

La prise en charge anesthésique de l'hémorragie maternelle

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Octobre 2026

Objectifs

1. Réviser les particularités de l'hémorragie maternelle ;
2. Revoir les principales étiologies de l'hémorragie maternelle ;
3. Identifier les facteurs de risque et les adresser dans la prise en charge initiale ;
4. Établir une prise en charge structurée de l'HPP sévère.

Évaluation/Dx
Réanimation
Traitements

1. Réviser les particularités
de l'hémorragie maternelle ;

DÉFINITIONS

- Définition Hémorragie Post Partum (OMS)
 - $\geq$ **300 ml** pertes mesurées + Δ HD
(TAS < 100, TAD < 60, pls > 100) ou
 - Au moins **500 ml** de pertes mesurées
- Définition HPP (RCOG) – études européennes
 - Mineure 500-1000ml $\rightarrow$ > 500 ml = 1/3 des accouchements
 - Majeure 1000-2000ml $\rightarrow$ > 1000 ml = 3-9%
 - Sévère > 2000ml $\rightarrow$ > 2000 ml = 1-2%
- Hémorragie Massive
 - Pertes sanguines objectivées ou anticipées > **40%** du volume sanguin circulant
 - Perte sanguine rapide $\leq$ **3 heures**
 - Saignement **incontrôlé**

Van de Velde. Br J Anaesth 2026;137:168-81
Coomarasamy. Lancet 2026; 408:62-73
Rani. J Clin Diagn Res 2017;11(2):QE01-0

ÉPIDÉMIOLOGIE

• Taux HPP

- 5 à 10% mondial
- 5-6% Canada
- 27 millions/année
 - 17 millions AV (13%)
 - 10 millions CS (31%)

• Taux mortalité HPP

- 43 000 femmes/année
- 74% Afrique subsaharienne

Maternal deaths from PPH:

High income country (HIC) = 0.01% (95% CI: 0.00% to 0.03%)

Low- and middle-income country (LMIC) = 2.6 % (95% CI: 1.6% to 3.9%)

Coomarasamy. Lancet 2026; 408:62-73
Supplementary appendix

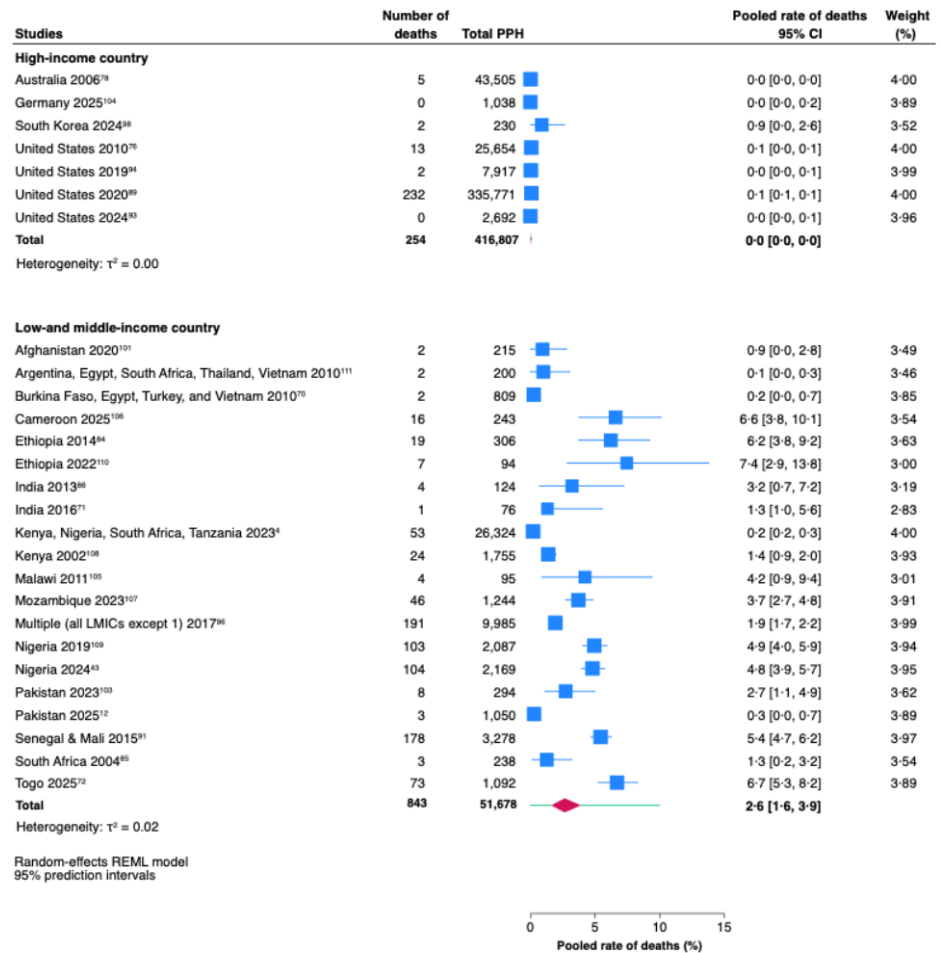


Figure S12: Maternal deaths from PPH: high income country versus low- and middle-income country



TERRAIN

- Particularités de la femme enceinte
 - Hypercoagulabilité
 - ↑ Procoagulants
 - ↓ Anticoagulants
 - Débit sanguin utérin élevé
- À la délivrance
 - **Contraction myomètre**
 - Augmentation activité plaquettaire
 - Vasoconstriction
 - Activité fibrinolytique
 - Relâche massive de facteurs de coagulation

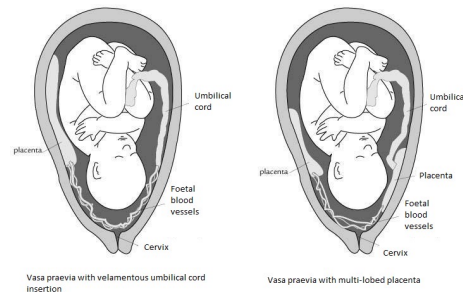
**Hypoperfusion
(saignement):
Activité
fibrinolytique**

2. Revoir les principales
étiologies de l'hémorragie
maternelle ;

ÉTIOLOGIES

- Antépartum

- Placenta previa
- Décollement placentaire
- Rupture utérine
- Vasa previa



**→ s'intéresser au bien-être
foetal...**

- Postpartum

- Tonus
- Tissus
- Traumatisme
- Thrombine/anomalie de la coagulation



Tonus

**Étiologie #1
70% des cas**

- Mécanismes de l'atonie
 - Distension utérine
 - Entrave à l'involution utérine
 - Désensibilisation à l'oxytocine
 - Diminution/épuisement tonus utérin
- **Lorsque l'atonie n'est pas l'étiologie primaire, elle s'ajoute souvent en cours de route...**
- Importance du massage bi-manuel
 - Stimule les prostaglandines endogènes

Tissus

Étiologie #2
16% rétention
4% insertion

- Tissus ou rétention produits de conception
 - Rétention placentaire
 - Incarcération
 - Adhérence
 - Anomalie d'insertion
 - Rétention cotylédons
 - Caillots non éliminés
- Importance de l'inspection placentaire et de l'évaluation manuelle sous échographie au besoin



Placenta previa

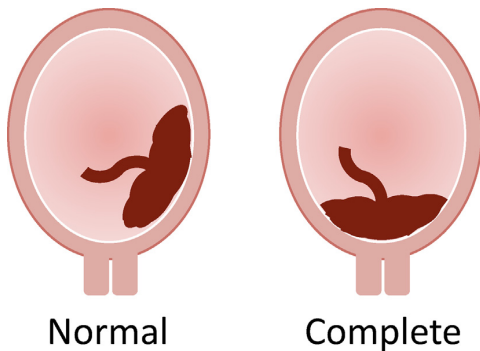


Fig. 1. Placenta previa describes a condition whereby the placenta partially or completely covers the cervix.

Incision transplacentaire
Contraction utérine moins efficace
Risque anomalie d'accrета

TABLE 37.1 Risk for Placenta Accrета in Patients with Placenta Previa: Relationship to Number of Prior Cesarean Deliveries

Number of Prior Cesarean Deliveries	% of Patients with Placenta Accrета
0	3
1	11
2	40
3	61
4 or more	67

Modified from Silver RM, Landon MB, Rouse DJ, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstet Gynecol.* 2006;107:1226–1232.

Chestnut's Obstetric Anesthesia 6^e edition



Spectre placenta accreta

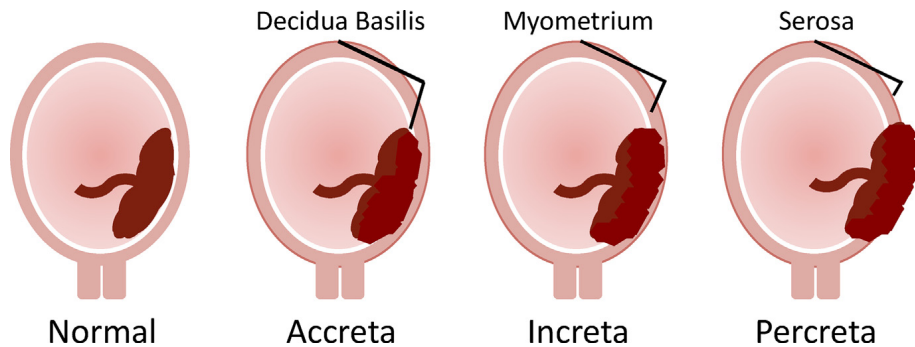


Fig. 2. Placenta accrete occurs when all or part of the placenta attaches abnormally to the myometrium. The 3 grades of abnormal placental attachment are defined according to the depth of uterine invasion.

Table 2
FIGO PAS classification system.

Grade 1	Abnormally adherent placenta to the myometrium
Grade 2	Abnormally invasive placenta into the myometrium
Grade 3	Abnormally invasive placenta through the myometrium
Subtype 3a	Limited to the uterine serosa
Subtype 3b	Urinary bladder invasion
Subtype 3c	Invasion of other pelvic tissues or organs

Césarienne ≈ 35 sem

Multiples façons de gérer;

Wedge

Hystérectomie d'emblée

Hystérectomie à distance

Conservateur

Anticipation:

- Planifier le geste chirurgical
- Grossesse non viable; embolisation
- Envisager une prophylaxie post naissance avec ballons/ligatures/Reboa
- Être prêt à la réanimation sanguine
- Disposer d'options pour une prise en charge invasive de l'hémorragie massive



Traumatisme

Étiologie #3
17% des cas

- Passage vaginale
 - Forceps/Macrosomie... → hématomes
 - Épisiotomie
- Chirurgicale
 - Lacération artères utérines
 - Varices
- Rupture utérine (sur cicatrice)
- Inversion utérine (placenta fundique, atonie et traction cordon)

Vulvaire
(br a. honteuse)
Vaginale
(br descend a. utérine)
Rétropéritonéale
(br a. hypogastrique)



Thrombine ... ou pas

Étiologie #4
2% des cas

- Préexistante à l'accouchement
 - Conditions héréditaires ; VWF, Déficit FVIII – IX - XI
 - Conditions acquises en grossesse ; PTI, PE/HELLP
 - Anticoagulant
- Per accouchement sur étiologie HPP, trauma, HRP, SAG
 - Déplétion sanguine & dilution
 - CIVD
 - Hypoperfusion (∅ endothéliales) + (tissus fœtal) → procoagulant → thrombine → fibrinolyse
 - Aigu ou forme faible grade chronique
 - Coagulopathie aigue obstétricale (CAO)

Wolfovitz. Semin Thromb Hemost 2026;52:342-48
Bell. J Thromb Haemost 2023;21:2064-77
De Lloyd. J Thromb Haemost 2023;21:862-79

HPP ≠ coagulopathie

- Déplétion, consommation, dilution
- ↓ linéaire facteurs (exception Plt et FVIII)
- > 3000 ml dilution des facteurs

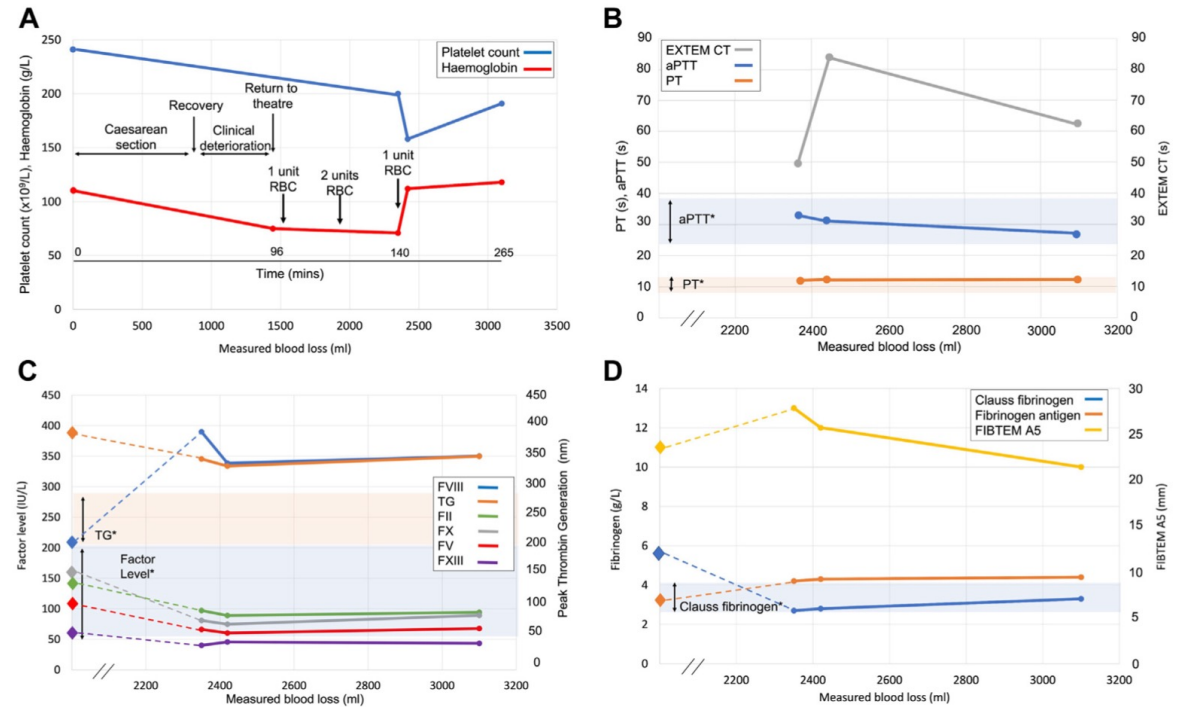


FIGURE 2 Case 1: Changes in hemostatic variables and blood product resuscitation during postpartum hemorrhage. (A) Clinical timeline,

CS pour arrêt de progression
HPP sur atonie synton, ergo & suture
4 culots – PS 3100 ml

Gill. Best Pract Res Clin Anaesth 2024; 38: 233-45
 Bell. J Thromb Haemost 2023;21:2064-77
 De Lloyd. J Thromb Haemost 2023;21:862-79

HPP massive → coagulopathie

- Déplétion facteurs
- Dilution via réplétion
 - ↓ linéaire facteurs
- 4000 ml (besoin 30%)
- (Consommation caillot; CIVD)

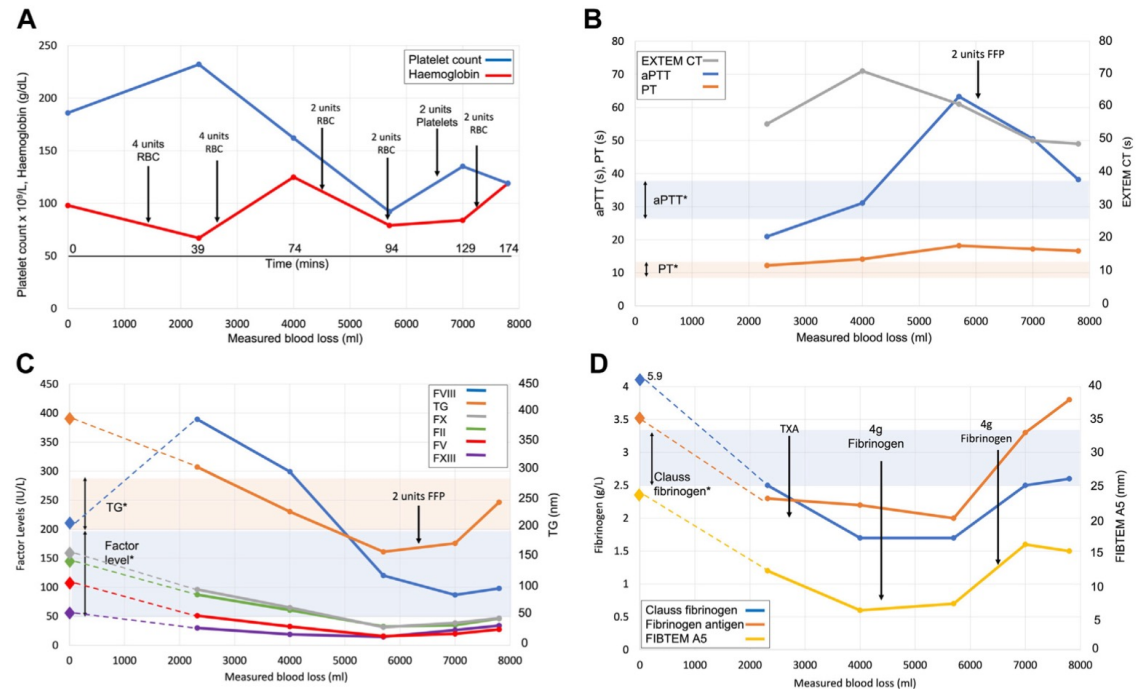
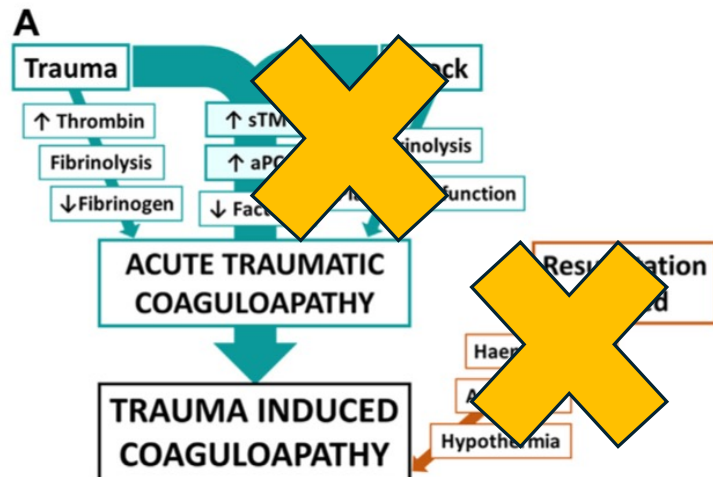


FIGURE 3 Case 2: Changes in hemostatic variables and blood product resuscitation during postpartum hemorrhage. (A) Hemoglobin and

CS urgente : 3 CS ant en travail
HPP sur adhésions & accreta
HAT
14 culots, 2 PFC, 2 Plt, 8g fibrinogène
PS 8500 ml

Coagulopathie aigue obstétricale (CAO)

- Hyperfibrinolyse & Dysfibrinogémie acquise
- Peut être avant le saignement
- Contextes clinique
 - SAG = CAO
 - Association : HRP
 - Multiples

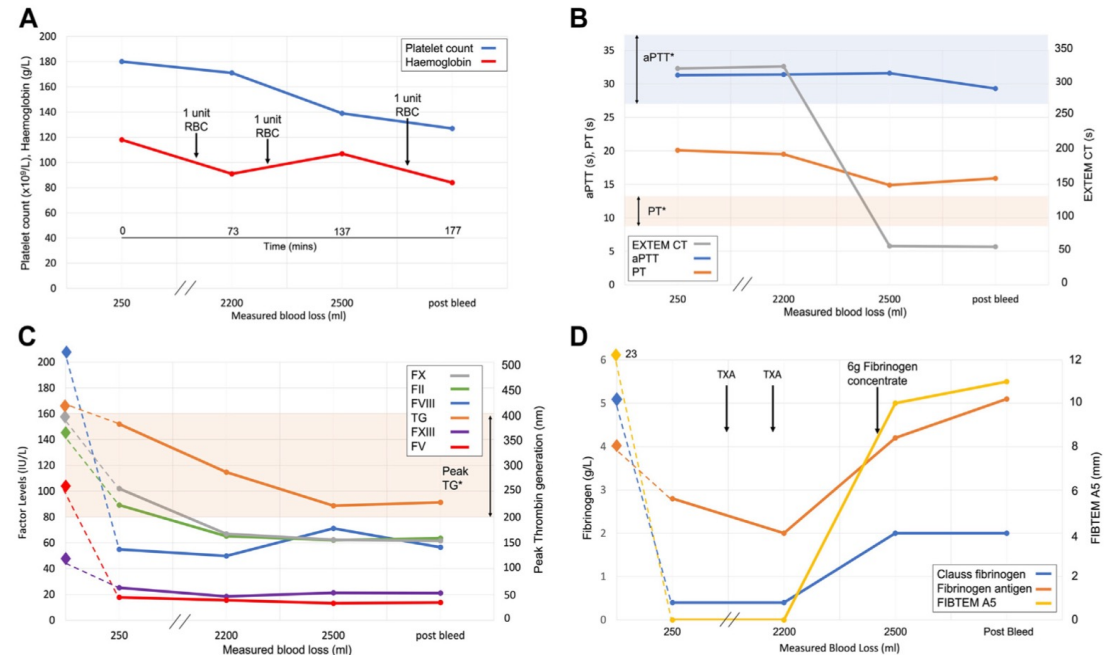
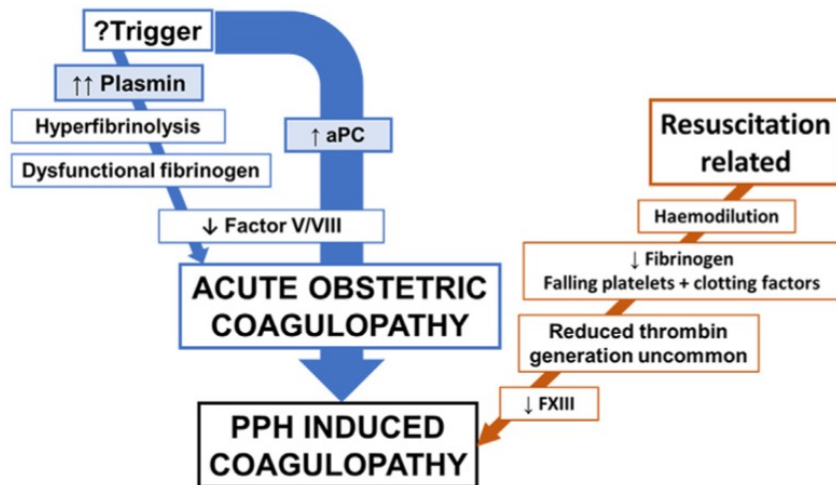
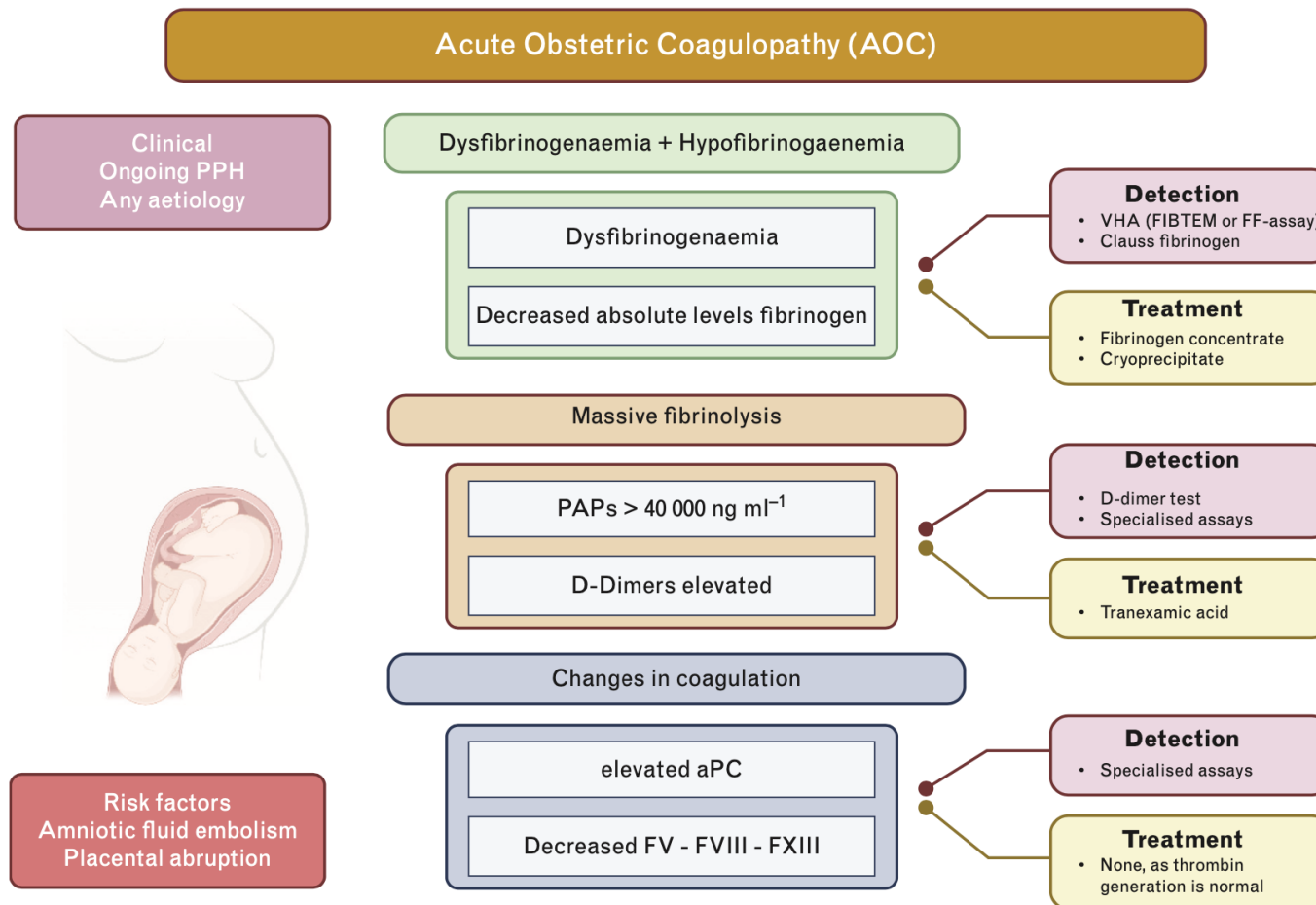


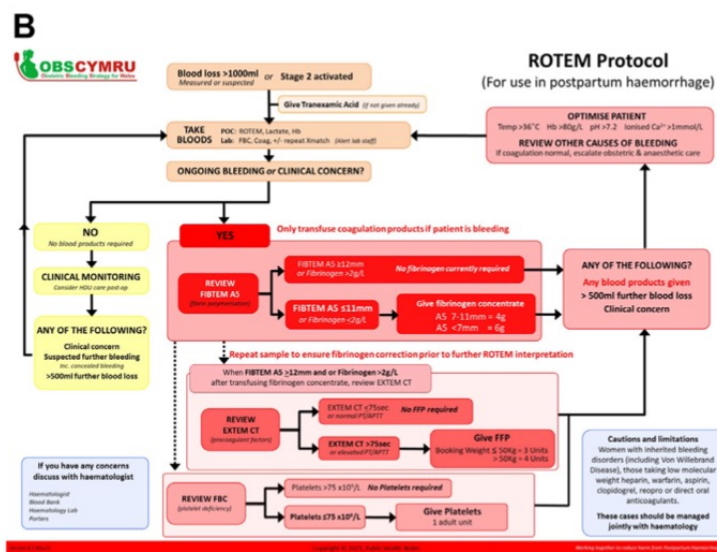
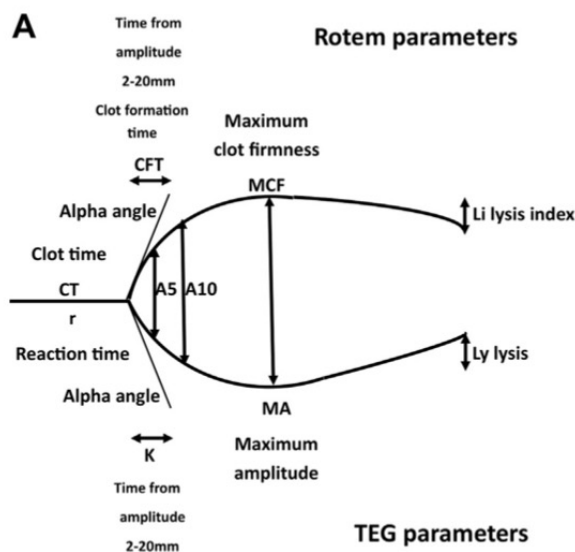
FIGURE 4 Case 3: Changes in hemostatic variables and blood product resuscitation during postpartum hemorrhage (A) Hemoglobin (Hb)

MIU à T2 (CF ~12 hrs) + TPT
AV → HPP → Révision utérine AG
3 culots, 6 g fibrinogène
PS 2500 ml



AOC, acute obstetric coagulopathy; aPC, activated protein C; FF-assay, fibrinogen function assay; FIBTEM, fibrin-based ROTEM assay; FV, coagulation factor V; FVIII, coagulation factor VIII; FXIII, coagulation factor XII; PAPs, plasmin–antiplasmin complexes; PPH, postpartum haemorrhage; VHA, visco-elastic haemostatic assay.

TEG/ROTEM



Parameter	Explanation	Interpretation
EXTEM CT/R	Time to reach 2mm amplitude	Clotting factor activity including anticoagulant effects
EXTEM A5/10	Clot amplitude after 5 mins from 2mm amplitude	Platelets and fibrinogen contribution to clot strength
FIBTEM A5/10	As per EXTEM A5/10	Fibrinogen contribution alone
MCF/MA	As per A5 but at maximal amplitude	As per EXTEM A5/10
LI30/LY30	Residual clot firmness in percentage of MCF at 30 minutes	Fibrinolysis activity

FIGURE 1 Viscoelastic hemostatic assays and local blood product algorithm. (A) Schematic diagram of viscoelastic hemostatic assays showing the main parameters of ROTEM and TEG. (B) The institution's local postpartum hemorrhage blood product algorithm in use at the time of the described cases.



Key message

Thromboelastometric evidence of hyperfibrinolysis during the earliest stage of postpartum hemorrhage is not predictive for progression to severe postpartum hemorrhage. Clinical value of viscoelastometric point-of-care testing for hyperfibrinolysis is limited.

& Hyperfibrinolyse peu fréquente en HPP

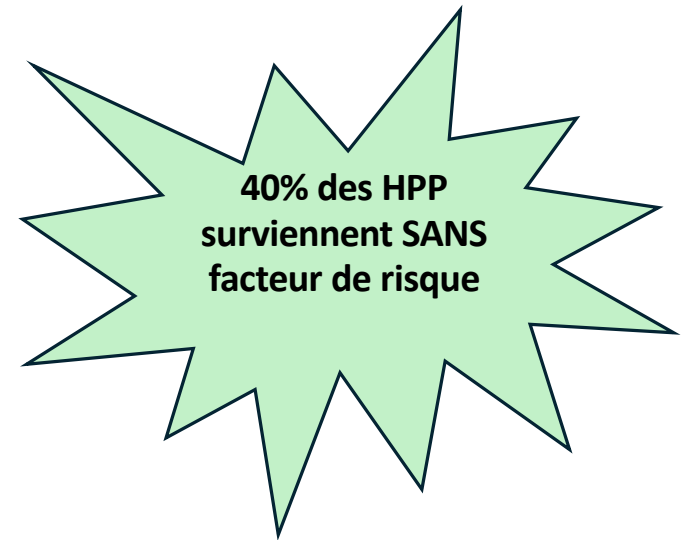
EFI = EXTREM – APTEM
 > 15% hyperfibrinolyse

Bell. J Thromb Haemost 2023;21:2064-77

3. Identifier les facteurs de
risque de l'HPP & les
adresser dans la prise en
charge initiale ;

PRÉPARATION (Structure)

- Protocoles & Algorithmes
- Accès rapide; médication & plateaux
- ÉquipeS de support
 - Équipe de réanimation/banque de sang
 - Équipe de gynéco
 - Centre de référence
- Simulation
- Débriefing post événement & Qualité de l'acte



Yunas. Lancet 2025;405:1468-80
Federspiel et al. Am J Obstet Gynecol MFM 2023;5(2):100740
Cpsi icsp octobre 2016
Lyndon. California Maternal Quality Care Coll. 2015

ANTICIPATION (Accès)

- En amont; identification des facteurs de risque
 - Évaluation pré-anesthésique
 - Liste vérification pré-chirurgicale
- Plan
 - Gestion du sang
 - Plan anesthésique; voie d'accès & technique anesthésique
 - Lieux & l'organisation
 - Transfert

Baird. Anesthesiology Clin 2017;35:15-34
Main. Obstet Gynecol 2015; 126(1): 155-62
Girard. Curr Opin Anesthesiol 2014;27:267-74



Facteurs de risque

Facteurs protecteurs
Peau à peau
Allaitement

	Faibles	Modérés	Sévères 
ATCD médicaux	IMC 25-29,5 Fibromes Antidépresseurs Asthme Épilepsie	IMC 30-34,9 Maladie hépatique COVID-19	Anémie Mutilation génitale Sepsis
ATCD obstétricaux		Hx familiale HPP	ATCD HPP Grande multiparité
Grossesse en cours		Pré-éclampsie Diabète gestationnel Polyhydramnios	Grossesses multiples Placenta previa Pas de suivi anténatal MIU Procréation assistée
Travail & Naissance	RPM Induction Travail stimulé Instrumentation	Macrosomie 4-4,5 kg Épisiotomie	Césarienne Anesthésie générale Sulfate de magnésium 2^{ième} stade prolongé Dystocie épaules Macrosomie 4,5kg

Coomarasamy. Lancet 2026; june 2026
Yunas. Lancet 2025;405:1468-80



Utérotoniques

- Première ligne
 - Prophylaxie **après** la naissance
 - Ne pas attendre le clampage du cordon
 - Favoriser le tonus utérin → Éviter l'HPP
- Deuxième ligne (combinaison à la 1^{ère} ligne)
 - Risque élevé d'HPP
 - Tonus utérin inadéquat (subjectif)
 - Saignement



Utérotoniques

Efficacité

Carbetocin 43%

Oxytocine 42%

Oxytocine + miso 30%

Oxytocine + ergo 24%

Miso 36%

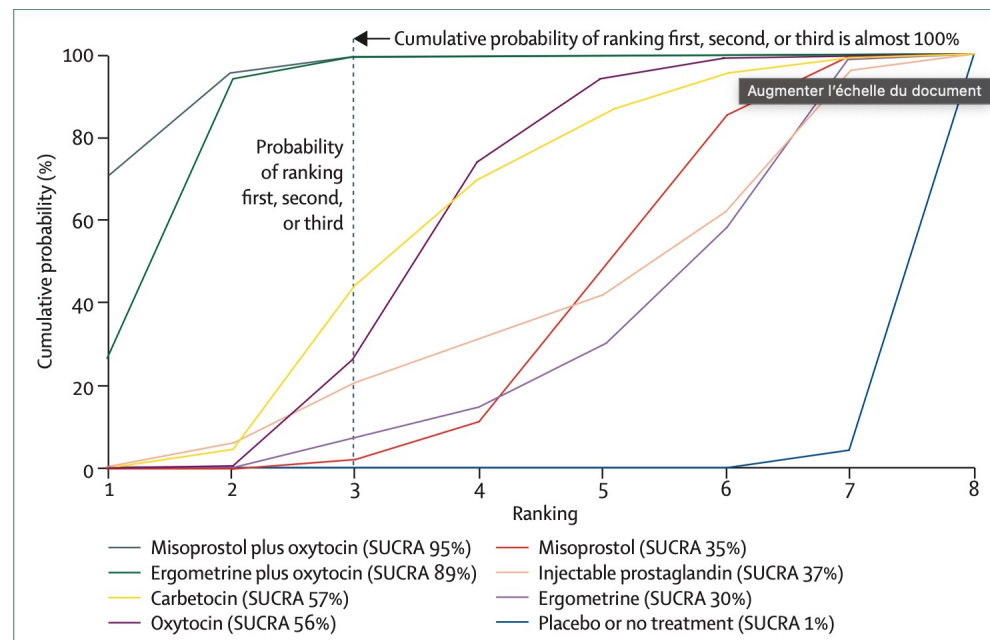


Figure 2: Cumulative rankograms comparing each of the uterotonic agents for prevention of postpartum haemorrhage (blood loss ≥ 500 mL)

Gallos. Lancet 2026; june 2026

Table 2

Minimum effective bolus doses of first-line uterotonics in 90% of women (ED₉₀).

	Oxytocin ED ₉₀	Carbetocin ED ₉₀
Elective CS	0.35 IU	14.8 mcg
Elective CS BMI ≥ 40	0.78 IU	68 mcg
Intrapartum CS	2.99 IU	121 mcg

Onwochei. Best Pract Res Clin Anesthesiol 2024;38:209-220

**Sur 30 sec pour
éviter l'hypoTA**

Oxytocin & Carbetocin

- Mécanismes
 - Stimule directement les récepteurs oxytocin
 - Stimule la relâche prostaglandine PGF2 α
- Effets secondaires
 - ☠ Danger bolus oxytocin > 5 IU
 - Effet antidiurétique
 - Craintes des hypoTA et tachycardie ...
- Comparaison; Carbetocin 100ug $\cong$ Oxytocin 5 IU
 - Durée d'action 5hrs (vs 1h30)
 - Débute en 2 minutes, ½ vie 40 min (vs 1 à 6 min)
 - Diminue le risque HPP en césarienne versus \$\$\$
 - Ne mobilise pas de voie veineuse

Lavoie. Anesth Analg 2015;121:159-64

Farina. South African Medical Journal 2015;105:271-4

Su. Cochrane Database of Systemic Reviews 2012; CD005457

Gimpl. Physiological Reviews 2001;81:629-83

Utérotoniques - Première ligne

First-line drugs

Oxytocin

Elective caesarean section

Bolus 1 IU oxytocin; start oxytocin infusion at 2.5–7.5 IU.h⁻¹ (0.04–0.125 IU.min⁻¹).

If required after 2 min, give a further dose of 3 IU over ≥ 30 s.

Consider second-line agent early in the event of failure of this regimen to produce sustained uterine tone.

Review the patient's clinical condition before discontinuing the infusion; this will usually be between 2 h and 4 h after commencement.

Intrapartum caesarean section

3 IU oxytocin over ≥ 30 s; start oxytocin infusion at 7.5–15 IU.h⁻¹ (0.125–0.25 IU.min⁻¹).

Alternative – carbetocin

Elective caesarean section

100 µg over ≥ 30 s.

Smaller doses (as low as 20 µg) may be sufficient; in this case, doses can be repeated if required, up to 100 µg.

Do not exceed 100 µg – if required move to second-line drug.

Intrapartum caesarean section

100 µg over ≥ 30 s.

Do not exceed 100 µg – if required move to second-line drug.

Dose maximale 120µg



Oxytocin & **Collège Royal**

The effects of oxytocin on the pulmonary and systemic circulation have been measured in a study using pulmonary artery catheterisation. A 10 IU bolus of oxytocin was followed by a 40% decrease in femoral artery pressure, and a 59% and 40% decrease in systemic and pulmonary vascular resistance, respectively, after 30 s. Heart rate increased by 31% and stroke volume by 17%, and cardiac output increased by 54%. At 150 s after injection, pulmonary artery and pulmonary wedge pressure had increased by 33% and 35%, respectively. However, all women in this study had undergone general anaesthesia, which limits comparability with women having regional anaesthesia [38].

Slow administration of oxytocin results in less cardiovascular effects. A 5 IU dose administered as an infusion over 5 min was associated with a 5 mmHg reduction in mean arterial pressure and a 10 beats.min⁻¹ increase in heart rate, compared with a 27 mmHg decrease and a 17 beats.min⁻¹ increase seen after the same 5 IU dose given as a bolus [39]. Repeated doses of oxytocin are associated with an attenuated cardiovascular effect, possibly from receptor desensitisation [37].



Utérotoniques Deuxième ligne

Second-line drugs

These drugs should be considered for both prophylaxis and treatment of postpartum haemorrhage.

Consider early use in the event of failure of first-line drugs to produce sustained uterine tone.

Depending on local availability, the following drugs can be used:

- 1 Ergometrine (ergonovine) 200–500 µg/methylergometrine (methylergonovine) 200 µg: i.m., or slow i.v. in exceptional circumstances; may be repeated after 2 h.
- 2 Misoprostol 400–600 µg: sublingual, rectal, vaginal, oral; repeat after 15 min if required, maximum dose 800 µg.
- 3 Carboprost 250 µg: i.m. or intramyometrial (contraindicated i.v.); up to every 15 min if required, maximum eight doses.
- 4 ~~Sulprostone 500 µg: i.v. at 100 µg.h⁻¹; maximum dose 1500 µg.~~

Le plus efficace

Consider early use of adjunctive medication to counter adverse effects, for example, antiemetics.

Further uterotonic administration (third-line drugs) should be considered within a multimodal postpartum haemorrhage regimen (pharmacology/haematology and antifibrinolysis/surgery/interventional radiology).

**73% efficacité à
dose #1**

**IV =
bronchospasme,
↑ PAP, HTA,
N/V**

**Intramyomètre
(off label) =
+ rapide**

Utérotoniques

Onwochei. Best Pract Res Clin Anesthesiol 2024;38:209-220

Table 1
Characteristics of uterotonics.

Uterotonic	Oxytocin	Carbetocin	Ergometrine	Carboprost	Misoprostol
Storage Structure	Fridge (2–8 °C) Nonapeptide	Room temperature Synthetic oxytocin analogue	Fridge (2–8 °C) Ergot alkaloid Semisynthetic derivative of D-lysergic acid and amine	Fridge (2–8 °C) Prostaglandin F _{2α}	Room temperature Prostaglandin E ₁
Mechanism of action	Oxytocin receptor Increase in intracellular Ca ²⁺ to facilitate uterine contraction	Oxytocin receptor Increase in intracellular Ca ²⁺ to facilitate uterine contraction	α ₁ , dopaminergic and 5-HT ₂ receptors Increase in intracellular Ca ²⁺ to facilitate uterine contraction	FP receptor Increase in intracellular Ca ²⁺ to facilitate uterine contraction	EP ₃ receptors Increase in intracellular Ca ²⁺ to facilitate uterine contraction
Method of administration	Bolus and infusion	Bolus	Bolus	Bolus	Bolus
Route of administration	Intravenous Intramuscular	Intravenous Intramuscular	Intramuscular Intravenous in exceptional circumstances, if severe and life threatening PPH	Intramuscular Intramyometrial	Oral, sublingual, rectal and vaginal
Dose	<u>Elective CD</u> : initial bolus of 1 IU over at least 30 s and, if needed, further bolus of 3 IU over at least 30 s followed by infusion of 2.5–7.5 IU per hour <u>Emergency CD</u> : bolus of 3 IU over at least 30 s followed by infusion of 2.5–7.5 IU per hour	<u>Elective CD</u> : bolus of 20–100 mcg followed by, if needed, further boluses up to maximum cumulative dose of 100 mcg <u>Emergency CD</u> : bolus of 100 mcg	Bolus 200–500 mcg Minimum dosing interval of 2 h	Bolus of 250 mcg Minimum dosing interval of 15 min Maximum cumulative dose of 2 mg	Bolus of 400–600 mcg
Pharmacokinetics	Onset at 1 min Plasma half-life of 3–20 min Metabolised by oxytocinase in plasma, liver and kidneys Eliminated mainly as metabolites in urine	Onset at 1.2 min Plasma half-life of 33 min Peak plasma concentration at 30 min Some metabolism by oxytocinase, minimal urinary excretion	Onset within 7 min of intramuscular bolus Plasma half-life of 30–120 min Metabolised by CYP3A4 enzymes in liver Eliminated with bile into faeces and unchanged in urine	Peak plasma concentration at 20–30 min Metabolised by omega oxidation Eliminated mainly as metabolites in urine	Metabolised to misoprostol acid and then undergoes oxidation Eliminated mainly in urine
Contraindications	Caution in cardiovascular disease with a dose reduction and slow administration	Caution in cardiovascular disease with a dose reduction and slow administration	Cardiovascular disease Hypertension and pre-eclampsia Severe hepatic and renal impairment	Asthma Active respiratory disease Right ventricular dysfunction and pulmonary hypertension Occlusive vascular disease Active hepatic and renal impairment Sepsis	Caution in cardiovascular disease
Side effects	Common: Bradycardia; tachycardia; hypotension; headache; nausea; and vomiting Uncommon: arrhythmia Rare: anaphylaxis; and rash Unknown rate: myocardial ischemia; hyponatremia; and flushing	Very common: hypotension; headache; tremor; nausea; abdominal pain; flushing; and pruritus Common: dyspnoea; chest pain; vomiting; dizziness; chills; and metallic taste Unknown rate: bradycardia; tachycardia; and myocardial ischemia	Respiratory: dyspnoea; and pulmonary oedema Cardiac: arrhythmias; palpitations; bradycardia; hypertension; coronary vasospasm; chest pain; and myocardial infarction Central nervous system: dizziness; and headache Gastrointestinal: nausea; vomiting; and abdominal pain Immune: anaphylaxis Skin: rash	Very common: nausea; vomiting; and diarrhoea Common: cough; headache; chills; and flushing Uncommon: dyspnoea; respiratory distress; tachycardia; hypertension; and abdominal pain Unknown rate: anaphylaxis; bronchospasm; chest pain; palpitations; and pyrexia	Very common: diarrhoea; rash Common: dizziness; headache; nausea; vomiting; abdominal pain; and constipation Uncommon: pyrexia Unknown rate: anaphylaxis; and chills
Desensitisation	Yes	Yes	No	No	No

Very common: ≥10%; common: ≥1% and <10%; uncommon: ≥0.1% and <1%; and rare: ≥0.01% and <0.1%.

Calcium en césarienne

- Mécanismes
 - Tonus utérin
 - Effet hémodynamique
 - Facteur IV – hémostase
- Littérature
 - Utilisation établie lors de transfusion
 - Intérêt préventif ?
 - Éviter la 2nd ligne
 - Chez population à risque ?

Aihara. Eur J Obstet Gynecol Reprod Biol 2026;325:11591
Ansari. Int J Obstet Anesth 2025;104711
Epstein. Br J Anesth 2021;1022-28

Calcium - Prévention HPP

Intravenous calcium for the prevention of postpartum hemorrhage in cesarean delivery: A systematic review and meta-analysis

Camila M. Aihara Nakayama^{a,b,*}, Laura Beatriz Wuensch Weschenfelder^c, Maria Julia Lemos^d, Julia Molisani^e, Matheus A.M. Sandre^f, Laura Fonseca Queiroz^g, Rodrigo Ruano^{h,i}

Aihara. Eur J Obstet Gynecol Reprod Biol 2026;325:11591

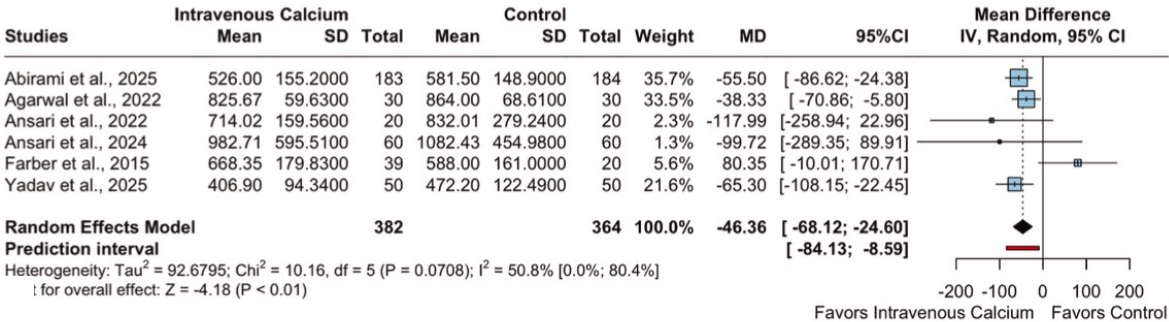


Fig. 2. Blood Loss (mL) was significantly reduced with intravenous calcium compared to control.

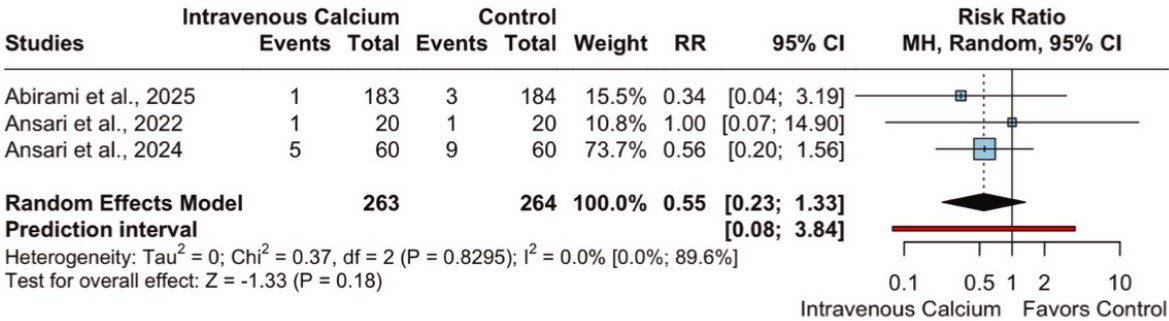


Fig. 3. Blood transfusion (n) did not differ between intravenous calcium and control.

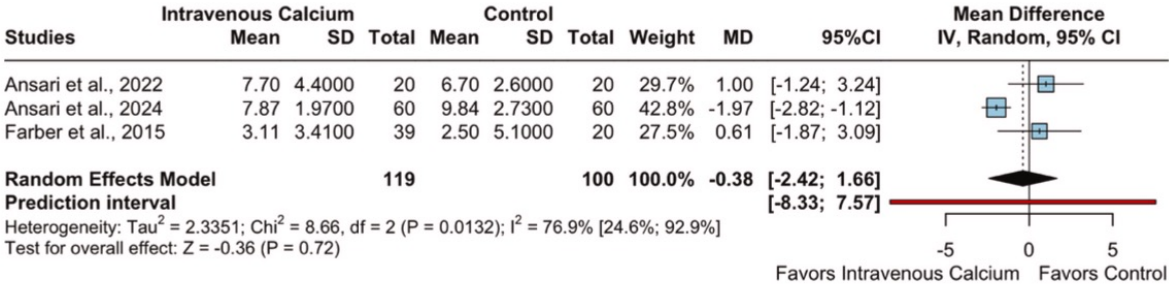


Fig. 4. Hematocrit change (%) did not differ between intravenous calcium and control.

Calcium – Prévention HPP

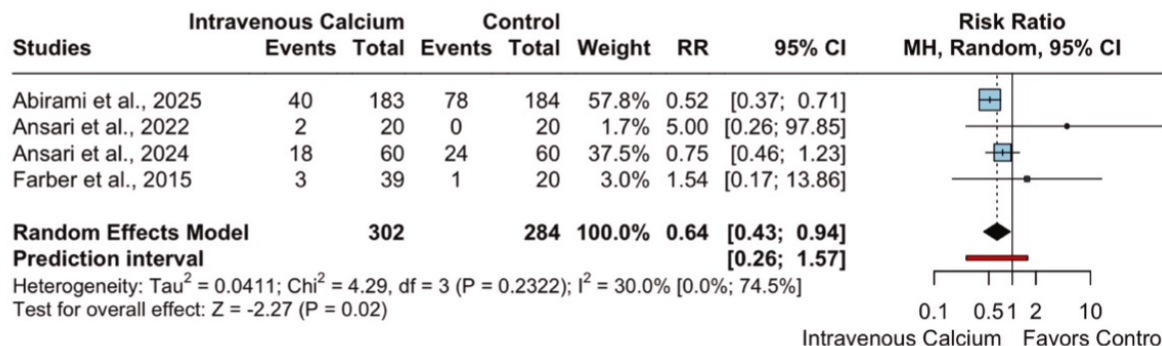


Fig. 6. Second-line uterotonic requirement (n) was significantly reduced with intravenous calcium compared to control.

• On en conclue quoi?

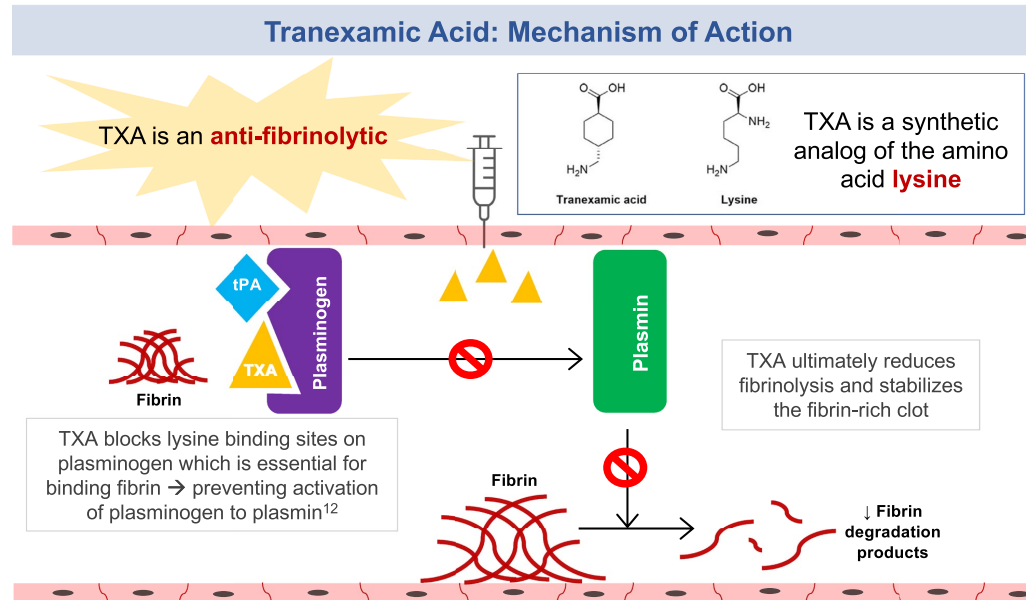
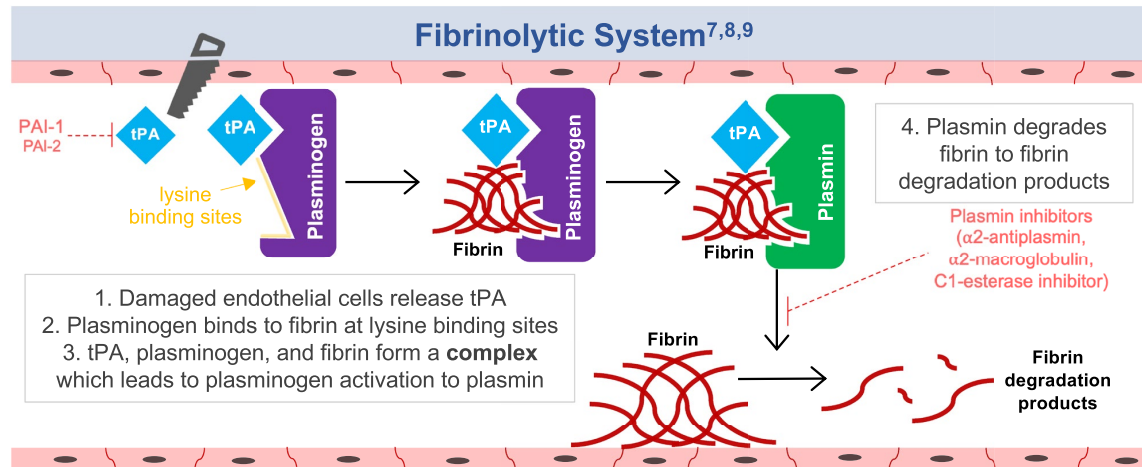


- Pas assez de données pour le recommander en prévention
- Intérêt à *l'envisager* lorsqu'un dx HPP est posé selon certains experts

Pacheco. Am J Obstet Gynecol 2026; S280-309

Aihara. Eur J Obstet Gynecol Reprod Biol 2026;325:11591

Onwochei. Best Pract Res Clin Anesthesiol 2024;38:209-220





A tranexamique & HPP du traitement à la prévention

- **Thérapeutique; standard de pratique**
 - ↓ mortalité hémorragique
 - Bénéfice mortalité hémorragique > > Bémols WOMAN
 - Bénéfice > > > risques thromboemboliques
- **Prophylaxie; grand intérêt littérature**
 - Multiples petites études « positives »
 - 4 Grandes études « négatives »
 - Multiples méta-analyses depuis 2022 qui tentent de trouver une explication...

Tranexamic Acid for the Prevention of Blood Loss after Vaginal Delivery

TRAPP

August 23, 2018

N Engl J Med 2018; 379:731-742

DOI: 10.1056/NEJMoa1800942

Loïc Sentilhes, M.D., Ph.D., Norbert Winer, M.D., Ph.D., Elie Azria, M.D., Ph.D.,

- Randomisée, contrôlée, double insu, multicentrique
- France → 3891 patientes avec **accouchement vaginal**
- Acide tranexamique 1g versus placebo après clampage

Table 2. Primary and Secondary Outcomes (Modified Intention-to-Treat Population).

Outcome or Event	Tranexamic Acid Group (N=1945)	Placebo Group (N=1946)	Risk Ratio (95% CI)	Difference (95% CI)*	P Value	
					Unadjusted	Adjusted†
Primary outcome — no./total no. (%)‡	156/1921 (8.1)	188/1918 (9.8)	0.83 (0.68 to 1.01)	−1.7 (−3.5 to 0.1)	0.07	—
Clinically significant postpartum hemorrhage, according to provider — no. (%)	151 (7.8)	203 (10.4)	0.74 (0.61 to 0.91)	−2.7 (−4.5 to −0.7)	0.004	0.04
Additional uterotonic agent for excessive bleeding — no. (%)	141 (7.3)	189 (9.7)	0.75 (0.61 to 0.92)	−2.5 (−4.2 to −0.7)	0.006	0.04
Severe postpartum hemorrhage — no./total no. (%)§	47/1921 (2.4)	57/1918 (3.0)	0.82 (0.56 to 1.21)	−0.5 (−1.6 to 0.5)	0.32	0.59
Blood loss — ml¶						
At 15 min	130.5±144.3	135.3±149.8	—	−4.7 (−14.1 to 4.6)	0.32	0.59
At bag removal	199.1±261.2	210.4±256.1	—	−11.3 (−27.7 to 5.0)	0.17	0.46
Estimated total	220.3±280.4	236.9±291.6	—	−16.7 (−34.7 to 1.4)	0.07	0.23

Tranexamic Acid for the Prevention of Blood Loss after Cesarean Delivery

L. Sentilhes, M.V. Sénat, M. Le Lous, N. Winer, P. Rozenberg, G. Kayem, E. Verspyck, F. Fuchs, E. Azria, D. Gallot, D. Korb, R. Desbrière, C. Le Ray, C. Chauleur, F. de Marcillac, F. Perrotin, O. Parant, L.J. Salomon, E. Gauchotte, F. Bretelle, N. Sananès, C. Bohec, N. Mottet, G. Legendre, V. Letouzey, B. Haddad, D. Vardon, H. Madar, A. Mattuizzi, V. Daniel, S. Regueme, C. Roussillon, A. Benard, A. Georget, A. Darsonval, and C. Deneux-Tharaux, for the Groupe de Recherche en Obstétrique et Gynécologie*

TRAPP 2

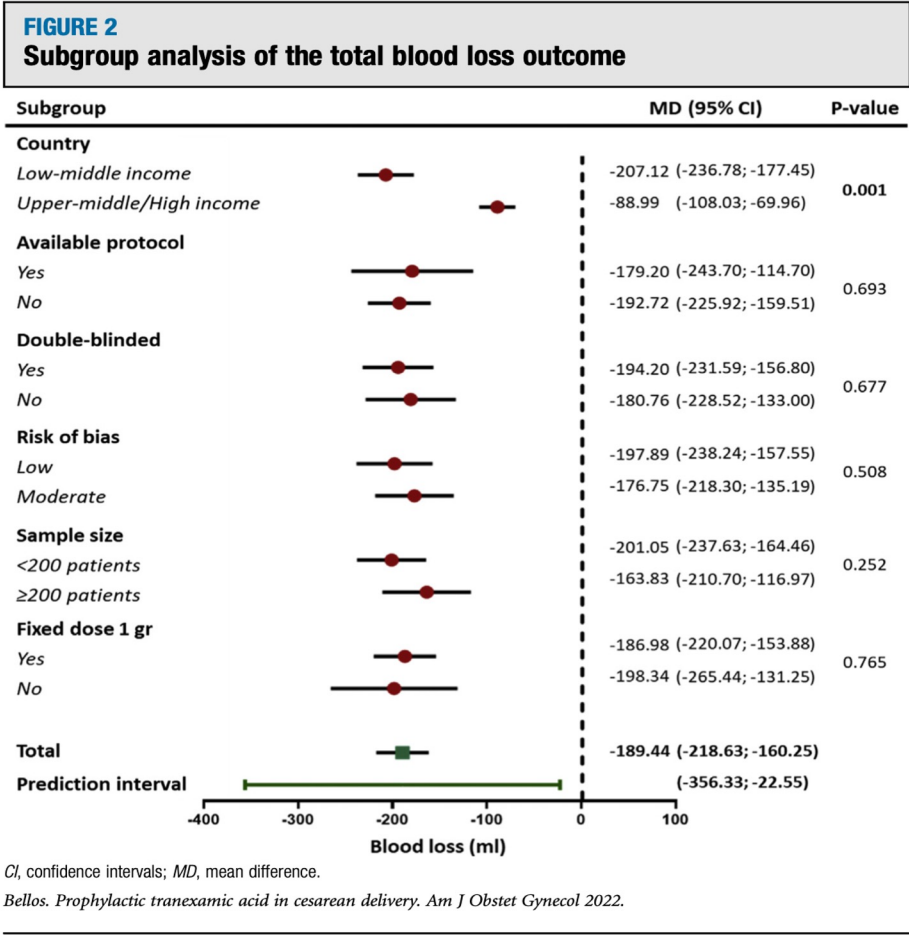
N Engl J Med 2021;384:1623-34.
DOI: 10.1056/NEJMoa2028788

- Randomisée, contrôlée, double insu
- 27 maternités françaises → 4431 patientes en **césarienne**
- Acide tranexamique 1g versus placebo **après clampage**

Table 2. Primary and Secondary Outcomes in the Modified Intention-to-Treat Population.*

Outcome	Tranexamic Acid Group (N=2222)	Placebo Group (N=2209)	Unadjusted Difference (95% CI) [†]	Adjusted Risk Ratio or Mean Difference (95% CI) [‡]	P Value [§]
Postpartum hemorrhage — no./total no. (%)¶	556/2086 (26.7)	653/2067 (31.6)	−4.9 (−7.7 to −2.2)	0.84 (0.75 to 0.94)	0.003
Calculated estimated blood loss >1000 ml	550/2084 (26.4)	650/2066 (31.5)	−5.1 (−7.8 to −2.3)	0.84 (0.75 to 0.94)	—
Red-cell transfusion by day 2	35/2221 (1.6)	30/2209 (1.4)	0.2 (−0.5 to 0.9)	1.16 (0.71 to 1.89)	—
Gravimetrically estimated blood loss — ml	689±887	719±920	−30.6 (−90.2 to 29.0)	−33.06 (−77.48 to 11.37)	NS
Gravimetrically estimated blood-loss category — no./total no. (%)					
>500 ml	1133/1774 (63.9)	1110/1754 (63.3)	0.6 (−2.6 to 3.8)	1.01 (0.93 to 1.09)	—
>1000 ml	545/1774 (30.7)	521/1754 (29.7)	1 (−2 to 4)	1.03 (0.92 to 1.16)	—

Méta-analyses	# études/ # participants/ période	Population	Primaires
Bellos 2022	36 10 659 (2004-2021)	CS 2 +/-3 haut risque 260	Saignements Variation Hb
Ferrari 2022	25 13 098 (2004-2021)	AV (3) ou CS (22) (thérapeutique retranché)	Saignements
Assis 2023	16 6731 (2004-2019)	AV ou CS	Saignements Variation Hb
Al-Dardery 2023	59 18 649 (2003-2021)	AV ou CS	Saignements Nausées et Vomissements
Yang 2023	21 3805 (2004-2021)	CS électorive pré-incision	Saignements per CS Saignements 2h postpartum Saignements totaux (per +2h)
Lee 2024	10* 2 817 (2011-2021)	CS	Saignements > 1000ml



Tranexamic Acid to Prevent Obstetrical Hemorrhage after Cesarean Delivery

L.D. Pacheco, R.G. Clifton, G.R. Saade, S.J. Weiner, S. Parry, J.M. Thorp, Jr., M. Longo, A. Salazar, W. Dalton, A.T.N. Tita, C. Gyamfi-Bannerman, S.P. Chauhan, T.D. Metz, K. Rood, D.J. Rouse, J.L. Bailit, W.A. Grobman, H.N. Simhan, and G.A. Macones, for the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal–Fetal Medicine Units Network*

N Engl J Med 2023;388:1365-75.

DOI: 10.1056/NEJMoa2207419

- Randomisée, contrôlée, double insu
- Multicentrique; 31 hôpitaux USA → 11 000 patientes en **césarienne**
- Acide tranexamique 1g versus placebo après clampage

Table 2. Primary and Secondary Outcomes.*

Outcome	Tranexamic Acid (N=5525)	Placebo (N=5470)	Relative Risk or Mean Difference (95% CI)†
Primary outcome: maternal death or blood transfusion by hospital discharge or 7 days post partum, whichever was earlier — no. (%)	201 (3.6)	233 (4.3)	0.89 (0.74 to 1.07)‡
Maternal death	0	1 (<0.1)	—
Blood transfusion	201 (3.6)	232 (4.2)	0.86 (0.71 to 1.03)
Estimated blood loss >1 liter — no./total no. (%)	339/4641 (7.3)	366/4575 (8.0)	0.91 (0.79 to 1.05)
Intervention in response to bleeding and related complications by 7 days post partum — no. (%)	892 (16.1)	986 (18.0)	0.90 (0.82 to 0.97)
Surgical or radiologic intervention by 7 days post partum — no. (%)	233 (4.2)	231 (4.2)	1.00 (0.84 to 1.19)
Uterotonic agent other than oxytocin by 48 hr post partum — no. (%)	649 (11.7)	732 (13.4)	0.88 (0.80 to 0.97)
Open-label use of tranexamic acid by 7 days post partum — no. (%)	108 (2.0)	109 (2.0)	0.98 (0.75 to 1.28)
Transfusion of any blood product by 7 days post partum — no. (%)	205 (3.7)	238 (4.4)	0.85 (0.71 to 1.02)
Change in hemoglobin level — g/dl§	-1.8±1.1	-1.9±1.1	-0.1 (-0.2 to -0.1)
Transfusion of blood products other than packed red cells by 7 days post partum — no. (%)	29 (0.5)	31 (0.6)	0.93 (0.56 to 1.53)
Blood transfusion of ≥4 units by 7 days post partum — no. (%)	20 (0.4)	19 (0.3)	1.04 (0.56 to 1.95)

Méta-analyses	# études/ # participants/ période	Population	Primaire(s)	Commentaires sur les bénéfices
Cheema 2023	50 20 144 (2011 à 2023)	CS 6 haut risque (616)	Saignements > 1000ml Saignements Transfusions	- Haut > Bas risque - Pré-incision >> Post clampage - Biais publication

TABLE 2
Grading of recommendations, assessment, development, and evaluation (GRADE) summary of findings.

Outcome	No. of participants (studies)	Effect estimate (95% CI)	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Quality of Evidence (GRADE)
Blood loss > 1000 mL	High-risk population	RR, 0.26 (0.17–0.42)	Not serious	Not serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ MODERATE
	Low-risk population	RR, 0.64 (0.51–0.81)	Serious	Not serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ LOW
Mean total blood loss (mL)	High-risk population	MD, -377.89 (-449.44 to -306.33)	Not serious	Not serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ MODERATE
	Low-risk population	MD, -179.97 (-203.67 to -156.26)	Serious	Serious	Not serious	Not serious	Undetected	⊕⊕⊕⊕ LOW
Need for blood transfusion	High-risk population	RR, 0.28 (0.17–0.44)	Not serious	Not serious	Not serious	Not serious	Undetected	⊕⊕⊕⊕ HIGH
	Low-risk population	RR, 0.48 (0.35–0.68)	Serious	Not serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ LOW
Blood loss > 400 or 500 mL	6176 (10)	RR, 0.30 (0.17–0.53)	Serious	Serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ VERY LOW
Hb levels	High-risk population	MD, 1.07 (0.12–2.02)	Not serious	Serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ LOW
	Low-risk population	MD, 0.63 (0.53–0.74)	Serious	Serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ VERY LOW
Need for additional uterotonic agents	High-risk population	RR, 0.26 (0.19–0.37)	Not serious	Not serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ MODERATE
	Low-risk population	RR, 0.56 (0.46–0.69)	Serious	Serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ VERY LOW
Nonthromboembolic adverse events	18,642 (18)	1.38 (1.15–1.65)	Serious	Serious	Not serious	Not serious	Suspected	⊕⊕⊕⊕ LOW

CI, confidence interval; Hb, hemoglobin; MD, mean difference; RR, relative risk.

Cheema. Antifibrinolytics for blood loss in cesarean deliveries. Am J Obstet Gynecol MFM 2023.

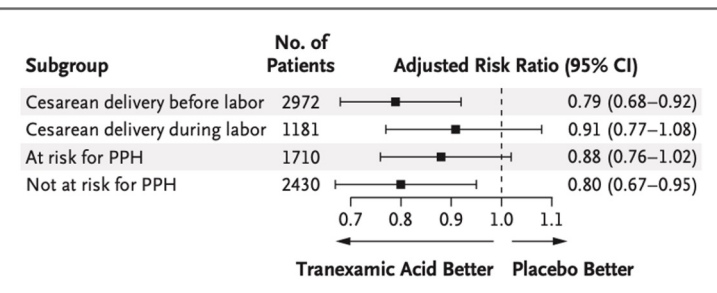


Figure 2. Prespecified Subgroup Analyses of the Primary Outcome (Modified Intention-to-Treat Population).

Shown is the risk ratio for postpartum hemorrhage (PPH) (tranexamic acid vs. placebo), adjusted for randomization stratification variables (center and timing of the cesarean delivery). PPH was defined as a calculated estimated blood loss greater than 1000 ml or receipt of a red-cell transfusion within 2 days after delivery. Women who were at risk for PPH were defined as those who had one or more risk factors for PPH with an odds ratio of at least 3 in the literature³²: previous PPH, pregnancy-related hypertensive disorder, multiple pregnancy, or cesarean delivery during labor.

TRAPP 2

N Engl J Med 2021;384:1623-34.
DOI: 10.1056/NEJMoa2028788

Méta-analyses	# études/ # participants/ période	Population	Primaire(s)	Commentaires sur les bénéfices
Cheema 2023	50 20 144 (2011 à 2023)	CS 6 haut risque (616)	Saignements > 1000ml Saignements Transfusions	
Provinciatto 2024	38* 22 940 (2004-2023)	CS	Saignements > 1000ml	
Guinness 2024	61* 25 098 (2004-2023)	CS 9 haut risque 11 intermédiaire	Saignements > 1000ml	
Rhower 2025	6 15 981 (2022-2023) <i>Cochrane Sentilhes + Pacheco</i>	CS 1 haut risque	Saignements > 1000ml Calculés	
Ker 2024	5 54 404 (2017-2024) Thérapeutique & prophylaxique	AV ou CS	- Saignements potentiellement mortels (mort ou interventions; laparo, embol, suture, ligature 24H) - Événements thromboemboliques	

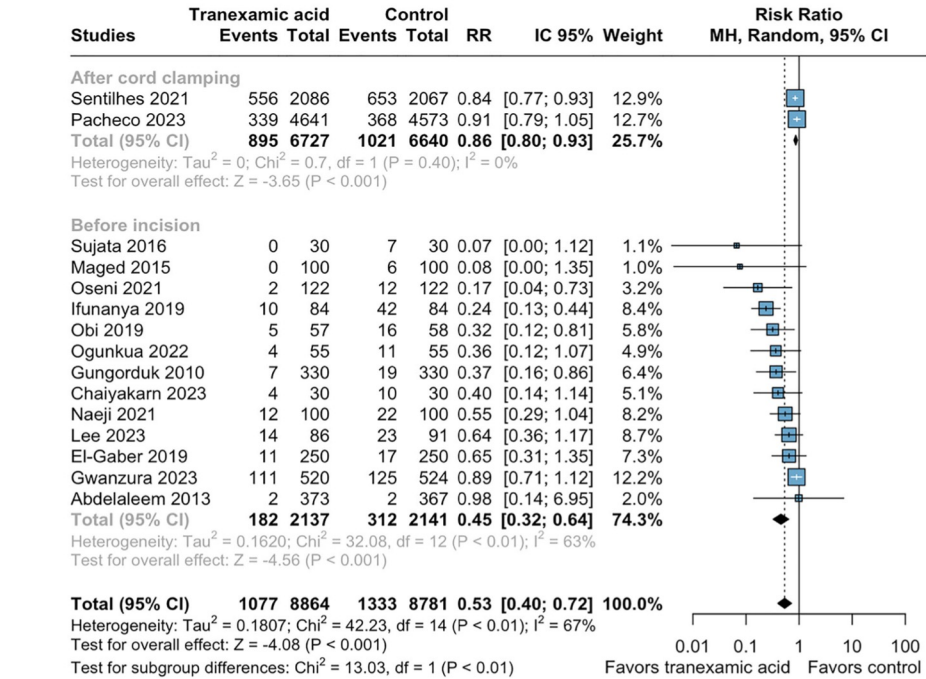


Fig. 5 Forest plot of the risk of postpartum hemorrhage regardless of the timing of tranexamic acid administration (before surgical incision and after cord clamping)

CI = confidence interval; PPH = postpartum hemorrhage; TXA = tranexamic acid

À considérer haut risque

Saignement mortel:

- Si ≥ 1/100; NNT < 500
- Si ≤ 1/100 000 ; NNT ↑↑

Provinciatto. Can J Anesth 2024;71:465-78

The effect of tranexamic acid on postpartum bleeding in women with moderate and severe anaemia (WOMAN-2): an international, randomised, double-blind, placebo-controlled trial

Lancet 2024; 404: 1645-56

The WOMAN-2 Trial Collaborators*

- Randomisée, contrôlée, double insu
- Nigeria, Pakistan, Tanzanie, Zambie → 15 068 patientes avec **accouchement vaginal**
- Acide tranexamique 1g versus placebo délai 15 min après le clampage chez **Hb < 100**

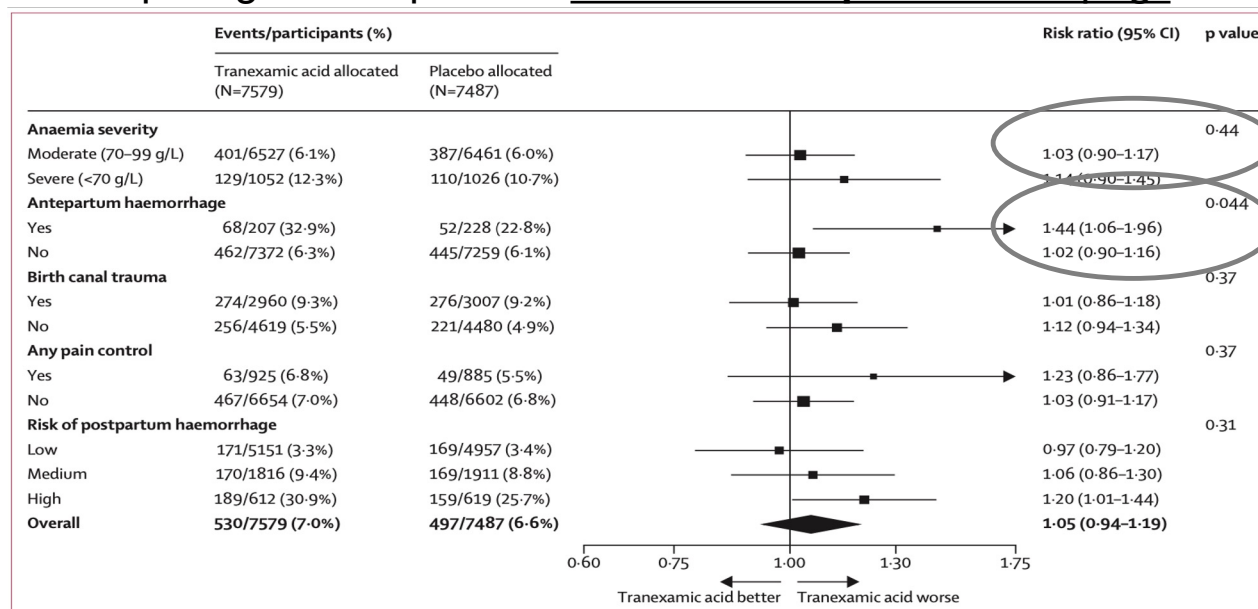
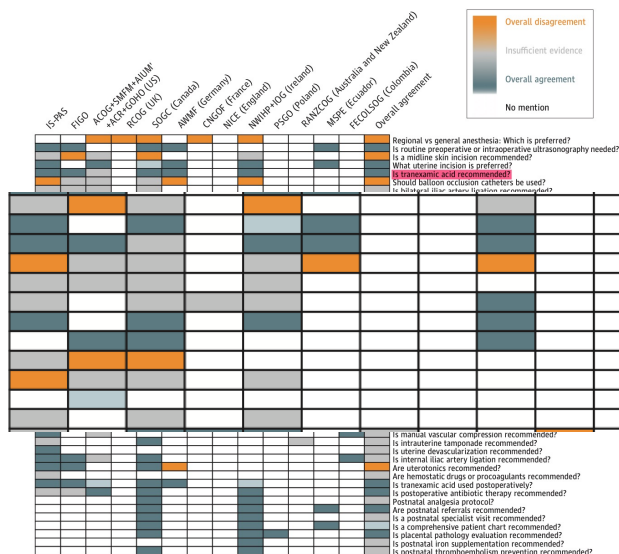


Figure 3: Effect of tranexamic acid on clinically diagnosed postpartum haemorrhage overall and by subgroup
p values are for heterogeneity. Birth canal trauma includes episiotomy, vaginal, perineal, or cervical tear, or uterine rupture. Baseline variables included in the risk of postpartum haemorrhage model can be found in the appendix (p 2).

Méta-analyses	# études/ # participants/ période	Population	Primaires	Commentaires sur les bénéfices
Daghmouri 2025	11 1627 (2019-2024)	CS Haut risque PREVIA, HPP, distension utérine, anémie	Saignements intra op	- ▲ 343 ml - PRÉ-incision majoritaire
Adepoju 2026	6 213 (2016-2024) Thérapeutique prophylactique	AV ou CS MvW Déficit FXI Dysfonction Plt THOI	Saignements > 1000ml	- 56% de réduction - POST clampage - Pays riches - Indépendant - Hyperfibrinolyse



Original Investigation | Obstetrics and Gynecology

Guidelines on Placenta Accreta Spectrum Disorders A Systematic Review

Cesarean hysterectomy management	Modified dorsal lithotomy position for delivery Preoperative or intraoperative ultrasonography recommended to map placental edges Uterine incision at sufficient distance from the placenta	Choice between general and regional anesthesia. Skin incision choice Use of preoperative or intraoperative balloon occlusion catheters	Lack of evidence supporting total vs subtotal hysterectomy. Insufficient evidence on planned delayed hysterectomy Lack of evidence on deliberate cystotomy and excision of the involved bladder Routine use of bilateral internal iliac artery ligation and uterine stent placement
Is a midline skin incision recommended?	What uterine incision is preferred?	Use of preoperative or intraoperative balloon occlusion catheters	Insufficient evidence on future pregnancy rates after conservative management Insufficient guidance on mentioning risks of CD scar pregnancy, ICU admission, or death during counseling Insufficient guidance on triple-P procedure, aortic balloon vs bilateral iliac occlusion Lack of consensus on monitoring protocols for patients opting for conservative management Hemorrhage management: insufficient guidance on manual vascular compression, intrauterine tamponade, internal iliac artery ligation, and use of hemostatic agents or procoagulants
Is tranexamic acid recommended?	Should balloon occlusion catheters be used?	nent after intrapartum diagnosis ed risk of recurrent PAS is not it tempted placenta removal is accepted depending on the d presence of PAS endations on uterotonics are not it	
Should balloon occlusion catheters be used?	Is bilateral iliac artery ligation recommended?		
Is routine ureteric stent placement needed?	What maternal position is recommended?		
How should placental removal be managed?	Total or subtotal hysterectomy?		
Is planned delayed hysterectomy recommended?	Is cystotomy or involved bladder excision recommended?		
How to diagnose and manage PAS during VD?	are not recommended		
Is manual vascular compression recommended?	Use of tranexamic acid to prevent or manage hemorrhage is recommended		
Is intrauterine tamponade recommended?	Postoperative antibiotic therapy is recommended, especially if placenta left in situ		
Is uterine devascularization recommended?			
Is internal iliac artery ligation recommended?			
Are uterotonics recommended?			
Are hemostatic drugs or procoagulants recommended?			
Is tranexamic acid used postoperatively?			
Is postoperative antibiotic therapy recommended?			
Is postnatal analgesia protocol?			
Are postnatal referrals recommended?			
Is a postnatal specialist visit recommended?			
Is a comprehensive patient chart recommended?			
Is placental pathology evaluation recommended?			
Is postnatal iron supplementation recommended?			
Is postnatal thromboembolism prevention recommended?			

Bonanni. JAMA Network Open 2025;8(7):e2521909

Prévention TXA - Impact de l'utérotonique ?



Amaral. Lancet Glob Health 2025;13:e1415-24

Figure 4: Heatmap graph of SUCRA values for postpartum haemorrhage (A) and intraoperative blood transfusion (B), ranking the prophylactic therapies based on their relative effectiveness
SUCRA=surface under the cumulative curve.



Éditorial

Bouthors. Int J obst Anesth 2025;64:104710

[Article traduit] L'administration prophylactique d'acide tranexamique chez toutes les femmes enceintes est-elle efficace pour prévenir la survenue d'une hémorragie post-partum? très probablement non[☆]

Tableau 1
Principaux re

Etude
Randomize
TRAAP ⁴
TRAAP2 ⁶
WOMAN2 ⁸
PROBE ⁵
TXA-MFMU
Meta-analy
Cochrane (C

Prophylaxie non recommandée chez les patientes à faible risque

Futur:

1) Patientes à haut risque

2) Administration avant l'accouchement

Cochrane (VD)¹⁰

Accouchement par voie basse, Faible et haut risque

Mixte

saignement (≥ 1000 mL) ou la transfusion sanguine

Pas ou peu de différence sur le saignement (≥ 1000 mL ou >500 mL) ou la transfusion sanguine

Pas de différence significative sur le risque de saignement clinique

timing et les doses de TXA

80% des patients incluses dans la méta-analyse provenaient de l'essai WOMAN2

Aucune étude n'a étudié l'administration de TXA avant la naissance

Individual-patient meta-analyses¹¹

Accouchement par voie basse et césarienne

Saignement significatif cliniquement



Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage



Suggested citation. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

14. Tranexamic acid is not recommended for the prevention of postpartum haemorrhage at vaginal birth.

New

Not recommended

15. Tranexamic acid is not recommended for the prevention of postpartum haemorrhage at caesarean birth.

New

Not recommended

For caesarean sections, PPH prophylaxis typically means administering TXA before the incision (pre-incision). However, some studies administered TXA after cord clamping to avoid fetal exposure, which could address some bleeding, aligning more with treatment than true prophylaxis.

Clinical judgement should be used because individual woman needs and circumstances can vary. For certain high-risk women, benefits may outweigh the harms, and clinicians could consider using TXA to control bleeding even before the diagnostic criteria of PPH are met.

Prophylaxie à considérer si facteur(s) de risque important(s)

• Certaines évidences dans la littérature

- Administration pré-incision
- Attention pas de saignement > 3h préalable
- Intérêt si trouble hémorragique & anomalie de placentation

• Questionnements

- Bénéfice avec carbetocin??
- Quels facteurs de risque???

Études à venir ...

STUDY PROTOCOL

Open Access

Tranexamic acid by the intramuscular or intravenous route for the prevention of postpartum haemorrhage in women at increased risk: a randomised placebo-controlled trial (I'M WOMAN)

Amy Brenner^{1*}, Haleema Shakur-Still¹, Rizwana Chaudhri², Projestine Muganyizi³, Oladapo Olayemi⁴, Monica Arribas¹, Aasia Kayani², Kiran Javid², Adenike Bello⁴, Ian Roberts¹ and on behalf of the I'M WOMAN Trial Collaborative Group

Brenner *et al. Trials* (2023) 24:782
<https://doi.org/10.1186/s13063-023-07687-1>

- Randomisée, contrôlée, double insu
- Afrique et Asie du sud / 30 000 patientes
- AV (couronnement) ou CS (PRÉ-incision)
- Acide tranexamique 1g IV ou IM (2X5ml)
- Primaire: Dx HPP; 500ml en AV
1000ml en CS ou instabilité HD
- Secondaires : Saignements, transfusions, interventions, nausées/vomissements, complications, mortalité

Study protocol: TRAAPREVIA—TRANexamic acid for preventing blood loss following a cesarean delivery in women with a placenta pREVIA or low-lying placenta: a multicenter randomized, double blind, placebo controlled trial

Loïc Sentilhes^{1*}, Hugo Madar¹, Amélie Ifrah^{2,3}, Jean-Marie Chrétien⁴ and Catherine Deneux-Tharaux⁵ on behalf of the TRAAPREVIA Study Group. the Groupe de Recherche en Obstétrique et Gynécologie (GROG)

Sentilhes *et al. BMC Pregnancy and Childbirth* (2025) 25:635
<https://doi.org/10.1186/s12884-025-07682-1>

- Randomisée, contrôlée, double insu
- France / 2 760 patientes
- CS (POST-clampage) ≥ 32 semaines
- Acide tranexamique 1g IV
- Primaire: Transfusion avant le congé
- Secondaire: Pertes sanguines post partum



TXA en prévention de l'HPP : Sécurité



WOMAN

	Tranexamic acid group	Placebo group	RR (95% CI)	p value
Thromboembolic events*	10 033	9985	—	—
Any event	30 (0.3%)	34 (0.3%)	0.88 (0.54-1.43)	0.603
Venous events	20 (0.2%)	25 (0.3%)	0.80 (0.44-1.43)	0.446
Deep vein thrombosis	3 (0.03%)	7 (0.07%)	0.43 (0.11-1.65)	0.203
Pulmonary embolism	17 (0.2%)	20 (0.2%)	0.85 (0.44-1.61)	0.611
Arterial events	10 (0.1%)	9 (0.09%)	1.11 (0.45-2.72)	0.827
Myocardial infarction	2 (0.02%)	3 (0.03%)	0.66 (0.11-3.97)	0.651
Stroke	8 (0.08%)	6 (0.06%)	1.33 (0.46-3.82)	0.599
Complications*	10 033	9985	—	—
Renal failure	129 (1.3%)	118 (1.2%)	1.09 (0.85-1.39)	0.505
Cardiac failure	110 (1.1%)	115 (1.2%)	0.95 (0.73-1.23)	0.710
Respiratory failure	108 (1.1%)	124 (1.2%)	0.87 (0.67-1.12)	0.274
Hepatic failure	29 (0.3%)	30 (0.3%)	0.96 (0.58-1.60)	0.882
Sepsis	180 (1.8%)	185 (1.9%)	0.97 (0.79-1.19)	0.756
Seizure	33 (0.3%)	43 (0.4%)	0.76 (0.49-1.20)	0.242

Patientes 20 060

Patientes dans les grandes études de prévention **34 673**

TRAPP 2

Table 3. Adverse Events (Safety Population).*						
Event or Measure	Tranexamic Acid Group (N=2190)	Placebo Group (N=2177)	Unadjusted Difference (95% CI)†	Adjusted Risk Ratio or Mean Difference (95% CI)‡	P Value	
					Unadjusted	Adjusted§
In the operating room or PACU						
Vomiting or nausea — no. (%)	940/2186 (43.0)	786/2166 (36.3)	6.7 (3.8 to 9.6)	1.19 (1.08 to 1.30)	<0.001	0.001
Photopsia — no. (%)¶	9/2186 (0.4)	2/2166 (0.1)	0.3 (0.0 to 0.6)	3.92 (0.83 to 18.45)	—	—
Dizziness — no. (%)	93/2186 (4.3)	68/2166 (3.1)	1.1 (0.0 to 2.2)	1.35 (0.99 to 1.85)	—	—
Day 2 after delivery						
Urea nitrogen — mmol/liter	3.5±1.6	3.5±1.5	0.0 (−0.1 to 0.1)	0.03 (−0.06 to 0.13)	0.47	NS
Creatinine — µmol/liter	55.1±12.1	55.6±11.3	−0.5 (−1.2 to 0.3)	−0.41 (−1.11 to 0.30)	0.26	NS
Alanine aminotransferase >2x ULN — no. (%)	26/2042 (1.3)	19/2043 (0.9)	0.3 (−0.3 to 1.0)	1.37 (0.76 to 2.48)	0.29	NS
Aspartate aminotransferase >2x ULN — no. (%)	32/2047 (1.6)	34/2039 (1.7)	−0.1 (−0.9 to 0.7)	0.94 (0.58 to 1.52)	0.79	NS
Up to 3 mo after delivery						
Completed interviews at 3 mo — no. (%)	2047/2190 (93.5)	2056/2177 (94.4)	—	—	—	—
Deep-vein thrombosis or pulmonary embolism — no. (%)**	8/2049 (0.4)††	2/2056 (0.1)	0.3 (0.0 to 0.6)	4.01 (0.85 to 18.92)	0.08	NS
Seizure — no. (%)‡‡	1/2047 (<0.1)	1/2054 (<0.1)	—	—	—	—

Patientes (approximatif) dans les petites études citées des méta-analyses **14 329**

Pacheco

Table 3. Safety Outcomes.*				
Event	Tranexamic Acid (N=5513)	Placebo (N=5457)	Relative Risk (95% CI)	P Value
Thromboembolic event, ischemic stroke, or myocardial infarction — no./total no. (%)	12/5069 (0.2)	13/4996 (0.3)	0.91 (0.42-1.99)	0.81
Thromboembolic event, venous or arterial†	8/5069 (0.2)	13/4996 (0.3)	0.61 (0.25-1.46)	0.26
Ischemic stroke	2/5069 (<0.1)	0/4996	—	0.50
Myocardial infarction	2/5069 (<0.1)	0/4996	—	0.50
New-onset seizure — no./total no. (%)	2/5069 (<0.1)	0/4996	—	0.50
Admission to ICU for more than 24 hr — no./total no. (%)	21/5069 (0.4)	17/4996 (0.3)	1.22 (0.64-2.30)	0.55
Maternal death — no./total no. (%)‡	2/5069 (<0.1)	2/4996 (<0.1)	0.99 (0.07-13.6)	>0.99
Thromboembolic event, ischemic stroke, myocardial infarction, new-onset seizure activity, admission to the ICU for more than 24 hr, or maternal death — no./total no. (%)	35/5069 (0.7)	32/4996 (0.6)	1.08 (0.67-1.74)	0.76
Hospital readmission — no./total no. (%)	199/5069 (3.9)	162/4996 (3.2)	1.21 (0.99-1.48)	0.07
Any side effect — no. (%)§	616 (11.2)	667 (12.2)	0.91 (0.82-1.01)	0.09
Nausea	362 (6.6)	403 (7.4)	0.89 (0.78-1.02)	0.09
Vomiting	266 (4.8)	273 (5.0)	0.96 (0.82-1.14)	0.67
Dizziness	156 (2.8)	186 (3.4)	0.83 (0.67-1.02)	0.08

Pacheco. N Engl J Med 2023; 388: 1365-75
Sentilhes. N Engl J Med 2021; 384: 1623-34
WOMAN. Lancet 2017;389:2105-16



TXA & Erreur médicamenteuse

Case Report



Accidental Intrathecal Tranexamic Acid Injection During Caesarean Section: A Case Report

Raymond Oyugi Samuel ¹, Victoria Adonicam,² and Andrew Hans Mgaya ³

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²*Department of Anaesthesiology, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania*

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Case Reports in Anesthesiology

Volume 2024, Article ID 4731010, 5 pages

<https://doi.org/10.1155/2024/4731010>

<https://www.who.int/news/item/16-03-2022-risk-of-medication-errors-with-tranexamic-acid-injection-resulting-in-inadvertent-intrathecal-injection>



TXA & Foetus



ANESTHESIOLOGY

Placental Transfer of Tranexamic Acid and the Case for Earlier Use in Obstetric Hemorrhage Trials

Grace Lim, M.D., M.Sc., Philip C. Spinella, M.D.
ANESTHESIOLOGY 2025; 143:1449–52

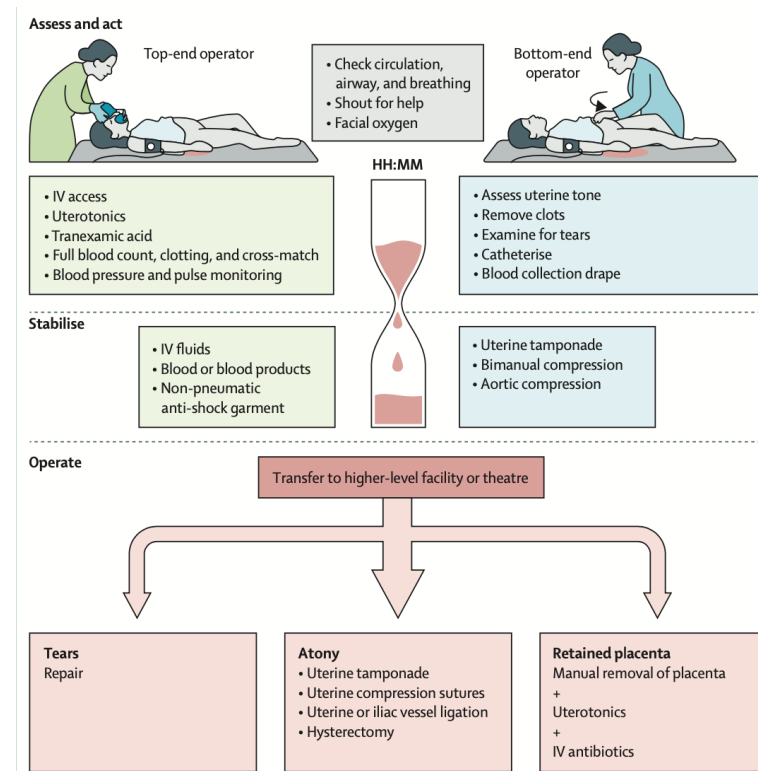
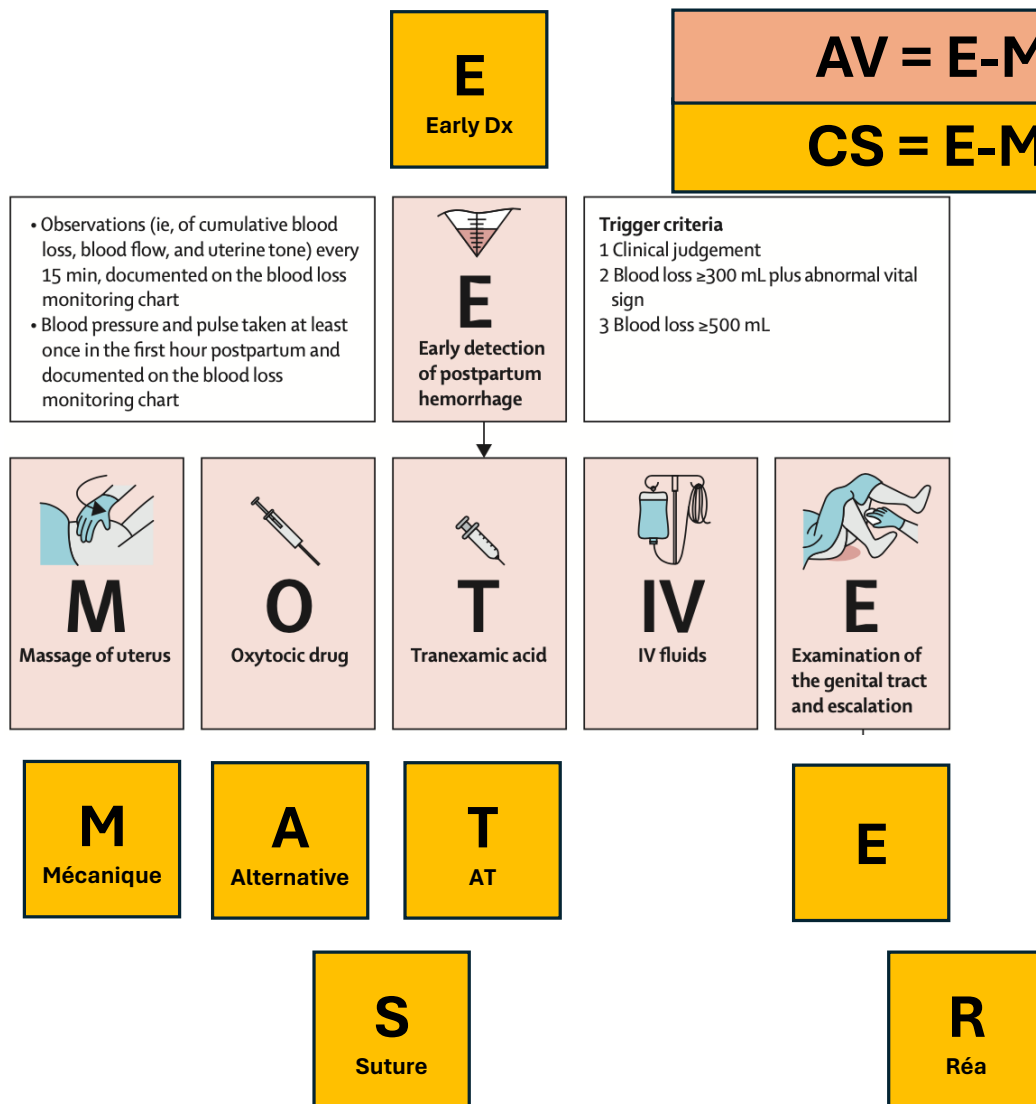
- TXA traverse le placenta
 - Pas de métabolisme placentaire
 - Concentrations fœtales = concentrations maternelles
- Réassurance de la littérature
 - Études animales
 - Littérature sur chx cardiaque néonatale
 - Études avec utilisation prophylaxique PRÉ-clampage
- Recommandations
 - À donner si la thérapeutique est nécessaire
 - À donner en prophylaxie chez patientes à haut risque

Pas d'excès de mortalité nouveau-né allaité dans WOMAN

versus 43 (0.43%) in the placebo group. Eight women in the tranexamic acid group suffered the death of a breast-fed baby compared with seven women in the placebo group. No thromboembolic events were reported in breast-fed babies in either group. Of

WOMAN trials collaborators, Lancet 2017;389:2105-16.

4. Établir une prise en charge structurée de l'hémorragie sévère;



Coomarasamy. Lancet 2026; 408; 83-92



III- ÉVALUATION

- Reconnaître l'hémorragie
- Quantifier
 - Saignement
 - Évaluation visuelle / évaluation mesurée
 - Évaluation retardée via le statut HD
 - Évaluation objective; HemoCue®, FSC, Coagulogramme
 - Hémodynamie
- Qualifier
 - Hypothèses de travail partagées



Utérotonique / Ca?
A tranexamique

#2^{ième} voie
Volume
Sang; réserve
Labos/artère?
Anesthésie?

**30
min**

Gallos et al. NEJM 2023;389:11-21
Federspiel et al. Am J Obstet Gynecol MFM 2023;5(2):100740
Bienstock et al. N Engl J Med 2021;384(17): 1635-45



Pertes sanguines attendues

AV **moyenne 353 ml**
médiane 220 ml
CS **moyenne 792 ml**

Yunas. Lancet Obstet Gynaecol Womens Health 2026;2:e129-39

Mitts. Am J Obstet Gynecol 2025;232:478e1-7

Gallos. N Engl J Med 2023;389:11-21

Drapeau ROUGE - HPP

Somnolence, Confusion

Dyspnée, Oligurie

Suintement

PS $\geq$ 1500 ml

Pls 110, TAS $<$ 90

Hb $<$ 70

Fb $<$ 2, INR $\geq$ 1,5

Lactate $>$ 2,6

Table 1
Classes of hemorrhagic shock

	Class I	Class II	Class III	Class IV
Blood loss (mL)	Up to 750	750–1500	1500–2000	>2000
Blood loss (% of blood volume)	Up to 15%	15%–30%	30%–40%	>40%
Pulse rate	<100	100–120	120–140	>140
Blood pressure (mm Hg)	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	>35
Urine output (mL/h)	>30	20–30	5–15	Negligible
Mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, Lethargic
Fluid replacement	Crystalloid	Crystalloid	Crystalloid + blood	Crystalloid + blood

Table 2
Signs and symptoms of blood loss with obstetric hemorrhage in the healthy parturient

Blood Loss (mL)	Systolic Blood Pressure (mm Hg)	Heart Rate (bpm)	Symptoms
1000	>100	<100	Palpitations, lightheadedness
1500	90–100	100–120	Weakness, diaphoresis
2000	70–80	120–140	Restlessness, confusion, pallor
3000	50–70	>140	Lethargy, air hunger

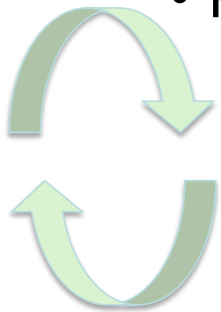
Baird. Anesthesiology Clin 2017;35:15-34



IV- DIAGNOSTIC commun

- Point de départ; diagnostic commun

- Réévaluations fréquentes du diagnostic



- Pertes sanguines objectivées + hémoglobines sériées
- Évolution vers une CIVD OU CAO?
 - Visuelle + coagulogrammes sériés/fibrinogène + FSC
 - (TEG®, ROTEM® - fib-tem)
- Évolution vers anomalies électrolytiques
- Données cliniques autres...

Pacheo. Sem Perinatology 2019;22-26
Snegovskikh. J Clin Anesth 2018;44:50-56
Guash. Med Intensiva 2016;40(5):298-310



V- TRAITEMENTS INITIAUX

- Échographie
- Préparation SOP
- Réanimation; anticiper
 - Volume
 - A tranexamique à répéter
- Traitement curatif de l'hémorragie
 - Contraction utérine
 - 2^{ième} ligne utérotonique
 - (Calcium?)
 - Curetage
 - Examen vaginal

30
min



Sang demandé
Artère; labos
Anesthésie



Réa – Anesthésie?

- Anesthésie régionale résiduelle...
- Anesthésie pour geste technique
 - Instabilité HD proscrit ALR
 - Majoration de l'instabilité
 - Pas de protection voies aériennes
 - Coagulopathie possible
 - Induction stable
 - Halogénés proscrits



Réa - Volume

- Cristalloïdes (LR & NaCl)
 - 20% iv après 1h → Œdème → microcirculation
 - > 4000 ml associé à devenir moins favorable
 - Approche restrictive non délétère 0,75-1ml/kg
- Colloïdes (Voluven max 30ml/kg)
 - Restauration volume vs entrave coagulation
 - Effets secondaires & ↑ mortalité aux SI
- Recommandations variables
 - Cristalloïdes : 500 ml à 2 L ou encore 1-2ml/ml PS
 - Colloïdes : relatif confort ad 1L adultes en santé (abstention en insuffisance rénale, prééclampsie...)

28. Isotonic crystalloids are recommended in preference to colloids for intravenous fluid resuscitation of women with postpartum haemorrhage.^b

Edited

Recommended

Suggested citation. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

Van de Velde. Br J Anaesth 2026;137:168-81
Schol. PLoS ONE 16(6):e0253765
Baird. Anesthesiology Clin 2017;35:15-34

Traitement

a. tranexamique

TXA for treatment of PPH

Ducloy-Bouthors (2011)	France	144	4 g (plus 1 g/h)	—
WOMAN trial (2009–2016)	Worldwide	20,060	1 g (plus repeat 1 g if ongoing hemorrhage)	—
Gillissen (2017)	Netherlands	1260	1 g (plus repeat 1 g if ongoing hemorrhage)	—

♦ Traitement ; littérature très limitée avant WOMAN

- Nombreux biais
- Différence de saignement peu significative cliniquement
- Sécurité non assurée
 - Événements thrombo-emboliques
 - Convulsions

Ahmadzia. Obstet Gynecol Surv 2018;73(10): 587-594

Sentilhes. Br J Anaesthesia 2015;114 (4):576-87

Docloy-Bouthors. Crit Care 2011;15:R117

Ferrer. BMC Pregnancy Childbirth 2009;9:29

Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

WOMAN Trial Collaborators*

Published **Online**

April 26, 2017

[http://dx.doi.org/10.1016/](http://dx.doi.org/10.1016/S0140-6736(17)30638-4)

S0140-6736(17)30638-4

- Randomisée, contrôlée, double insu
- Multicentrique; 21 pays → 20 000 patientes
- HPP accouchement vaginal ou césarienne

	Tranexamic acid group (n=10 050)	Placebo group (n=9905)	RR (95% CI)	p value (two-sided)
Bleeding	155 (1.5%)	191 (1.9 %)	0.81 (0.65–1.00)	0.045
Pulmonary embolism	10 (0.1%)	11 (0.1%)	0.99 (0.38–2.15)	0.82
Organ failure	25 (0.3%)	18 (0.2%)	1.38 (0.75–2.53)	0.29
Sepsis	15 (0.2%)	8 (0.1%)	1.87 (0.79–4.40)	0.15
Eclampsia	2 (0.02%)	8 (0.1%)	0.25 (0.05–1.17)	0.057
Other	20 (0.2%)	20 (0.2%)	0.99 (0.54–1.85)	0.99
Any cause of death	227 (2.3%)	256 (2.6%)	0.88 (0.74–1.05)	0.16

Data are n (%), unless otherwise indicated. RR=risk ratio.

Table 2: Effect of tranexamic acid on maternal death



Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage



FIGO
International Federation of
Gynecology and Obstetrics



**International
Confederation
of Midwives**



**World Health
Organization**

Suggested citation. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

27. Early use of intravenous tranexamic acid (within 3 hours of birth) in addition to standard care is recommended for women with postpartum haemorrhage following vaginal birth or caesarean section.^g

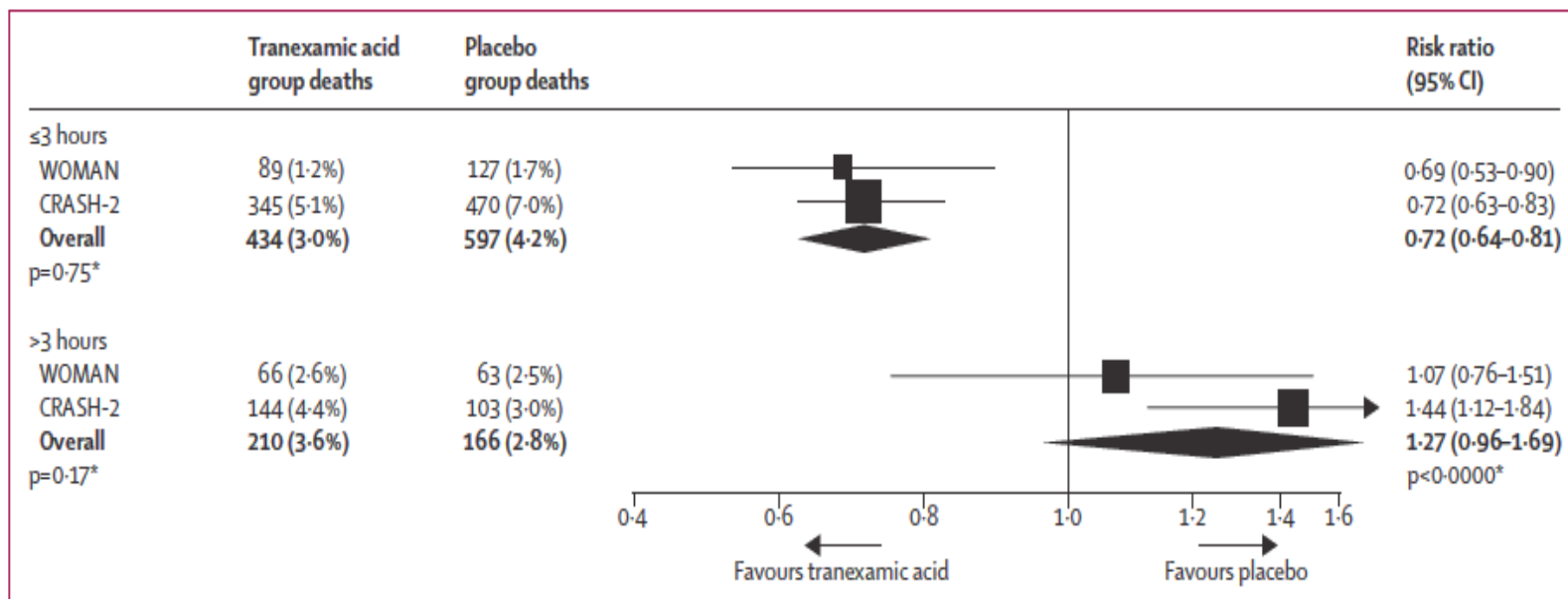
Recommended

Edited

- **1g a tranexamique sur 10 minutes**
 - **À répéter si saignement après 30 min**
 - **À répéter si reprend dans le premier 24 heures**
 - **Ne pas débiter > 3h après naissance**
- **Diagnostic HPP: $\geq 500\text{ml}$ ou $\geq 300\text{ ml}$ avec instabilité HD**
- **Toutes causes d'hémorragie post partum**
- **Contre-indication idem thérapie antifibrinolytique**
- **Doit être disponible**
- **Autres voies d'administration à étudier**

✖ Nous ne pouvons pas afficher l'image.

Délai optimal 3 heures [Essai WOMAN et CRASH]

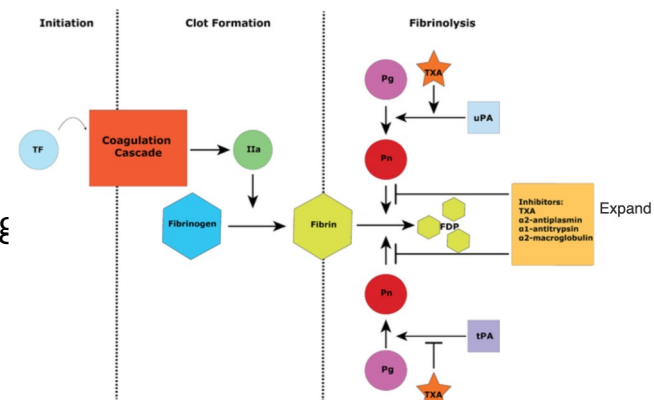


WOMAN trials collaborators, Lancet 2017;389:2105-16; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6491317/pdf/CD012964.pdf>.

Initiation a. tranexamique

3 heures post saignement

- Mortalité ↑ secondairement aux saignement
- Contexte
 - Hyperfibrinolyse
 - Shutdown fibrinolyse
- Mécanisme;
 - Peu clair
 - Modèle souris
 - Activateur tissu-plasminogène (tPA)
 - Activateur urokinase-plasminog
- Clinique
 - CRASH-2 (2010)
 - WOMAN (2017)
 - WOMAN 2 (2024)



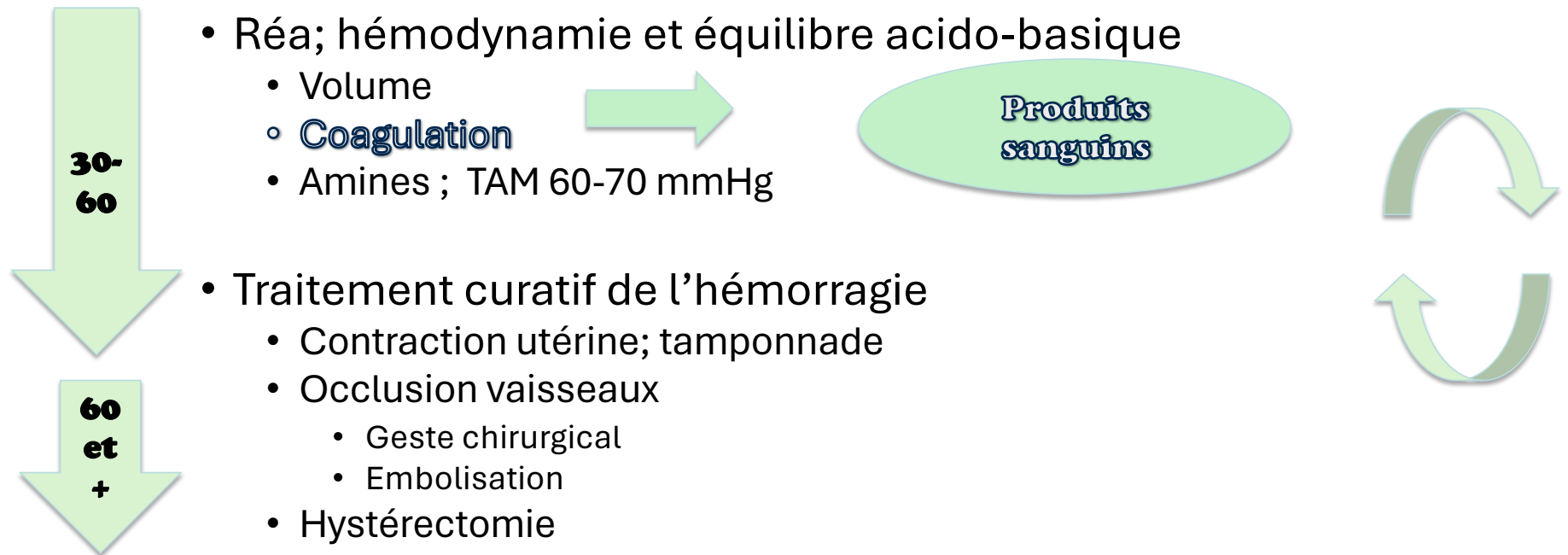
Wu. PLoS ONE 2020;15(5):e0233640

Moore. Anesth Analg 2019; 129(3): 762-773

Hijazi. Blood 2015;125 (16):2558-67



VI- TRAITEMENTS





Réa – Transfusion

- 1) Étiologie de l'HPP**
- 2) Statut HD & héματο de base**
- 3) Comorbidités**
- 4) Volume circulant**

- Initiation
 - Aucun critère strict – littérature pauvre
 - Perte sanguine 1000ml ou Instabilité HD & Hb < 70
- Aucune donnée randomisée sur le ratio OB, la pratique est guidée par des cibles générales...
- Définition transfusion massive
 - ≥ 10 culots en 24hrs OU
 - ≥ 4 culots en 1 heure

Réa – Globule rouge

- Globules rouges - mécanismes
 - Volume intravasculaire
 - Perfusion & oxygénation des tissus
 - Maintien coagulation ; transit et fonction plaquettes
- Globules rouges – cibles
 - Comorbidités
 - Hémorragie active
 - Évaluation de la situation



Réa - Plasma

- PFC - mécanismes
 - Facteurs de coagulation (dilution & consommation)
 - 30% du taux de base nécessaire
 - Protection en grossesse
 - Volume dilution > 3000 ml (4000 - 5000ml)
- PFC – cibles
 - Faire les tests de viscoélasticité > > > *suivre des ratios*
 - Suivre les cibles INR < 1,8
 - Une unité = 8% facteurs de coagulation
 - 30ml/kg PFC $\cong$ 8 PFC = fibrinogène 1g/L
 - *Empiriquement ad 1L pour débiter si HPP massive dx tardif → 4 PFC*

Ratio PFC : CULOT

- Études trauma
 - Biais & résultats mitigés
- Étude observationnelle obstétricale
 - Ratio 1: 1,8 → 1,1 moins d'intervention
 - Risques de sur-tranfusion de PFC
- Recommandations
 - Utilisation des tests viscoélasticité
 - Vers un ratio 1:1 **SI** saignement massif ou consommation en cours

Hofer. Eur J Anaesthesiol 2023;40:29-38
Guash. Med Intensiva 2016;40(5):298-310
Bonnet. F1000Res 2016;27;5
Holcomb. JAMA 2015;313(5):471-82



Réa – Plaquette

- Plt – mécanismes
 - Fonction plaquettaire ; coagulopathie consommation
 - Dilution > **5000 ml (sauf si thrombocytopenie)**
- Plt – cibles
 - 50 000 – 75 000
 - Une unité (pool 6 donneurs) = 25-30 000
- Ratio Plt 4:4:1? (aucune étude obstétricale)

Baird. Anesthesiology Clin 2017;35:15-34
Jones. Anaesthesia 2016;71(6):648-56
LeGouez. Transfus clin biol 2016;23:229-32
Oluwatoyosi. Int J Gyn Obstet 2012;119:3-5



Réa – Fibrinogène

- **Déplétion en fibrinogène rapide**
 - Saignement
 - Fibrinolyse
 - Hémodilution
- **Prédicteur de la progression HPP sévère**
 - 2g/L ou moins valeur prédictive positive 100%
 - 4g/L ou plus valeur prédictive négative 79%
 - Association, pas de preuve de causalité

Bonnet. F1000Res 2016;27;5
Wikkelsø. Br J Anaesth 2015;114(4):623-33
Ahmed. Transf Med 2012;22(5):344-9
Charbit. J Thromb Haemost 2007;5(2):266-73

Fibrinogène – déplétion en HPP

Statut hématologique patiente	% de patiente fibrinogène < 2g/L
PS 1000-1500 ml	4-5%
PS 2500 ml	17%
PS 3000 ml	26%
≥ 5 culots sur 4 hrs OU ≥ 8 culots	40-50%
PS 6000 ml	> 60%



Fibrinogène - traitement

- **Fibrinogène traitement**

- Niveau souhaité ≥ 2 g/L
- Algorithmes dans la littérature

- **Fibrinogène préventif en début HPP**

- Pas de bénéfice prouvé -
 - Études avec les concentrés de fibrinogène
 - Étude en cours pour les cryoprécipités (Green)
 - Questionnement de quantité saignement?
- Sécuritaire?

Green. Anaesthesia 2022;77:175-184

Tahitu. Acta Obstet Gynecology Scand 2022;101:145-152

Ducloy-Bouthors. BJOG 2021;128:1814-1823

Zaidi. Transfus Med Rev 2020;34:101-107

Wikkelso. Br J Anaesth 2015;114(4):623-33



Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage



Suggested citation. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

Transfusion of whole blood and/or fractionated blood products

Recommendation 41

NEW

For women experiencing acute or ongoing postpartum haemorrhage, the decision to initiate transfusion of blood products should be based on the underlying risk, continuous clinical and haematological assessments, and clear protocols for optimizing their use. (*Recommended*)

Fibrinogen:

- If available, transfusion of fibrinogen can be considered. The therapeutic goal is ≥ 2 g/L. If fibrinogen is < 2 g/L, administer cryoprecipitate to achieve a target fibrinogen level of ≥ 2 g/L. This typically requires 3–4 g of fibrinogen, corresponding to approximately 8–10 units of cryoprecipitate, depending on the fibrinogen content per unit. If available, pathogen-reduced cryoprecipitate should be chosen.
- The effectiveness of recombinant factor VIIa and prothrombin complex concentrate remain uncertain.

	Cryoprécipité	Concentré de fibrinogène RiaSTAP
Composantes	Facteurs VIII-XIII, vWF, fibrinogène, fibronectine	Concentré fibrinogène humain (dérivé de plasma) (Facteur XVIII ???)
Hémostase	Polymérisation de la fibrine VWF = aggregation plt Fc VIII = génération de thrombine Fc XIII = force caillot Fibronectine: régule l'hémostase, améliore réponse immunitaire, favorise la guérison, stabilité caillot	Polymérisation de la fibrine
Pathogène		Purifié (↓infectieux & ↓ immunologique)
Disponibilité	Banque de sang – décongelé + pool 20-30 minutes	Frigo 60 mois - tournoiement 10- 15 minutes (5 minutes) 100 mg/min
Volume	Pool 10 unités = 100 ml Empiriquement 10 unités	1g = 50 ml → 4g = 200 ml Empiriquement 4g
Coût	346,56\$/1 unité → 10 unités (3 465, 60\$) Perte plasma/plt & contamination???	533,34\$/1 fiole 1g → 4g (2 133,36\$)

Jacobs. Am J Hematology 2026;101: 794-806
Cushing. Transfusion 2020 ; 60: S17-S23
Callum. JAMA 2019;322:1966-76



Fibrinogène - source

•Concentré de fibrinogène

- Non infériorité
- Rapidité disponibilité
 - Syndrome anaphylactoïde de la grossesse
 - Décollement placentaire avec CIVD
- Sécurité?

•Cryoprécipité

- Hémostase
 - Qualité du caillot ; homogène et résistant
 - VWF réfractaire à humate P (multimères)
 - Déficit Facteur XIII?
- Contrôle sur le produit

Morrow. Int J Mol Sci 2021;22:2185
Cushing. Transfusion 2020 ; 60: S17-S23
Callum. JAMA 2019;322:1966-76
Ahmed. Transf Med 2012;22(5):344-9

Facteur XIII

• Rôle facteur XIII

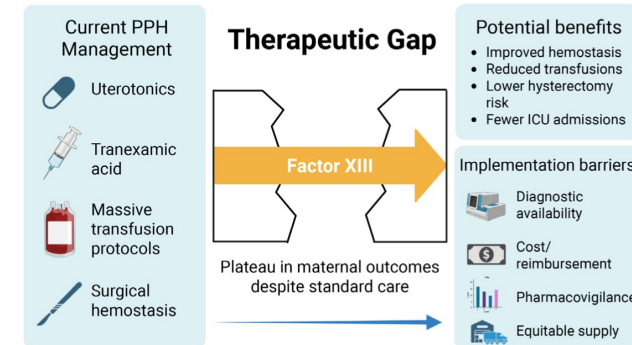
- Modification matrix fibrinogène
- Incorporation protéines anti fibrinolytiques

• Problématique

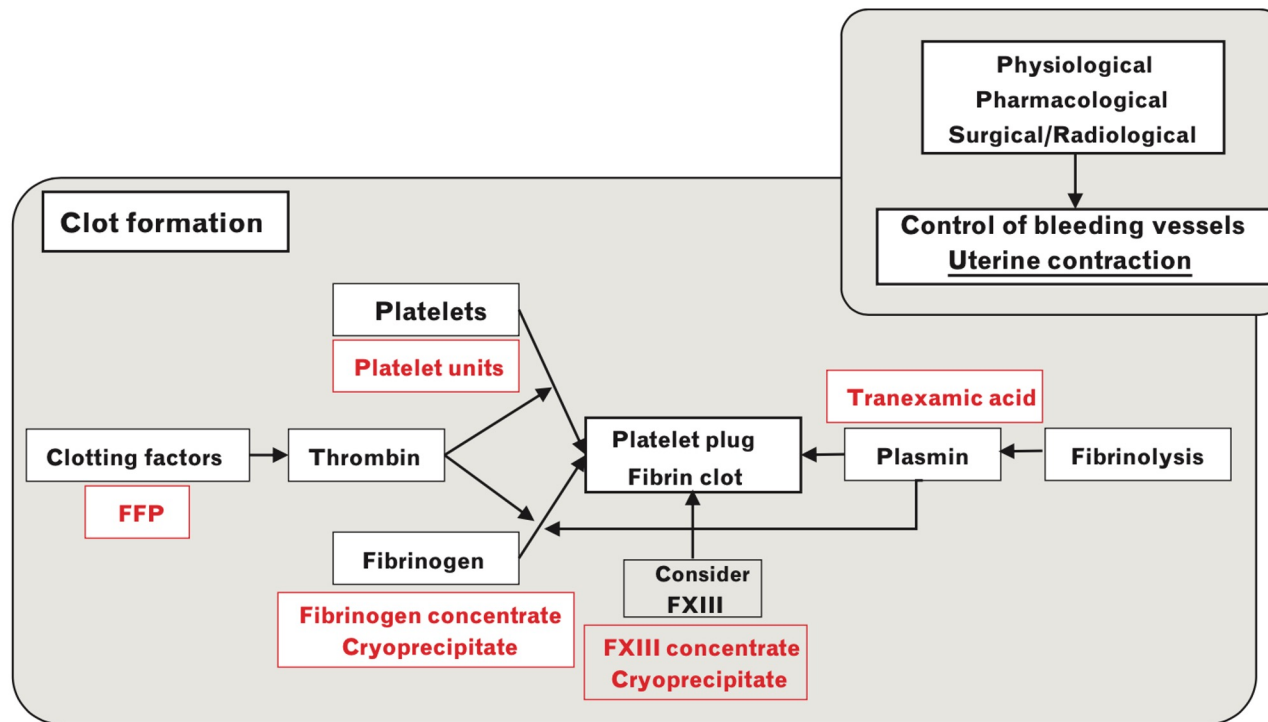
- ↓ FXIII → ↑ pertes sanguines en chirurgie
 - Fibrinolyse → Lyse du caillot + facile
 - Hémostase initiale adéquate → hémorragie 2nd
- Grossesse; FXIII ↓ activité 20-30%

• Sujet d'intérêt en OB

- Étude SWIFT en cours
- Quelques aspects pratiques ...



Jacobs. Am J Hematology 2026;101: 794-806
Karlsson. Int J Obstet Anesth 2021;47:103174
Haslinger. J Thromb Haemost 2020;18(6):1310-9
Bamberg. Arch Gyn Obst 2019;299:421-30



Clot stability is affected by different factors (black text) and the main goals of haemostatic management (red text) are to treat hyperfibrinolysis and to restore clot formation. FFP, fresh frozen plasma; FXIII, factor XIII.

PROTOCOLE D'HÉMORRAGIE MASSIVE (PHM)

Étapes à cocher	RÔLE DU MÉDECIN RÉANIMATEUR : Description des tâches à effectuer
	Déclencher le PHM selon les trois critères suivants : ☐ Perte sanguine objectivée / anticipée > 40% du volume sanguin total (Voir annexe 3) ou selon classification de perte sanguine ≥ stade III (Voir annexe 2) ☐ Perte sanguine rapide (< 3 heures) ☐ Saignement incontrôlé
☐ 2	Identifier la personne-ressource la plus apte (médecin, résident, infirmière, inhalothérapeute) pour assurer ce rôle et faire le suivi du protocole (section RÔLE DE LA PERSONNE-RESSOURCE).
☐ 3	Autoriser l'administration de sang sans épreuve de compatibilité et sans directive transfusionnelle à la banque de sang.
☐ 4	Procéder à la réanimation globale du patient : ABCDE Réanimation liquidienne : remplissage avec NaCl 0.9% ad arrivée de produits sanguins (tenter de limiter à 20 mL/kg). Éviter les cristalloïdes dès que les produits sanguins sont débutés.
☐ 6	Transfusion de produits sanguins (voir tableau 1 Annexe 1) d'abord selon un ratio 2:1 (culot : plasma), puis s'ajuster en fonction des résultats d'analyses de laboratoire selon les seuils visés . Voir annexe 4 pour le contenu des paniers de produits sanguins en fonction du poids. Choisir les produits sanguins à transfuser dans les paniers et l'indiquer à la personne-ressource ainsi qu'aux transfuseurs (infirmières et inhalothérapeutes) au chevet du patient. Évaluer la pertinence des transfusions selon les pertes sanguines.
☐ 7	Agents pharmacologiques : Acide tranexamique le plus rapidement possible (voir tableau 2 Annexe 1). Renversement de l'anticoagulation (FOPRI-2169), concentrés de facteurs, etc. (voir Annexe 1). Demander l'avis de l'hématologue de garde au besoin.
☐ 8	Corriger l'hypothermie (T°> 36°C) : Mesurer la température aux 30 minutes (mettre sonde); utiliser réchauffe-sang, couvertures, lampes chauffantes, élever la température de la salle, etc.
☐ 9	Surveillance des désordres métaboliques : Corriger l'acidose : si pH< 7.2, optimiser réanimation et ventilation (utilisation de Bicarbonate de Na controversée, à considérer si acidose métabolique sans trou anionique ou 2 ^{aire} à insuffisance rénale). Corriger l'hypocalcémie : si Ca ionisé mesuré <1,15 ou considérer après 2 ^e panier (et après chaque panier subséquent) si résultats d'analyse de laboratoire non disponibles; administrer Gluconate de Ca (60mg/kg, max 3g) ; (Annexe 1).

Protocole d'hémorragie massive

- **Déclenchement**
- **Produits sanguins rapidement**
- **Soutien technique (BS & labos)**
- **Gaspillage de ressources**



Commonly used parameters to predict massive transfusion protocol activation in the presence of active bleeding

- Heart rate >120 bpm
- Systolic blood pressure <90 mmHg
- Shock index (heart rate/systolic pressure) >1
- Pulse pressure <45 mmHg
- Transfusion >2 units packed red blood cells
- Estimated blood loss >1.5 L
- Lactate >5 mmol/L
- Abnormal coagulation laboratory values or clinical suspicion of DIC

Pacheco. Am J Obstet Gynecol 2026: S280-309
PHM 2025 – CHUSJ

Obstétrique (hémorragie post-partum)

Étape	Culot ¹	Plasma ²	Plaquette ³	Cryoprécipité ⁴
1	4			
2	4	4	À la demande	6
3	4	2	1 thrombaphérèse	
4+	4	Afficher l'Inspecteur À la demande		6

Produits sanguins et doses usuelles	Recommandations	Seuils visés
Culot globulaire: 20 mL/kg par dose (dose adulte = 1 culot ≈ 300 mL)	Débuter dès que possible et transfuser selon pertes sanguines et ratio 2:1 (culot:plasma) ad résultat Hb.	Hb > 80 g/L
Plasma : 10-20 mL/kg par dose (dose adulte = 4 unités ≈ 1000 mL)	Débuter au 2 ^e panier de produits sanguins et transfuser selon pertes sanguines et ratio 2:1 (culots:plasma) ad résultats INR	INR < 1.8
Plaquettes : 1 unité /10 kg par dose ou 5-10 mL/kg par dose (dose adulte = 5 unités ou 1 unité de thrombaphérèse ≈ 200 ml)	Transfuser au besoin selon résultat décompte plaquettaire (ou avec 3 ^e panier si résultat non disponible)	Plaquettes > 50 x 10 ⁹ /L
Cryoprécipités : 1 unité/10 kg par dose (dose adulte = 6 unités) Non disponible d'emblée dans panier sauf si femme enceinte; appeler banque de sang pour rajouter au panier	Transfuser au besoin selon résultat fibrinogène; transfuser précocement en hémorragie post-partum	Fibrinogène > 1.5 g/L (> 2 g/L si hémorragie post-partum ou CEC/ECMO)

Être attentif à ...

- **La température > 35 °C**
 - **Réchauffe sang**
 - **Couverture chauffante**
- **Le pH > 7,35**
- **Le Ca_i mesuré > 1,10**
 - **Empiriquement 3g CaGluconate/ 4 culots en 2-5 min**

Concentrés de fibrinogène : alternative possible aux cryoprécipités seulement dans les cas d'hémorragie post-partum ou de chirurgie

- Dose pédiatrique : 50 mg/kg (max 4 g/dose)
- Dose chez femmes enceintes : 4 g

PHM 2025 – CHUSJ

James. Semin Thromb Hemost 2016;42:724-31
LeGouez. Transfus clin biol 2016;23:229-32

Facteur VII activé (NiaStase)

- Facteur VII recombinant
- Littérature
 - Bénéfice potentiel sur la transfusion
 - Pas d'impact sur la survie
 - Risques thromboemboliques, notamment artériels
- Usages investigués
 - Zones éloignées
 - Topique au site placentaire
 - Échec des traitements



Facteur VII recombinant activé (NiaStase^{MD}) :

Peut être obtenu avec l'autorisation du Centre Québécois des Inhibiteurs, contacter le 514-345-2360 en tout temps.

- Dose : 20 mcg/kg, à répéter après 15 minutes si la 1^{ère} dose n'est pas efficace.

Les conditions préalables requises chez le patient pour obtenir le facteur VII recombinant activé sont :

1. Normothermie: température >35°C
2. pH >7,35
3. Ca ionisé mesuré >1,10 mmol/L
4. Fibrinogène >1,5 g/L
5. Plaquettes >50 x10⁹/L

Pacheco. Am J Obstet Gynecol 2026: S280-309
Schjoldager. Am J Obstet Gynecol 2017;216:608e1-2
Phillips. Anesthesiology 2009;109(6):1908-15

Complexe prothrombotique humain (Beriplex)

- Concentré des facteurs II, (VII), IX et X & protéines anticoagulantes C et S



- Administration plus rapide et moins de volume (10ml PCC ~ 250 ml PFC)



- Littérature obstétricale de case report et série de cas
- Pas d'antithrombine = crainte majoration état prothrombotique

Pacheco. Am J Obstet Gynecol 2026: S280-309
James et al. Semin Thromb Hemost 2016;42:724-31
Hunt et al. Br J Haematol 2015;170: 788-803

Auto-transfuseur

❖ POUR

- Profil physiologique favorable
- Minimiser les risques de réactions
- Éviter les transfusions (refus et accès)

❖ CONTRE

- HypoTA sur bris filtre (leucocytes – cytokines)
- Allo-immunisation
- Syndrome anaphylactoïde de la grossesse
- \$\$\$
 - anomalies placentations
 - Anémie sévère

Table 3. Suggested Indications for Consideration of Cell Salvage for Cesarean Delivery

Medical indications	Obstetric indications
Thrombocytopenia	Placenta previa
Severe anemia	Placenta accreta
Rare blood types	Prior uterine rupture
Difficulty cross-matching	Placental abruption
Jehovah Witness	Abnormal placentation
Refusal of allogeneic blood	

→ PS anticipées > 1000 ml
→ Intérêt à éviter transfusions

40. Cell salvage is recommended for the treatment of postpartum haemorrhage only in the context of rigorous research.

New

Suggested citation. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

Research-context recommendation

Van de Velde. Br J Anaesth 2026;137:168-81
Coomarasamy. Lancet 2026; 408; 83-92
Higgins. Curr Opin Anesthesiol 2019;32:278-28.
Baird. Anesthesiology Clin 2017;35:15-34
Goucher. Anesth Analg 2015;121:465-8



VII- TRAITEMENTS curatifs

- Tamponnade
 - Ballon; Bakri
 - Sutures de compression; B-Lynch
- Vaisseaux
 - Ligatures chirurgicales des vaisseaux
 - Embolisation
 - « Garot puis procédure chirurgicale »
- Chirurgie utérine
 - Résection en wedge
 - Hystérectomie d'hémostase
- Paquetage en dernier recours

TABLE 8

Proposed postpartum-specific definitions for intra-abdominal hypertension and abdominal compartment syndrome

IAP in healthy postpartum patients is 8–10 mmHg

IAH in postpartum is defined as sustained or repeated pathological elevation in IAP ≥ 12 mmHg

ACS in postpartum is defined as a sustained IAP ≥ 20 mmHg that is associated with new organ failure or dysfunction

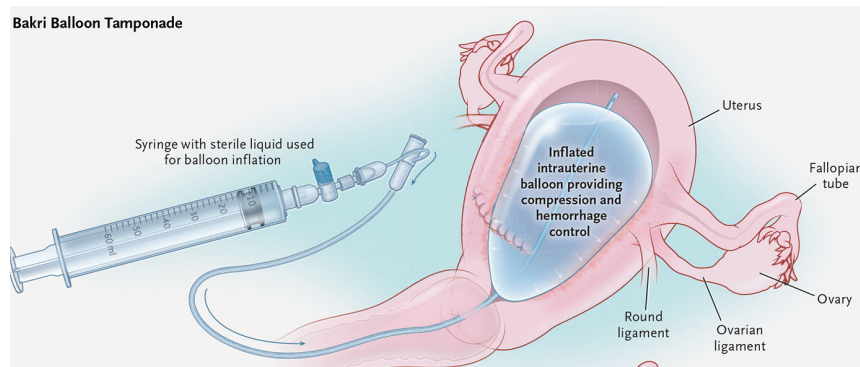
ACS, abdominal compartment syndrome; IAH, intra-abdominal hypertension; IAP, intra-abdominal pressure.

IAP is measured in mmHg at the end of expiration while the patient is in the supine position.



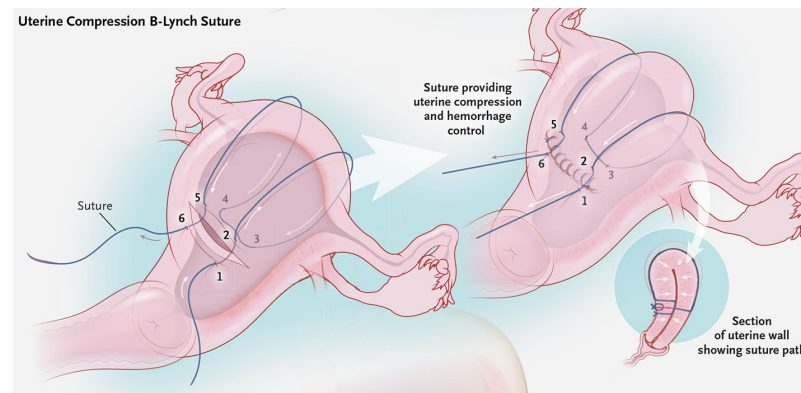
Pacheco. Am J Obstet Gynecol 2026: S280-309
Bienstock et al. N Engl J Med 2021;384(17): 1635-45

Tamponnade



500 ml max dans le ballon
Le col de l'utérus doit être préalablement ouvert
Maximum 24 heures
Sécuritaire
85% taux succès

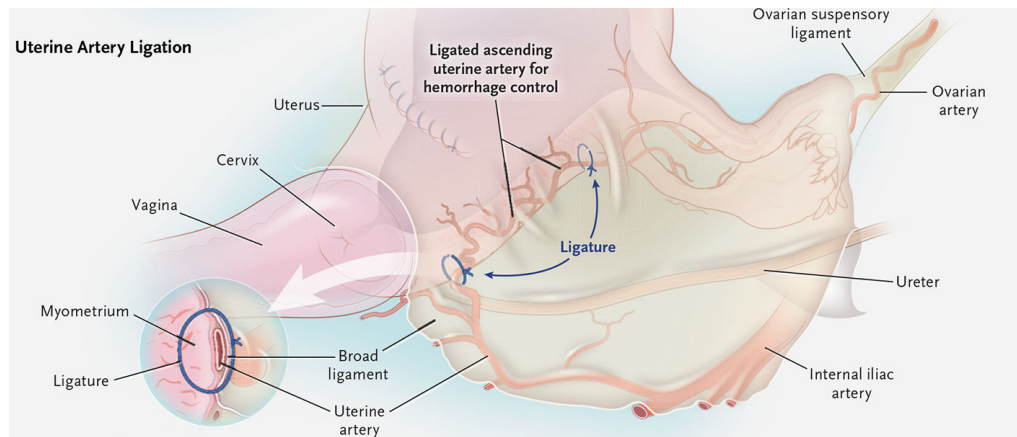
Comprimer l'utérus
Risques nécrose & synéchies
Taux succès 90%
Grossesse future 11-75%



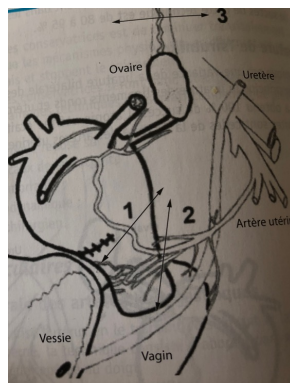
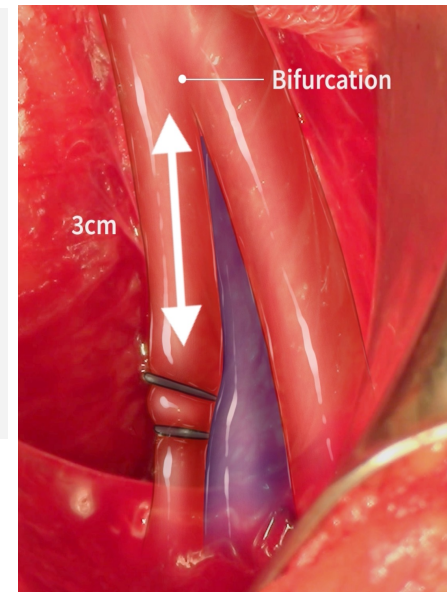
Bienstock et al. N Engl J Med 2021;384(17): 1635-45

Les vaisseaux; Ligature chirurgicale

#1 Ligature bilatérale des a. utérines



#2 Si échec; A. iliaques internes

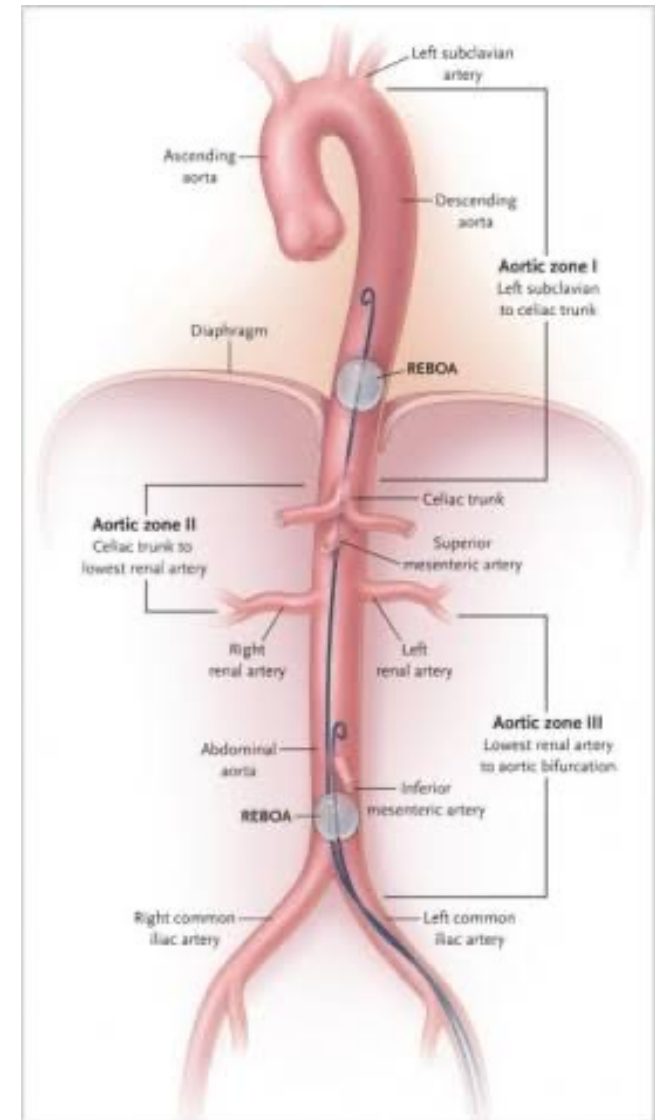


#3 A. ovariennes au besoin

Les vaisseaux; Embolisation

- Prévention dans certains cas
- À considérer en cas d'échec au tx
 - Atonie réfractaire
 - Anomalie d'insertion
- Règle #1 stabilité HD
 - Transfert
 - Salle d'angio n'est pas une salle d'op
- Taux de succès 75-100%
- Grossesse future 43-48%

Les vaisseaux REBOA (Resuscitative Endovascular Balloon Occlusion of the Aorte)

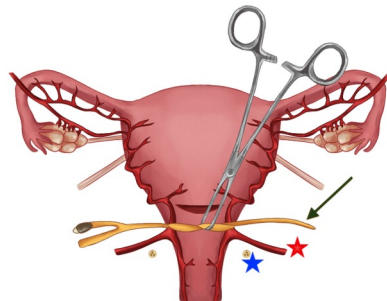


<https://www.c4ts.qmul.ac.uk/research-1-research/uk-reboa>

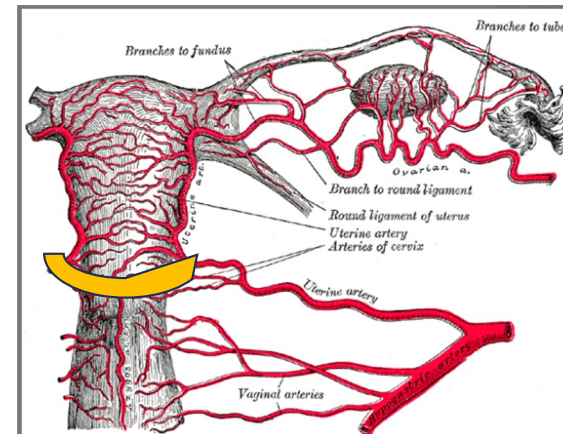
Les techniques chirurgicales

Résection en Wedge

- **Technique utilisée depuis avril 2024 au CHUSJ**
 - Incision Mayland (section des grands droits)
 - Dissection de la vessie jusqu'au segment inférieur
 - Césarienne sur l'utérus (selon le site du placenta)
 - Retrait du placenta
 - Soulèvement de l'utérus et application du garrot près du col
 - Écrasement des artères utérines
- **Suite selon l'évaluation préalable**
 - Fermeture utérus et hystérectomie
 - Wedge avec réapproximation des tissus

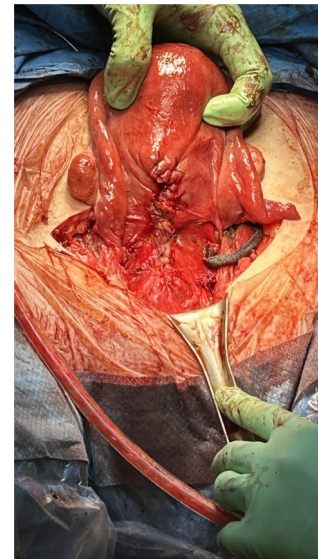
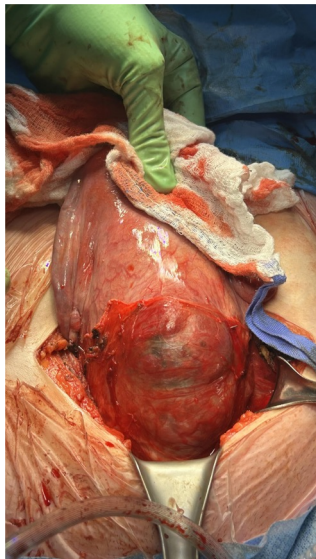


Staniczek. Life 2023; 13: 1774



Wikipedia

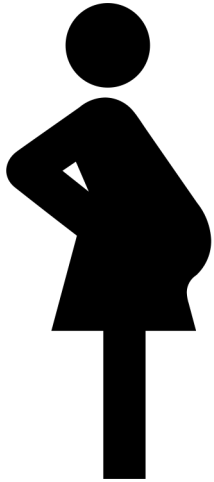
Technique chirurgicale du wedge



Gracieuseté Dre Élise Monceau

Hystérectomie subtotale ou totale

- Habituellement pour atonie réfractaire ou anomalies insertions
- Difficultés techniques
 - Gros utérus
 - Vaisseaux engorgés et collatérales
- Complications majorées
 - Hémorragique
 - Trauma
 - infection



Conclusion

- **L'hémorragie massive**
 - Partage d'informations ; quantitatives & qualitatives
 - **Anticipation en fonction du diagnostic**
 - Actions concertées;
 - **Réanimation efficace et rapide**
 - **Traitement de support hémostatique**
 - Traitement curatif
- **Comment s'y préparer et s'améliorer?**
 - Simulation
 - Communication/leadership
 - Tester protocoles/aides mémoires
 - Débriefing en équipe et personnel ...
 - Suivre la littérature
 - Nouveaux moyens d'évaluer
 - Nouvelles utilisations des molécules