Research Article ISSN 2835-6276

American Journal of Medical and Clinical Research & Reviews

Uterine Atony

Felis S, Belmartino S.

U.O. of Obstetric and Gynaecological Clinic, IRCCS Policlinico San Martino Hospital, Genoa

*Correspondence: Felis S

Received: 04 Nov 2023; Accepted: 07 Nov 2023; Published: 10 Nov 2023

Citation: Felis S. Uterine Atony. AJMCRR 2023; 2(11): 1-8.

ABSTRACT

Postpartum hemorrhage is common and can occur in patients without risk factors for hemorrhage. Active management of the third stage of labor should be used routinely to reduce its incidence. Use of oxytocin after delivery of the anterior shoulder is the most important and effective component of this practice. Oxytocin is more effective than misoprostol for prevention and treatment of uterine atony and has fewer adverse effects. Routine episiotomy should be avoided to decrease blood loss and the risk of anal laceration. Appropriate management of postpartum hemorrhage requires prompt diagnosis and treatment. The Four T's mnemonic can be used to identify and address the four most common causes of postpartum hemorrhage (uterine atony [Tone]; laceration, hematoma, inversion, rupture [Trauma]; retained tissue or invasive placenta [Tissue]; and coagulopathy [Thrombin]). Rapid team-based care minimises morbidity and mortality associated with postpartum hemorrhage, regardless of cause. Massive transfusion protocols allow for rapid and appropriate response to hemorrhages exceeding 1,500 mL of blood loss.

Keywords: Postpartum hemorrhage, uterine atony, Misoprostol; Oxytocin

Introduction

Uterine atony is the most frequent cause of postpartum haemorrhage, representing one of the top 5 causes of maternal mortality worldwide (1-3)lack of effective uterine contraction after childbirth is responsible for approximately 60% of cases of postpartum haemorrhage (3). Uterine atony occurs when the myometrial cells of the uterine body show inadequate contraction and the uterus fails to contract effectively after delivery; this contraction, aimed at stopping bleeding from the vessels at the placental implantation site, is induced by the production of endogenous oxytocin during labour (4, 5). The identification of a soft, 'flaccid' uterus, in the context of excessive postpartum blood loss, should suggest the presence of atony and should trigger a series of interventions aimed at achieving a lasting uterine contraction that is maintained in the immediate postpartum period (5, 6).

Physiology of uterine haemostasis

In the postnatal period, haemostasis is supported

by uterine contractile activity, induced by oxytocin and vasoconstriction, and sustained by local haemostatic mediators, such as prostaglandins and tissue plasminogen inhibitory factor type 1 (4, 6). Bleeding occurs because the spiral arteries of the uterus lack their own musculature and for this reason, after secondment, they depend on uterine contractions to be occluded; if the uterus does not contract, they remain beating (6). Remember that the uterus gravidarum is a highly perfused organ, its arterial flow at term is between 450 and 650 ml/min, which is about 10 - 12% of the total cardiac output and it takes only a short time to have massive bleeding (4).

Risk factors

Careful risk assessment is essential for identifying women with an increased likelihood of uterine atony, so that preventive measures can be instituted and delivery can be performed under conditions of availability of transfusion and anaesthetic procedures (5, 7). The risk factors for uterine atony are prolonged or precipitous labour, uterine overdistention (as in the case of multiple pregnancy, polyhydramnios or fetal macrosomia, see figure no. 1), the presence of uterine myomas, chorionamniosis, congenital or acquired uterine anomalies, the administration of magnesium sulphate, the use of general anaesthesia and the administration of oxytocin for induction or enhancement of labour; pre-eclampsia, white and Hispanic race and obesity (with body mass index > 40) are also independent factors favouring uterine atony (table no. 1) (8, 9). Uterine atony may be secondary to another cause of post-partum haemorrhage, such as retention of amniochorial tissue, placentation abnormalities (placental accretism, placenta previa, etc.), coagulation abnormalities (congenital or acquired, which may aggravate the picture of atony) and uterine inversion, in which obviously the distorted uterus, out of its anatomical location, cannot contract (7).

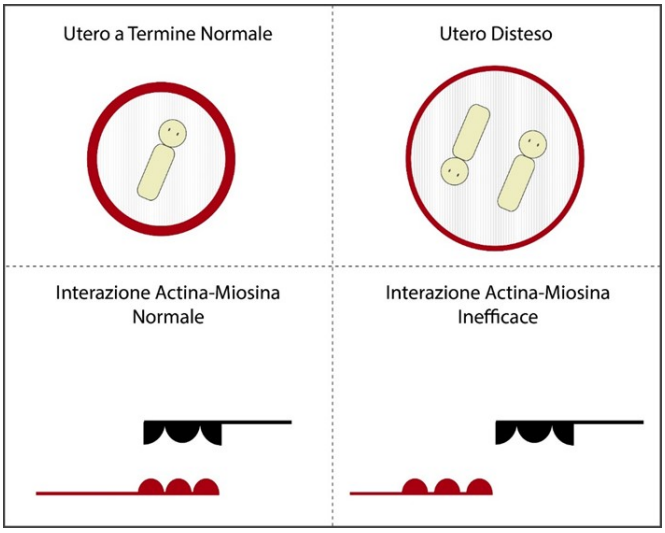

Figure 1 Overdistension interferes with normal actin-myosin interaction and can cause atony and haemorrhage.

Intra-partum risk factors	Anamnestic risk factors
Prolonged or precipitous labour Induced labour Uterine overdistension (for multiple pregnancy, polyhydramnios, fetal macrosomia) Presence of uterine fibroids Chorionamniosite Uterine relaxants such as deep anaesthesia (especially halogenated anaesthetic agents) and magnesium sulphate Inappropriate use of oxytocin Manual removal of the placenta	Previous post-partum haemorrhage Antepartum haemorrhage (placenta previa or placental abruption) Obesity (with Body Mass Index > 40) Pre-eclampsia Congenital or acquired uterine abnormalities White and Hispanic ethnicity

Table 1 Summary table of risk factors for uterine atony (8).

An important anamnestic data is the presence of previous post-partum haemorrhage, as these women have a 15% risk of recurrence in a subsequent pregnancy (8). A population-based cohort study

investigated which of the risk factors were associated with the development of severe post-partum haemorrhage, and the results reported first parity, multiparity with previous caesarean section, induction of cervical ripening as independent factors, prolonged labour and episiotomy (whether or not associated with operative delivery), another important risk factor that emerged was the delay in haemorrhage management procedures, i.e. administration of oxytocin, examining the uterine cavity and calling for further assistance (10). The importance of the timing of the recognition of the clinical picture and the initiation of procedures is thus apparent.

Unfortunately, the prediction of a post-partum haemorrhage episode is difficult, since less than 40% of women with uterine atony and a need for transfusion are found to have an identifiable risk factor, which is why the unpredictability of uterine atony makes it necessary to have strict protocols for the management of post-partum haemorrhage in each obstetric care unit. (11).

Anamnesis

The best clinical management that can be offered to the pregnant woman involves taking a thorough history and an equally thorough physical examination. Once high-risk patients have been identified, the necessary steps can be planned and the appropriate resources set up to manage any emergency, including the presence of experienced staff, appropriate drugs and instruments, and blood derivatives; if the hospital does not have the necessary resources, the patient should be sent for management to an appropriate hospital that does (10). International guidelines recommend identifying and stratifying, before delivery, women who have a history of risk factors for postpartum haemorrhage, suggesting that the maternal risk assessment should be performed at the time of admission, modifying it continually in the event of the emergence of other risk factors during labour or the postpartum period; risk assessment tools are readily available and have been shown to identify 60-85% of patients who will develop significant obstetric haemorrhage (10).

Table 2 shows the risk stratification according to these assessment tools (10).

Low Risk	Medium Risk	High Risk
Single pregnancy Less than four previous parts Uterus without previous scarring No history of post-partum haemorrhage	Previous caesarean or uterine surgery Multiple pregnancy Large uterine myomas Chorionamniosite Use of magnesium sulphate Prolonged use of oxytocin	Placental abnormalities (previa, accreta, increta, percreta) HCT < 30 Bleeding on admission Coagulation defect not known History of post-partum haemorrhage Altered vital signs (tachycardia and hypotension)

Table No. 2 Risk stratification suggested by the American College of Obstetricians.

Diagnosis

Identifying uterine atony is not complex, if one can distinctly appreciate on abdominal palpation, a flaccid and doughy uterus, at or beyond the transverse umbilical line, which is accompanied by abundant blood loss and/or mixed with clots. In cases of difficulty in abdominal assessment, such as in the case of unfavourable maternal habitus (if very bulky, abdominal fat can make it very difficult to assess the uterus) or localised uterine atony, in which the uterine fundus can be effectively con-

tracted but with an atonic lower uterine segment area that is difficult to appreciate on palpation of the abdomen, vaginal exploration can be of great assistance (6). It is of fundamental importance in the evaluation of the atonic uterus to exclude other causes of post partum haemorrhage, with the manual exploration of the uterine cavity it is in fact possible to exclude the presence of placental remnants or membranes (with adequate analgesic coverage), for this purpose the bedside ultrasound of the patient, which can highlight an endometrial rhyme with increased echogenicity, can be of great help in the evaluation of the retention of amniochorial material; with digital exploration of the vagina it is also possible to assess the presence of bleeding vagino-perineal lacerations (4, 6).

Clinical management

Prevention and prenatal preparation

A range of strategies should be implemented to reduce morbidity and mortality from post-partum haemorrhage(12). First of all, it is necessary to establish protocols to be implemented in case this obstetric emergency occurs. It is therefore important to have immediate availability of a haemorrhage trolley with specific kits with drugs (table no. 3), supplies, checklists, instructions and to establish a team ready to intervene, thus knowing who to call in case help is needed and to establish protocols for performing emergency transfusions (13)to improve the training of the emergency team in the delivery room, the literature suggests that teamwork simulations are extremely effective, improving the effectiveness of clinical management, reducing errors and the time taken to perform procedures (14).

Uterotonic drugs	**Plugging devices**
Oxytocin - SYNTOCINON 5 IU 8 ampoules Methylergometrine - METHERGIN 0.2 mg ampoules 5 ampoules Sulprostone - NALADOR 0.5 mg ampoules 2 ampoules Misoprostol - CYTOTEC 200 mg tablets 5 cps	Bakri Sengstaken-Blakemore Rush Foley catheters Tampon gauze

Table no. 3 Example of a uterine atony kit to be kept in the delivery room

It is also necessary to carry out a good antenatal assessment (15)which includes:

- screening and treatment of prenatal anaemia;
- screening for sickle cell anaemia and thalassaemia in women of African, South East Asian or Mediterranean origin;
- good ultrasound documentation in women at high risk of invasive placentas;
- the ready availability of the blood bank and operating theatre in case of a patient with a high risk of bleeding;
- identification of patients refusing blood products.

If the woman presents a medium or high haemorrhagic risk, arrangements must be made to have the necessary blood typed.

Intra-partum prevention and management

A 2011 Cochrane review (16)as also reported by the Royal College of Obstetricians and Gynaecologists guidelines (8) for the management and prophylaxis of postpartum haemorrhage, indicates as prophylaxis, even in patients without risk factors, the active treatment of the third stage of labour, which includes:

- Oxytocin administration at fetal anterior shoulder expulsion
- Clamping and early cutting of the umbilical cord (but not earlier than 1 minute after birth)
- Moderate traction on the cord when the uterus is centralised and well contracted.

If, despite active treatment of the third stage, the uterus fails to contract properly, medical treatment should be started immediately, aimed at re-establishing proper uterine contractility.

The first therapeutic approach to haemorrhage consists of the administration of uterotonics, firstly Oxytocin and then second-line drugs, accompanied by physical techniques to support uterine contractility, namely uterine massage and bimanual compression. These manoeuvres, designed to aid myometrial contractility and historically part of clinical obstetric practice, continue to be recommended, despite having low quality evidence to support their efficacy (15, 17, 18). It is indicated to continue until valid uterine contraction is achieved or until haemorrhage is reduced.

The **uterine massage** is performed by placing one hand at the level of the uterine fundus and the other at the level of the lower uterine segment, and then applying a pressure-massage from the fundus towards the lower segment of the uterus (18). If this manoeuvre is unsuccessful or difficult because of the maternal habitus, **bimanual compression** can be attempted. This is performed by placing one hand in the vagina pushing against the body of the uterus, while the other hand exerts pressure on the uterine fundus through the abdominal wall (17) (figure no. 2). An empty bladder facilitates these manoeuvres, so a permanent catheter should be placed, which will also allow diuresis to be monitored. If successful, these manoeuvres lead to uterine contraction and outflow of blood and clots, which should be followed by normal loops.

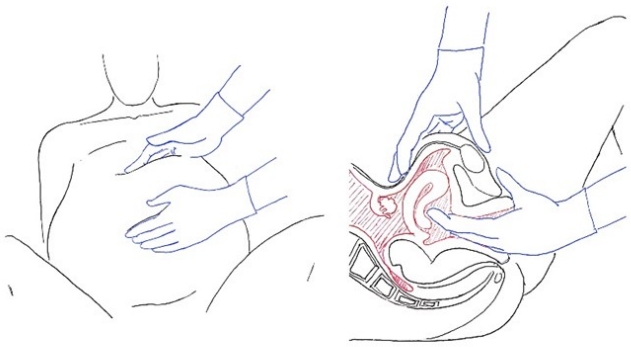

Figure 2 Manoeuvres for uterine massage (A) and bimanual compression (B)

Treatment

Although they differ on suggesting second-line therapies, the international guidelines all report very similar indications for the *medical treatment* of haemorrhage, which involves the administration of uterotonic drugs (7, 8, 15) in particular:

Oxytocin **(Syntocinon)**: 10-40 Units in 1000 ml intravenously or 10 Units intramuscularly;

Methylergotamine **(Methergin)**: 0.2 mg intramuscularly, administration may be repeated every 2-4 hours;

Sulprostone **(Nalador)**: 0.5 mg in 250 ml saline solution intravenously; may be administered every 30 minutes for up to two times

***Carboprost* (Hemabate)**: 0.25 mg intramuscularly, given every 15 - 90 minutes for up to 8 doses (maximum 2 mg);
***Misoprostol* (Cytotec)**: 400 to 1000 mg rectally;
Tranexamic acid: 1 g intravenously over 10 minutes; can be repeated after 30 minutes.

Uterotonic drugs are dealt with in the dedicated chapter of this book.

Oxytocin is the most effective treatment and should therefore be used as a first-line drug; the other uterotonic drugs are used second-line and their choice should be based on specific patient characteristics, such as hypertension, asthma or use of protease inhibitors.

Although not a uterotonic, tranexamic acid, if given within the first three hours, can also be used as an adjuvant drug in reducing mortality due to postpartum haemorrhage bleeding (7, 12)

Patients who do not respond to medical therapies can undergo uterine tamponade, conservative and non-conservative surgical techniques. Surgical therapy is discussed at length in the dedicated chapter of this book.

Management in the Puerperium

Once the haemorrhage has been controlled, depending on the starting haemoglobin values and the extent of blood loss, the patient may present with a certain degree of anaemia, which may also require haemotransfusion if the haemoglobin reaches values of 6-7 /dl or if the patient is very symptomatic even for higher values. It may be useful to administer oral or possibly parenteral martial therapy.

Pathological anatomy

Under normal circumstances, the post-partum uterus is enlarged due to hyperplasia and hypertrophy of the myometrial cellular components, the uterine wall is usually markedly thickened and firm and tense-elastic due to smooth muscle contraction; if atony is present, the uterus will be oedematous, less firm and with obvious haemorrhagic areas, most often these changes are spread throughout the viscera (19).

Microscopically, the findings are relatively non-specific and consist of a typically hypertrophic myometrium with diffuse, recent and profuse haemorrhages often in the vicinity of large ectatic vessels (Figure 3).

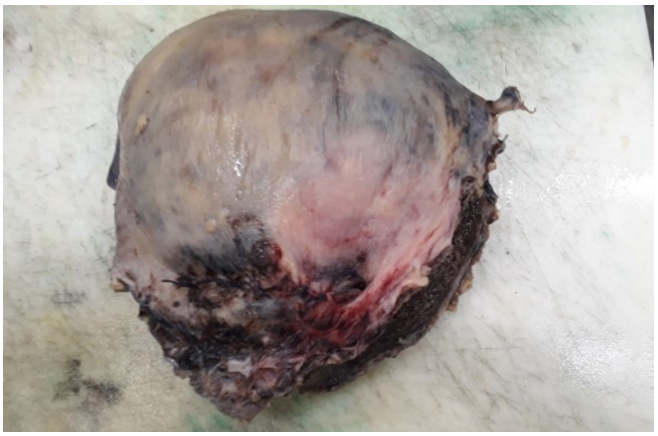

Figure No. 3 Operating specimen of subtotal hysterectomy for uterine atony. The viscera appears oedematous and congested.

Microscopically, the bundles of muscle fibres are separated by abundant oedematous transudate and/or haemorrhage (Figure 4)

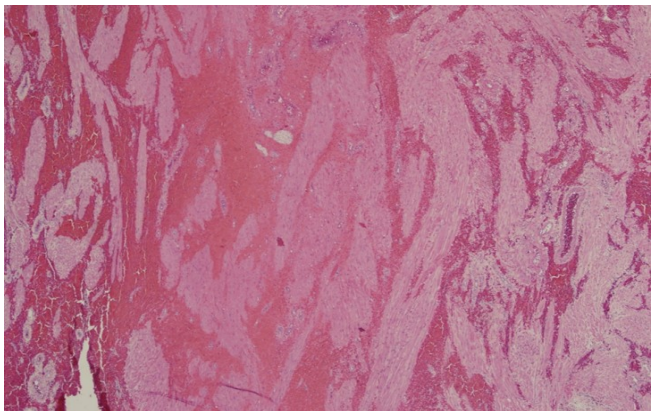

Figure no. 4 Myometrium with extensive recent haemorrhage, the bundles of fibrocells appear separated and sloughed off from haematas without any aspects of organisation (Haematoxylin/Eosin staining, 100X)

A typical anatomopathological picture is called Couvelair's uterus or uterine apoplexy, i.e. a potentially life-threatening condition in which a conspicuous haemorrhagic infiltration is observed. In these cases, the pathogenetic primum movens is represented by an abrubtio placentae with retroplacental saccate haemorrhage making its way between the muscle fibrocells of the myometrium; atony is often a concomitant and aggravating situation (20).

References

1. World Health Organization (WHO) Make Every Mother and Child Count: The World Report 2005. WHO; Geneva Sp.
2. American College of O, Gynecologists. ACOG Practice Bulletin: Clinical Management Guidelines for Obstetrician-Gynecologists Number 76, October 2006: postpartum hemorrhage. Obstet Gynecol. 2006;108(4):1039-47.
3. Nyflot LT, Sandven I, Stray-Pedersen B, Pettersen S, Al-Zirqi I, Rosenberg M, et al. Risk factors for severe postpartum hemorrhage: a case-control study. BMC Pregnancy Childbirth. 2017;17(1):17.
4. Cunningham FG LK, Bloom SL et al. Williams Obstetrics 24th Edition. MacGrawHill Education 2016. Obstetrical Hemorrhage pp 780-781, 785. Maternal Physiology pp 47.
5. Breathnach F, Geary M. Uterine atony: definition, prevention, nonsurgical management, and uterine tamponade. Semin Perinatol. 2009;33 (2):82-7.
6. Prabhcharan Gill AP, James W. Uterine atony. StatPearls Publishing Jan 2020
7. Committee on Practice B-O. Practice Bulletin No. 183: Postpartum Hemorrhage. Obstet Gynecol. 2017;130(4):e168-e86.
8. Mavrides E AS, Chandraharan E, Collins P, Green L, Hunt BJ, Riris S, Thomson AJ on behalf of the Royal College of Obstetricians and Gynaecologists. Prevention and management of postpartum haemorrhage. BJOG 2016;124:e106 -e149.
9. Morey SS. ACOG releases report on risk factors, causes and management of postpartum hemorrhage. Am Fam Physician. 1998;58 (4):1002, 4.
10. Driessen M, Bouvier-Colle MH, Dupont C, Khoshnood B, Rudigoz RC, Deneux-Tharaux C, et al. Postpartum hemorrhage resulting from uterine atony after vaginal delivery: factors associated with severity. Obstet Gynecol. 2011;117(1):21-31.
11. Bateman BT, Berman MF, Riley LE, Leffert LR. The epidemiology of postpartum hemorrhage in a large, nationwide sample of deliveries. Anesth Analg. 2010;110(5):1368-73.
12. Evensen A, Anderson JM, Fontaine P. Postpartum Hemorrhage: Prevention and Treatment. Am Fam Physician. 2017;95(7):442-9.
13. Goldhaber-Fiebert SN, Howard SK. Implementing emergency manuals: can cognitive aids help translate best practices for patient care during acute events? Anesth Analg. 2013;117 (5):1149-61.
14. Merien AE, van de Ven J, Mol BW, Houterman S, Oei SG. Multidisciplinary team training in a simulation setting for acute obstetric emergencies: a systematic review. Obstet Gynecol. 2010;115(5):1021-31.
15. SNLG. Postpartum haemorrhage: how to prevent it, how to treat it. 2016.

16. Begley CM, Gyte GM, Devane D, McGuire W, Weeks A. Active versus expectant management for women in the third stage of labour. Cochrane Database Syst Rev. 2011 (11):CD007412.
17. https://extranet.who.int/rhl/topics/preconception-pregnancy-childbirth-and-postpartum-care/care-during-childbirth/care-during-labour-3rd-stage/who-recommendation-use-bimanual-uterine-compression-treatment-postpartum-haemorrhage.
18. https://extranet.who.int/rhl/topics/preconception-pregnancy-childbirth-and-postpartum-care/postpartum-care/postpartum-haemorrhage/who-recommendation-use-uterine-massage-treatment-postpartum-haemorrhage#:~:text=Uterine%20massage%20involves%20placing%20a,and%20thus%20to%20reduce%20haemorrhage.
19. Chapter 12 Postpartum Hemorrhage SotPS, and Placenta Accreta. In Baergen RM editor. Manual of Pathology of the Human Placenta Second Edition. Springer.
20. Uterine Atony (Post Partum). In Netter's Obstetrics And Gynecology SES.