable as a convex surface (2).

In such cases, ultrasonographic evaluation (Figure No. 5) can be a useful diagnostic aid by highlighting "fallen fundus signs"(5), characterized by a "Y-shaped uterus" with a "crater-like depression" on its apical contour, which then continues downward with hypoechogenic stripes ("pseudostripes" represented by the two overlapping serosal surfaces)

that are placed in the center of a structure with myometrial-like echogenicity. Echographic evidence of the rounded contour of the uterine fundus, however, rules out uterine inversion (6). Thus, the diagnosis is conclusive when in sagittal section the rounded uterine fundus is not observed and there is a kind of mirror image of the uterus "upside down, inside out" with the pseudostrips indicating that the uterine fundus is invaginated within the uterine cavity (7).

Given the severity of the clinical picture, if not recognized, acute puerperal uterine inversion can lead to severe maternal complications up to death.

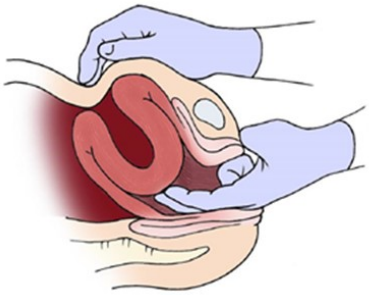


Figure 4: Incomplete uterine inversion

In incomplete uterine inversion, no masses are visualized leaking from the genitals. On abdominal palpation, a "cup-shaped" deformation of the uterus is perceived. On vaginal exploration, the inner part of the inverted fundus can be appreciated, which is palpated as a protruding convex formation within the cavity.

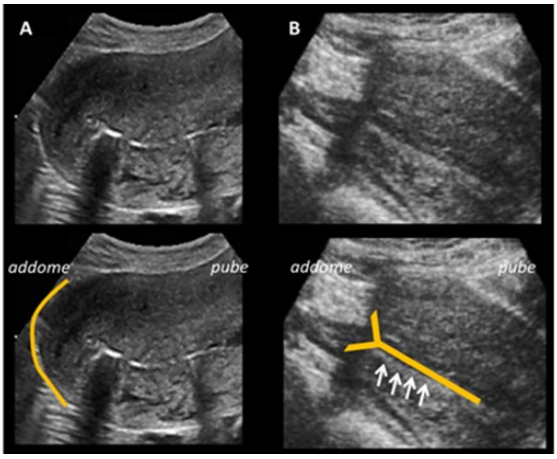


Figure 5: Ultrasound appearance of the uterus with fundus inversion

Left (A) normal ultrasound picture: in sagittal section, the rounded contour of the uterine fundus is clearly visible. On the other hand, on the right (B), a case of uterine inversion is depicted, with an image that looks "mirror-like" compared to the normal one. Also present are the typical Y-sign of the uterus, related to the invagination of the fundus within the cavity, and the internal pseudostriae related to the indentation of the seriosa.

Clinical management

Once the diagnosis is made, proceed to stabilize the woman.

Remember that the quickest and therefore best way to resolve hemorrhage and maternal shock is uterine repositioning (8). Also remember that the longer the repositioning is delayed, the more difficult the procedure becomes because uterine edema may occur, and the cervix may reconstitute and close (2).

Therefore, the first thing to do is to contact the anesthesiologist and, while waiting for him, obtain venous access with a large cannula needle to treat any hypotension and hypovolemia.

If secondment has not yet occurred, do not attempt to remove the placenta until the inversion has been corrected: placental removal with an inverted uterus could make the maternal hemorrhagic picture worse (9).

Then proceed to **uterine repositioning.**

There are several methodologies for attempting to

reposition the uterus and return it to its proper anatomical arrangement. All methodologies could, theoretically, benefit from the use of tocolytic drugs to allow uterine relaxation and thus allow the operator to act more easily. However, it is important to remember that the use of a tocolytic can aggravate bleeding and therefore should be used with caution if necessary. Foreign texts suggest the use of MgSO4 or terbutaline, or halothane because of their rapid action and short half-life (2,3,8,10). Whichever repositioning methodology is used, broad-spectrum antibiotic coverage should be done (2).

Manual repositioning

The first approach modality to try to resolve uterine inversion is manual repositioning (11), proposed by Dr. Johnson in the mid-1900s and still valid today (Figure No. 6).

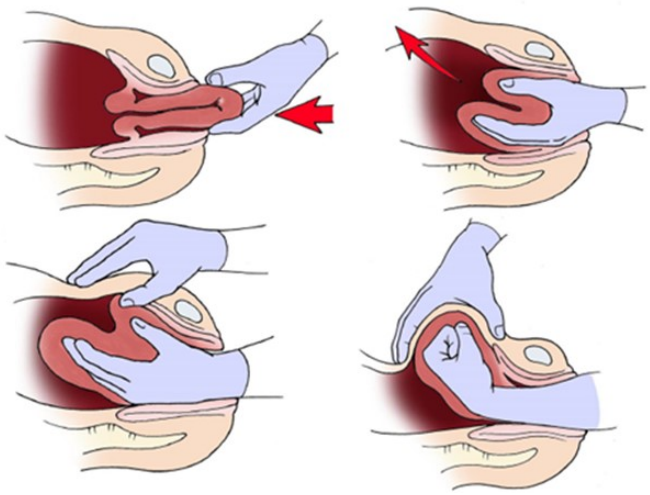


Figure 6: Maneuvers for manual repositioning of the inverted uterus if secondment has already occurred

It is necessary to grasp the uterus by placing the fingers at the level of the cervico-uterine junction so that the inverted fundus is contained in the palm of the operator's hand, posed as a cup. Then push the hand upward inside the vagina and uterine cavity in a supra-umbilical direction. The passive action of the uterine ligaments regaining their anatomical location may at this point help to resolve the invagination of the fundus. The probability of success of the maneuver corresponds to 43-88% (12-14). To prevent reinversion, once the fundus has been repositioned in its correct anatomical location, it is necessary to hold it in place for a few minutes by closing the hand into a fist; it is also helpful to administer oxytocin (15).

Contain the uterine fundus in the palm of the hand; gently push the uterus inside the abdomen by placing the fingers at the level of the cervico-uterine junction; the push should be impressed upward in the supra-umbilical direction; once the fundus has been repositioned, close the hand into a fist and hold the uterine fundus in place for a few minutes.

In case uterine inversion has occurred before the expulsion of the placenta, it is necessary to manually reposition the fundus by containing the placenta as well as the inverted uterus in the palm of the hand (Figure No. 7). When the uterine fundus has been repositioned and the uterus remains stably contracted, one can proceed to secondment.

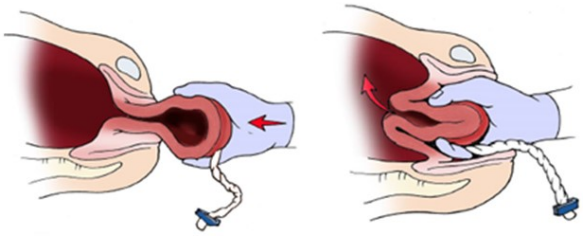


Figure 7: Manual repositioning of the inverted uterus if the placenta is still adherent to the uterus

Do not proceed with manual secondment. Reposition the uterine fundus by laying both fundus and placenta in the palm of the hand. Then proceed to

push upward. Only once repositioning of the fundus has been achieved can secondment proceed.

Hydraulic repositioning

About mid-1900, O'Sullivan published the first cases of resolution of uterine inversion by hydraulic method (16). The World Health Organization suggests the use of this method if manual repositioning fails (17).

To proceed with hydraulic repositioning, it is necessary to place the woman in the Trendelemburg position to take advantage of gravity and reduce traction on the infundibulum-pelvic, round, and ovarian ligaments. Attach at least two one-liter bags of warm sterile saline (isotonic sodium chloride) solution to an outflow device using a cystoscopy set (then with pressure infuser). Place the bags at least 1 to 1.5 meters above the patient to take advantage of gravity and hydraulic buoyancy. Insert one hand into the vagina with which to position the open end of the outflow tube at the level of the posterior vaginal fornix; then begin infusing the solution. With the other hand, close the labia minora around the wrist of the hand inserted into the vagina to prevent the fluid from leaking out. The water relaxes the posterior vaginal fornix and produces a gradual correction of the inversion. Remember that several liters of saline may need to be infused to achieve fundus repositioning. An alternative to introducing the operator's hand holding the end of the tube into the vagina is to insert into the posterior vaginal fornix a 6-cm silicone suction cup (or other appropriate size depending on the patient) to which the end of the outflow tube is attached (18). Once the cup is in place, infusion of the saline solution can be performed (Figure No. 8) by ajaring the labia minora around the tube protruding from the genitals. When using this variation of the hydraulic method, it is important to remember that the suction cup should not be placed at the bottom of the inverted uterus but rather directed toward the posterior vaginal fornix to allow vaginal distention. Remember that, theoretically, a possible complication of the hydraulic method is intravasation. However, no cases with this complication are reported in the literature, even in cases of conspicuous infusions of saline, reaching up to 5 liters (2).

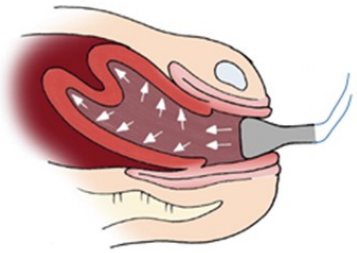


Figure 8: Hydraulic repositioning

Some saline solution is infused into the vagina through a outflow tube whose end is inserted in the direction of the posterior fornix. Vaginal filling facilitates repositioning of the uterine fundus.

Repositioning by Bakri® balloon.

Recently, the use of the Bakri balloon, which is inserted instead of the operator's hand, inflated, and left in place, has been suggested as a method of repositioning (19) (Figure No. 9).

Bakri's postpartum balloon method involves the combination of a hydrostatic pressure effect, given by the balloon filled with physiological saline solution that expands the uterus as a spherical body pressurizing the entire uterine cavity, and the effect of Johnson's method, in which the uterine ligaments are extended by the lifting of the balloon. It should also be mentioned that this method also has a hemostatic effect against bleeding from uterine atony, which may be present at the same time.

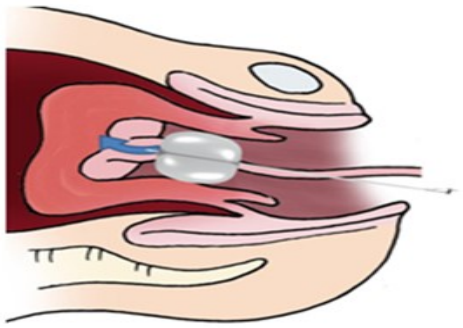


Figure 9: Repositioning using Bakri®balloon

Surgical repositioning

Laparotomy, proposed in the 1920s by Dr. Huntington (20), allows exposure of the area to be treated; the site of inversion is easily visualized, and the uterine fundus presents the typical "crater" appearance with induration of the tubal portion and the broad ligament within the concavity.

To surgically resolve uterine inversion according to the Huntington method, it is necessary to place Allis clamps on the broad ligament near its insertion on the uterus at the edge of the "crater" (Figure No. 10). Then apply gentle traction on the forceps to gently raise the indovate fundus. Reposition the forceps as needed; each time gradual externalization of the fundus is achieved. The Allis forceps should be repositioned as you go, at the level of the point of the broad ligament closest to the point of invagination. An assistant can possibly facilitate the success of the maneuver by exerting vaginally an upward push on the invaginated fundus.

A variant to the use of the Allis clamps, applicable in the case of a laparotomic approach, is that proposed by Antonelli (21), which involves the application of the obstetrical suction cup on the inverted uterine fundus to achieve reduction of the inversion (Figure No. 11).

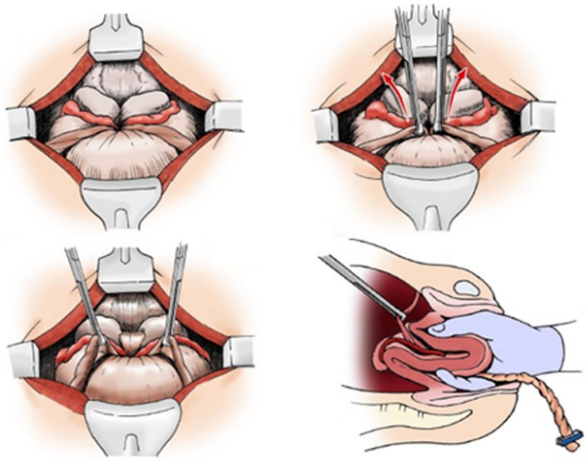


Figure 10: Surgical repositioning

Once the laparotomy has been performed, the area of uterine fundus introflexion is clearly visible due to its crater-like appearance. Allis forceps are placed on the broad ligament at the point where the invagination of the uterine fundus begins. The forceps are then gently lifted to facilitate the rise of the invaginated fundus. A second operator can help the successful maneuver by suspending the uterus vaginally.

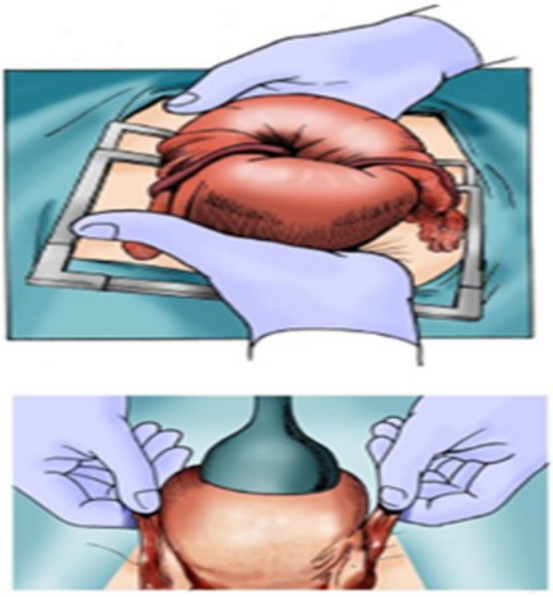


Figure 11: Variant of surgical repositioning using suction cup

The uterus is exteriorized, and the suction cup is applied to the point of fundus introflexion

Recently, Dr. Vijayaraghvan has proposed a variation of the surgical method instead, using a laparoscopic approach instead of laparotomy (22). If the decision is made to apply this method, special attention should be paid to maternal hemodynamic issues and the potential effects of pneumoperitoneum on the woman's general condition should be considered.

If, despite the methods used, repositioning of the uterine fundus has not been achieved, it is necessary to consider hysterectomy as a life-saving treatment for the patient. Literature data estimate a hysterectomy occurrence of less than 3% of cases (1).

A summary of the procedures to be performed in case of uterine reversal is schematized in Figure No. 12.

Figure 12: Possible management algorithm of uterine inversion (Modified from Bhalla R, Wuntakal R, Odejinmi F, Khan RH. Acute uterine inversion. The Obstetrician & Gynaecologist. 2009; 11:13-18)

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