

Maternal Mortality

- Obstetrical Hemorrhage -

Dr. Adiel Fleischer
Chief Maternal Fetal Medicine
NS-LIJ Health System

Maternal Mortality

-All pregnancies-

<u>Etiology</u>	<u>M. M.</u>
<i>Hemorrhage</i>	28.7%
<i>Embolism</i>	19.7%
<i>P.I.H.</i>	17.6%
<i>Infection</i>	13.1%
<i>Cardiomyopathy</i>	5.6%
<i>Anesthesia complic</i>	2.5%
<i>Others</i>	12.7%

Maternal Mortality

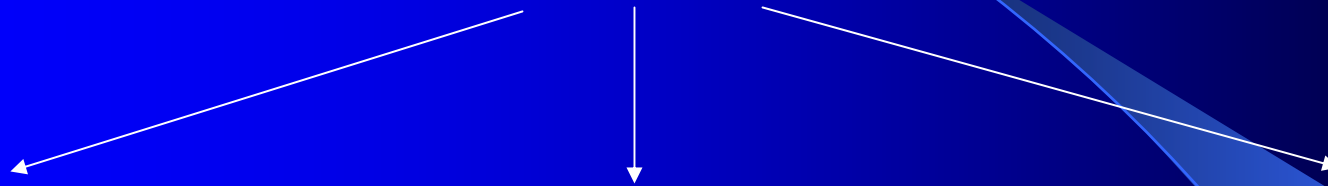
- Obstetrical Hemorrhage -

Peripartum Hemorrhage (PPH)



Maternal Mortality

- Obstetrical Hemorrhage -



Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

Maternal Mortality

- Obstetrical Hemorrhage -

1. -Identify
pat. at risk



- Pl previa/accreta*
- Anticoagulation Rx*
- Coagulopathy*
- Overdistended uterus*
- Grand multiparity*
- Abn labor pattern*
- Chorioamnionitis*
- Large myomas*
- Previous history of PPH*

Maternal Mortality

- Obstetrical Hemorrhage -

Patients
at risk



Pre-delivery
management



- 1.- Prepare for PPH*
- 2.- Optimize patient's hemodynamic status*
- 3.- Timing of Delivery*
- 4.- Surgical planning*
- 5.- Anesthesia /I.V. access/ invasive monitoring*
- 6.- Modify obstetrical management*
- 7.- Increased postpartum/postop surveillance*

Maternal Mortality

- Obstetrical Hemorrhage -

1. - Prepare for PPH

Personel

Drugs/Equipment

- Nursing
- Anesthesia
- Surg assistance
- Others (I.R.)

- Methergine
- Hemabate
- Cytotec
- Colloids
- Blood/Bl.products
- Surg. Instruments
- Hemostatic ballons
(Cook, S-B, Foley)

Maternal Mortality

- Obstetrical Hemorrhage -

Patients
at risk



Pre-delivery
management



- 1.- *Prepare for PPH*
- 2.- *Optimize patient's hemodynamic status*
- 3.- *Timing of Delivery*
- 4.- *Surgical planning*
- 5.- *Anesthesia /I.V. access/ invasive monitoring*
- 6.- *Modify obstetrical management*
- 7.- *Increased postpartum/postop surveillance*

Maternal Mortality

- Obstetrical Hemorrhage -

2.- Optimize hemodynamic status

1.- Acute isovolemic hemodilution

2.- Acute hypervolemic hemodilution

3.- Autologous donation

4.- Preoperative transfusion

Maternal Mortality

- Obstetrical Hemorrhage -

Acute
hemodilution

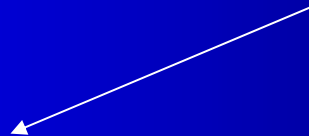


Decreases pre-op
Hb concentration

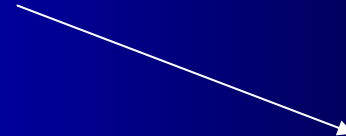


*For same blood
volume lost*

Lower RBC's loss



- ↓ Transfusion rates



- ↑ Final Hct's

Maternal Mortality

- Obstetrical Hemorrhage -

1.- Acute isovolemic hemodilution

Withdraw 2-4u. of Blood



Replace the volume with crystalloids



Lower the pre-op Hct



Replace the blood at end of surgery

2.- Acute hypervolemic hemodilution

Admin 1500-2000cc Crystalloids



Hemodilution (Lowers pre-op Hct)

Maternal Mortality

- Obstetrical Hemorrhage -

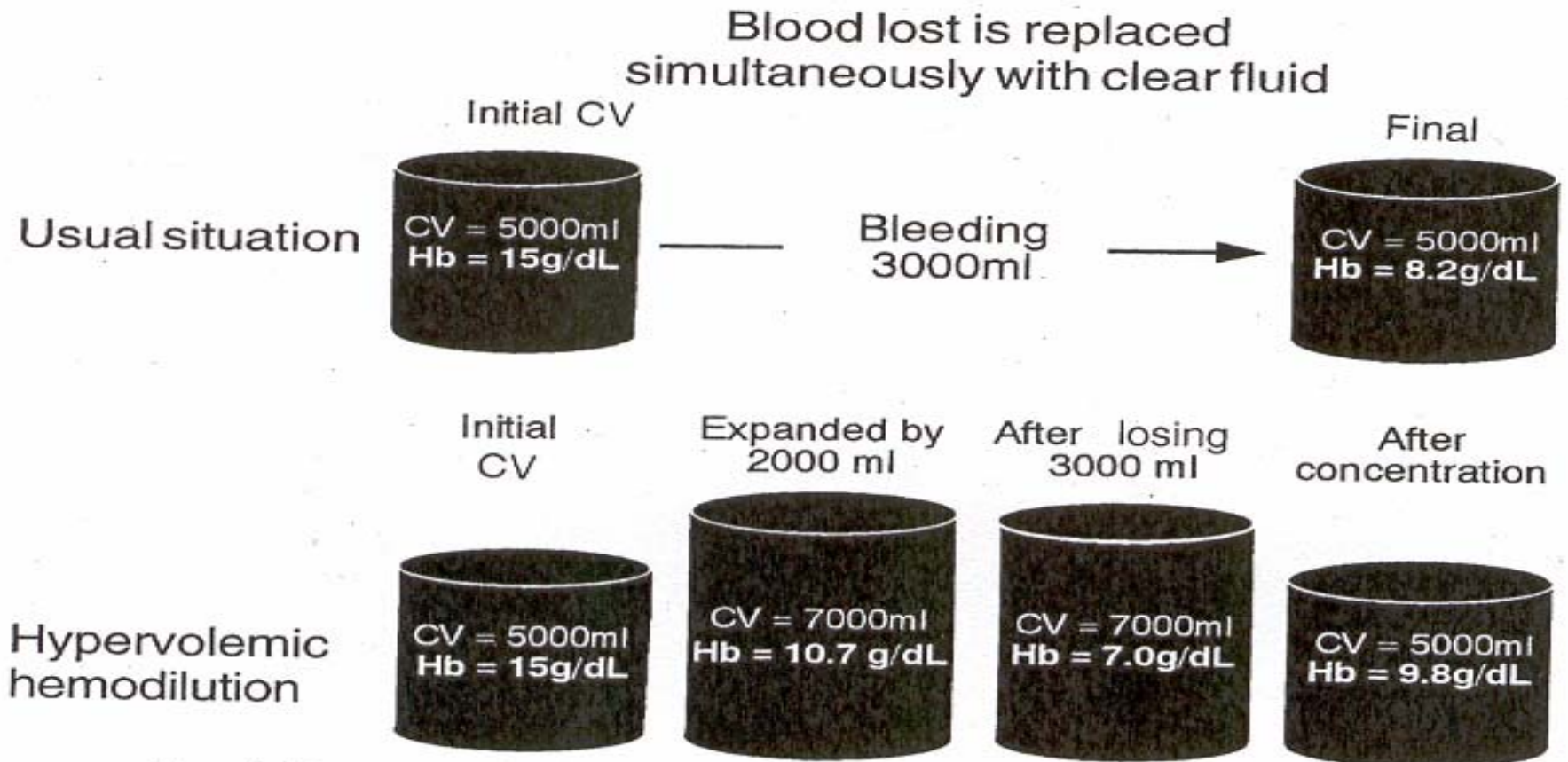


FIG. 4. Postoperative Hb gain in hypovolemic hemodilution.

Maternal Mortality

- Obstetrical Hemorrhage -

- Acute isovolemic/hypervolemic hemodilution

Initial Hb

Preop 45% → 15g Hb%

Blood loss

2,000cc

Hb loss

300g → (27%)

After hemodilution

Preop 30% → 10g Hb%

3,000cc

300g → (27%)

Maternal Mortality

- Obstetrical Hemorrhage -

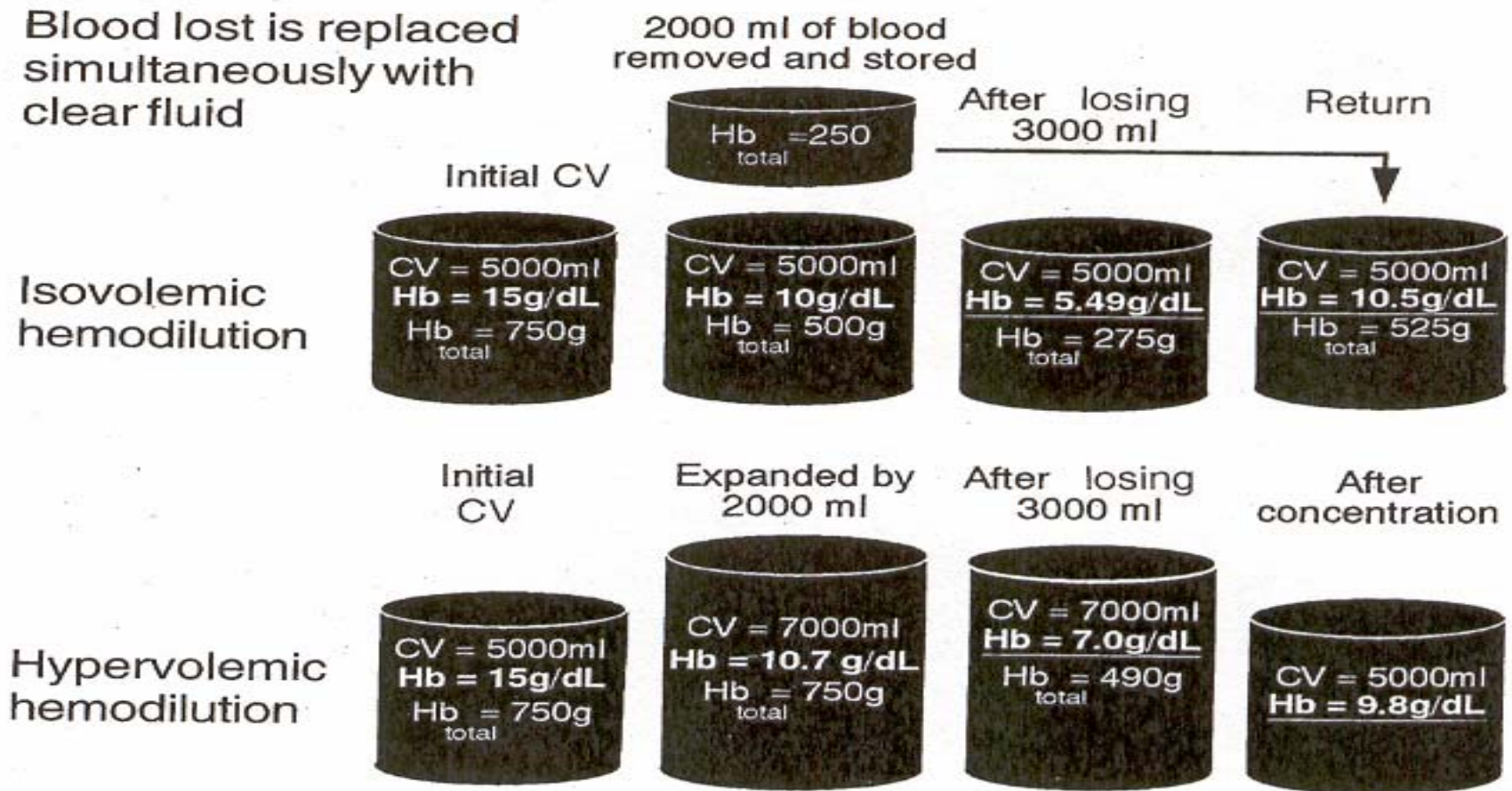


FIG. 6. Comparison of hypervolemic hemodilution with isovolemic hemodilution.

Maternal Mortality

- Obstetrical Hemorrhage -

Optimize hemodynamic status

1.- Acute isovolemic hemodilution

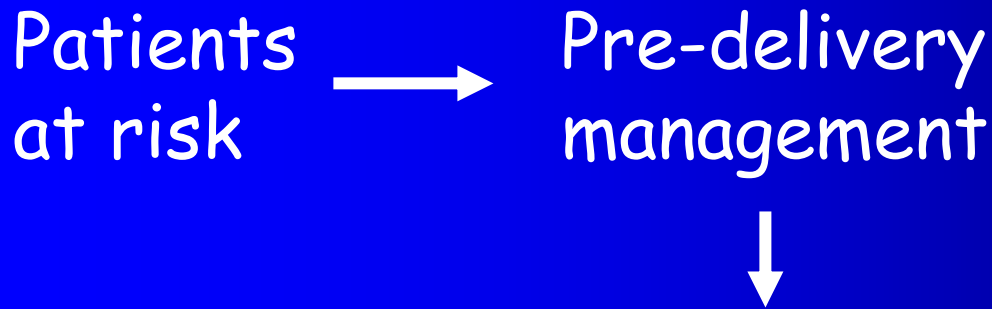
2.- Acute hypervolemic hemodilution

3.- Autologous donation

4.- Preoperative transfusion

Maternal Mortality

- Obstetrical Hemorrhage -



1.- Prepare for PPH

2.- Optimize patient's hemodynamic status

3.- Timing of Delivery

4.- Surgical planning

5.- Anesthesia /I.V. access/ invasive monitoring

6.- Modify obstetrical management

7.- Increased postpartum/postop surveillance

Maternal Mortality

- Obstetrical Hemorrhage -

3. - Timing of Delivery

- Placenta previa
- Prev classical
- Prev myomectomy
- Tumor previa

Schedule C/S

- 36-37wks after Amnio for FLM
- >37 wks if Amnio not possible

↓
Avoids uterine rupture
Avoids significant hemorrhage

Maternal Mortality

- Obstetrical Hemorrhage -

Patients
at risk



Pre-delivery
management



- 1.- Prepare for PPH*
- 2.- Optimize patient's hemodynamic status*
- 3.- Timing of Delivery*
- 4.- Surgical planning*
- 5.- Anesthesia /I.V. access/ invasive monitoring*
- 6.- Modify obstetrical management*
- 7.- Increased postpartum/postop surveillance*

Maternal Mortality

- Obstetrical Hemorrhage -

4. - Surgical planning

Realistic assessment of a significant PPH episode

- Wants to avoid TAH ? (religious/cultural)
- Inability to transfuse ? (Jehovah's witness, etc)
- Desires subsequent pregnancies ?
- Tolerates poorly large hemodynamic shifts

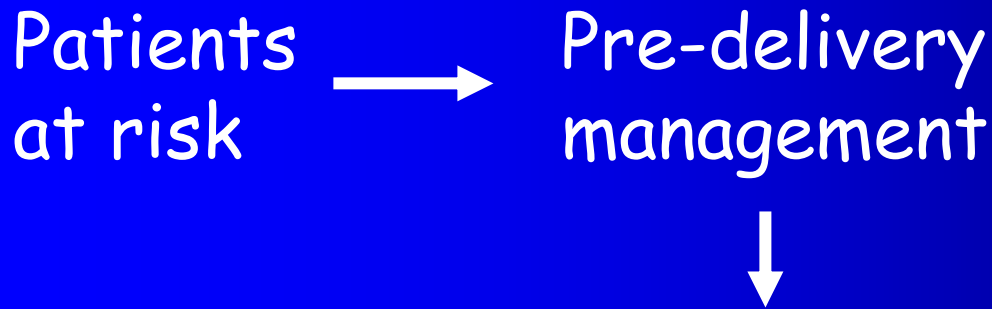
↑Bleeding → TAH

More Surgery/Embolization
More Transfusion.

↓
TAH

Maternal Mortality

- Obstetrical Hemorrhage -



1.- Prepare for PPH

2.- Optimize patient's hemodynamic status

3.- Timing of Delivery

4.- Surgical planning

5.- Anesthesia /I.V. access/ invasive monitoring

6.- Modify obstetrical management

7.- Increased postpartum/postop surveillance

Maternal Mortality

- Obstetrical Hemorrhage -

4. - Anesthesia / I.V. Access

Obtain Anesthesia consult

- Type of anesthesia
- Need for invasive monitoring (A line, S-G monitoring, etc)

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

- 1.- How/Who triggers the "H.P."
- 2.- Identify "The response team"
- 3.- Transfusion protocol
- 4.- Define the logistics involved
- 5.- Conduct drills
- 6.- Post-op care

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

1. - How/Who triggers the "H.P."

- Labor & Delivery
- Postpartum floor
- Antepartum floor
- E.D.

→ RN's, CNM's, PA's, MD's

Code "H"

Operator

Response
Team

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

2.- The "Response Team"

- *Nursing*
- *Anesthesia*
- *Ob surgery (MFM, Gyn Onc, Ob-Gyn,)*
- *Intervention Radiology*
- *Urology*
- *Hematology*

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

3. - Transfusion Protocol

- Immediate release of O neg Blood if required
- How fast can Crossmatched blood be made available
- Physical transport of Blood → O.R. and samples O.R. → Lab/Blood Bank

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

4. - Logistics

Hospital specific

- Define responsibilities

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

5. - Drills

- Conduct Drills 3-4 x/year*
- Evaluate the performance*
- Review the results with the entire team*

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

6. - Postoperative care

*Insures a smooth transition from the
O.R./L&D to the appropriate level of care
unit → In most hospitals
L&D/Postpartum units not ideal for these
patients*

Maternal Mortality

- Obstetrical Hemorrhage -

Identify
Patients at
Risk

Multidisciplinary
"Hemorrhage
protocol"

Clinical
management
of PPH

Diagnosis

- Early shock
- Severity of Shock

Treatment

- Insure hemostasis
- Adequate replacement

Maternal Mortality

- Obstetrical Hemorrhage -

Significant PPH →

Etiology

- Uterine atony
- Placenta previa/accreta
- Cervico-vag tears
- Uterine rupture
- Coagulopathy*

* Any major hemorrhage → Coagulopathy → Bleeding

Maternal Mortality

- Obstetrical Hemorrhage -

Significant PPH

- Uterine massage
- ↑ I.V. fluids
- Empty bladder
- Oxytoxic Agents

-Methergine 0.2mg
-Carboprost 250µg
-Cytotec 800-1000µg

⊕ Hemostasis

∅ Hemostasis

Surgery/Embolization

Maternal Mortality

- Obstetrical Hemorrhage -

Significant PPH

→ *Failed Medical Rx*

Ut Atony/Tears

Pl previa/accreta

- B-Lynch procedure
- Uterine a. ligation
- Stepwise devascularization
- Uterine repair
- U.A.E.



TAH

- Local mattress sutures
- Hemostatic balloons
- U.A.E.
- Conserv Rx of Pl accreta



TAH

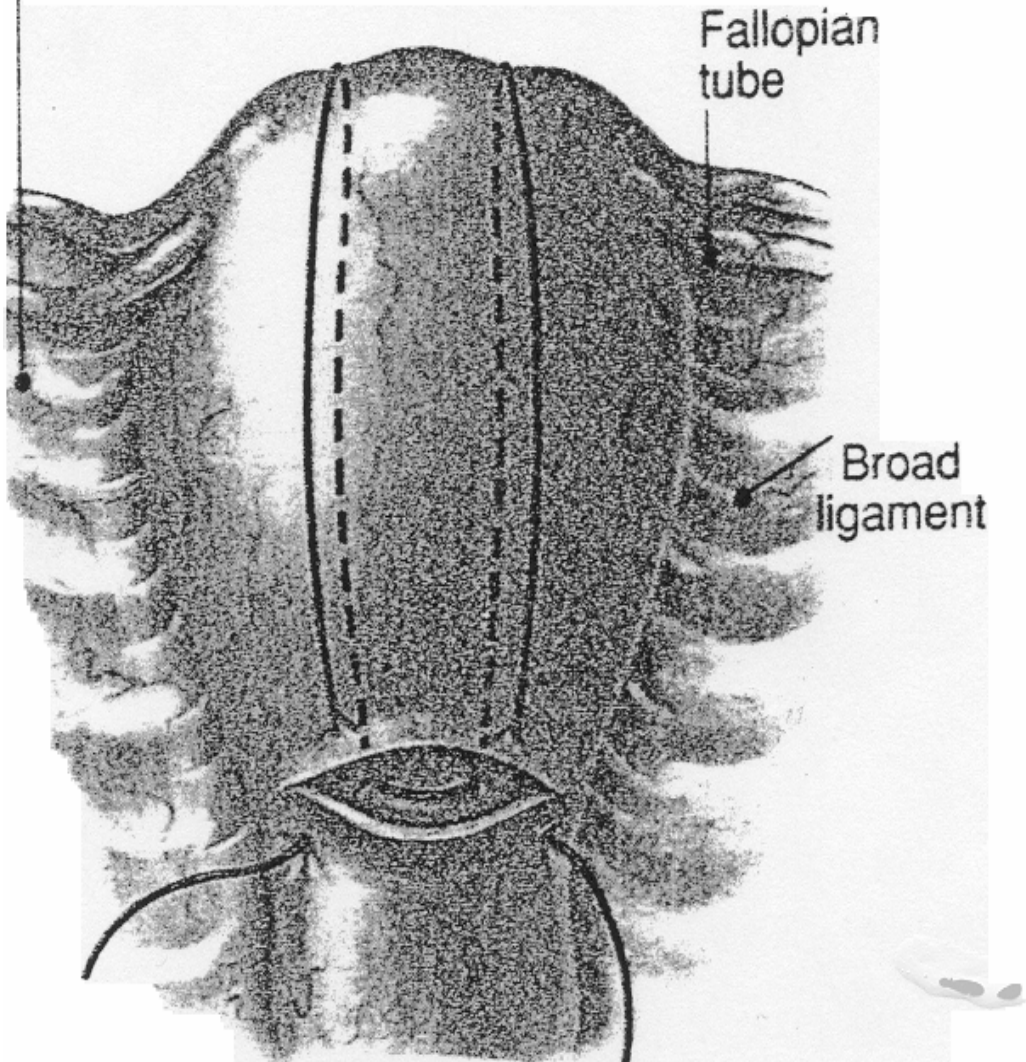
Maternal Mortality

- Obstetrical Hemorrhage -

Five cases of massive life threatening postpartum hemorrhage were managed by the use of the "B-Lynch surgical technique.

Christopher B-Lynch Br J Ob Gyn 1997

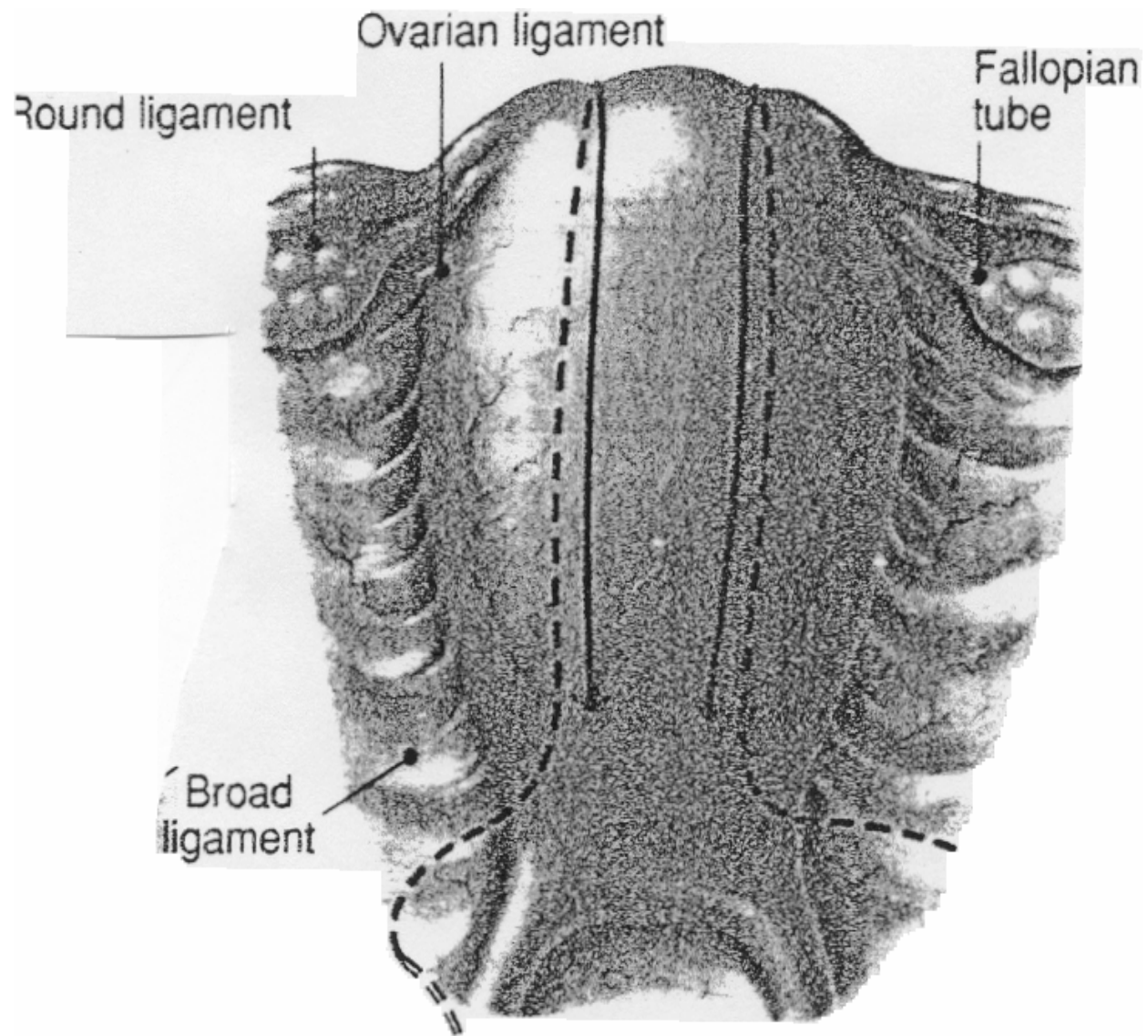
Round ligament



Fallopian tube

Broad ligament

(a) Anterior view



(b) Posterior view



(c) Anterior view

Maternal Mortality

- Obstetrical Hemorrhage -

Hypogastric artery ligation

- Decreases Blood Flow by → 48%
- Controls Severe P.P.H. in → 50% of cases

Clark et al Ob-Gyn 1985

Maternal Mortality

- Obstetrical Hemorrhage -

Uterine artery ligation

Over a 30 yr period 256 Ut artery ligation were performed for PPH.

- Successful 256 cases
- Failed 10 cases

O'Leary, J J Reprod Med 1995

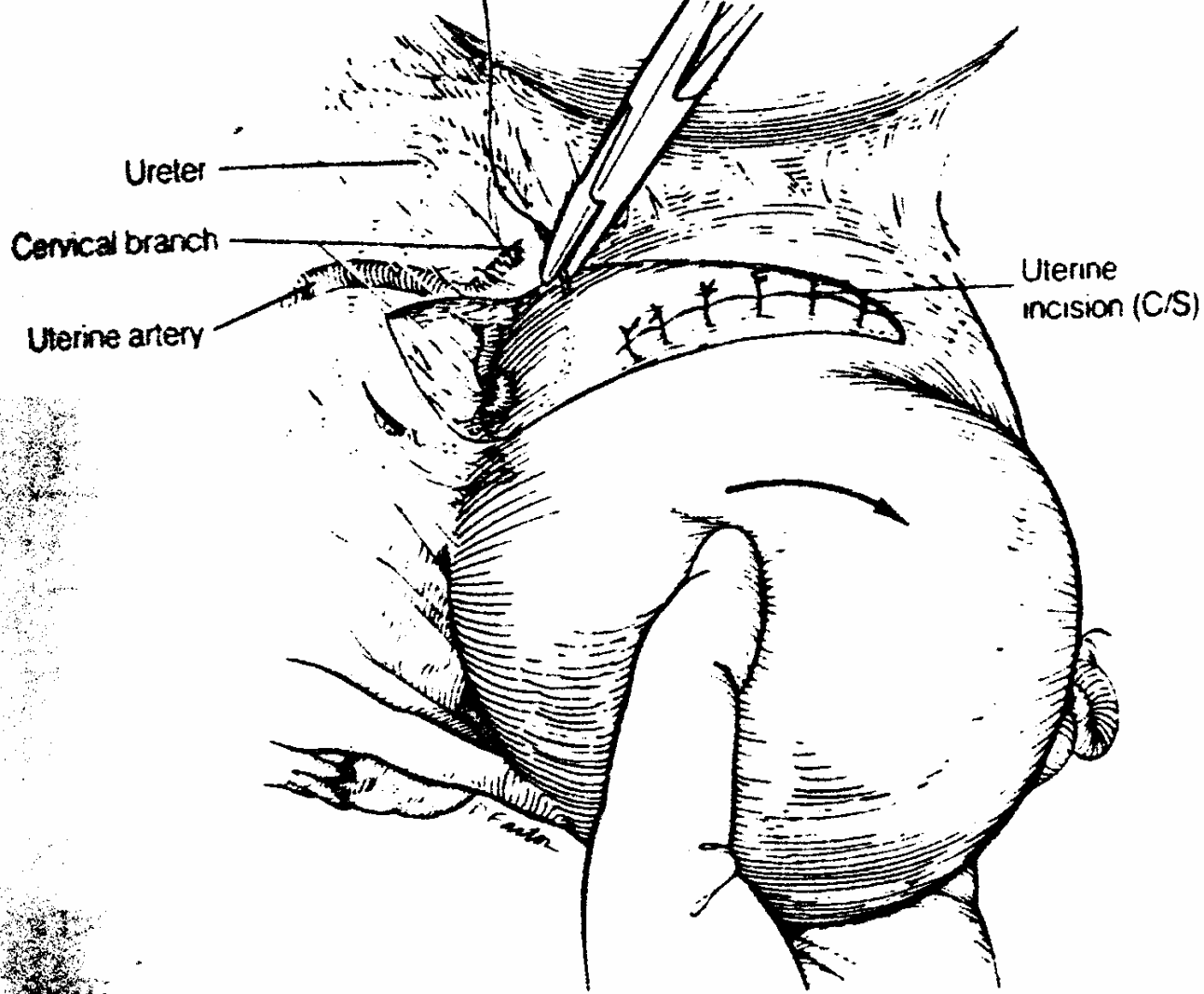


Figure 2

The uterus is tilted to the side to expose the vessels, and the ligature is placed 2–3 cm inferior to the incision. It includes 2–3 cm of uterine wall.

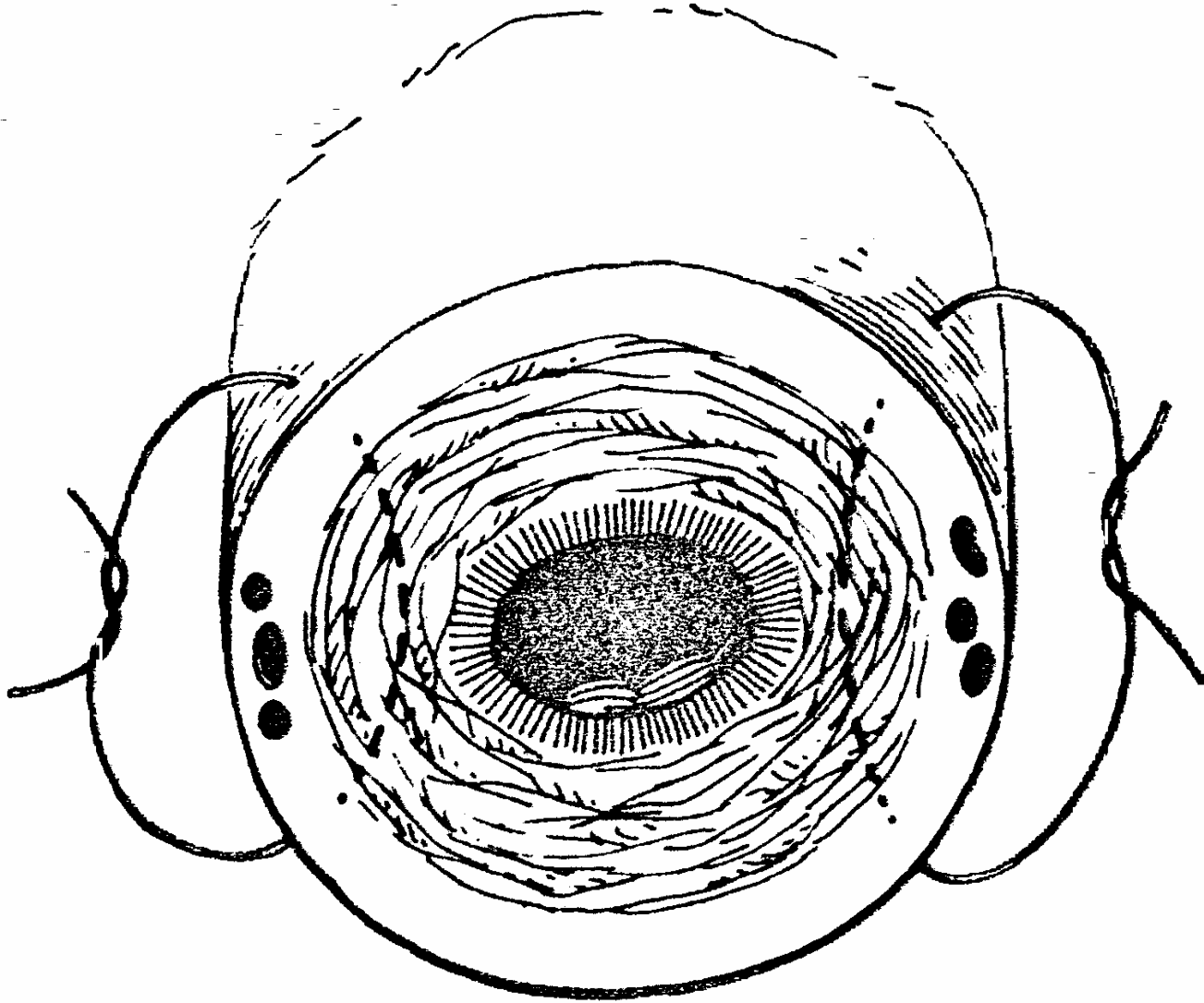


Figure 3

A coronal view of the lower uterine segment. The suture is inserted into the substance of the cervix without entering the uterine cavity and medial to the blood vessels.

Maternal Mortality

- Obstetrical Hemorrhage -

Stepwise uterine devascularization was performed for 103 patients to control intractable postpartum hemorrhage not responding to classic management

S.A. AbdRabbo Am J Ob Gyn 1994

Maternal Mortality

- Obstetrical Hemorrhage -

<u>Indication</u>	<u>Patients</u> (n=103)
Uterine atony	66(63%)
Placenta previa	7(7%)
Abruptio placenta	17(16%)
Couvellaire uterus	9(10%)
D.I.C.	4(4%)

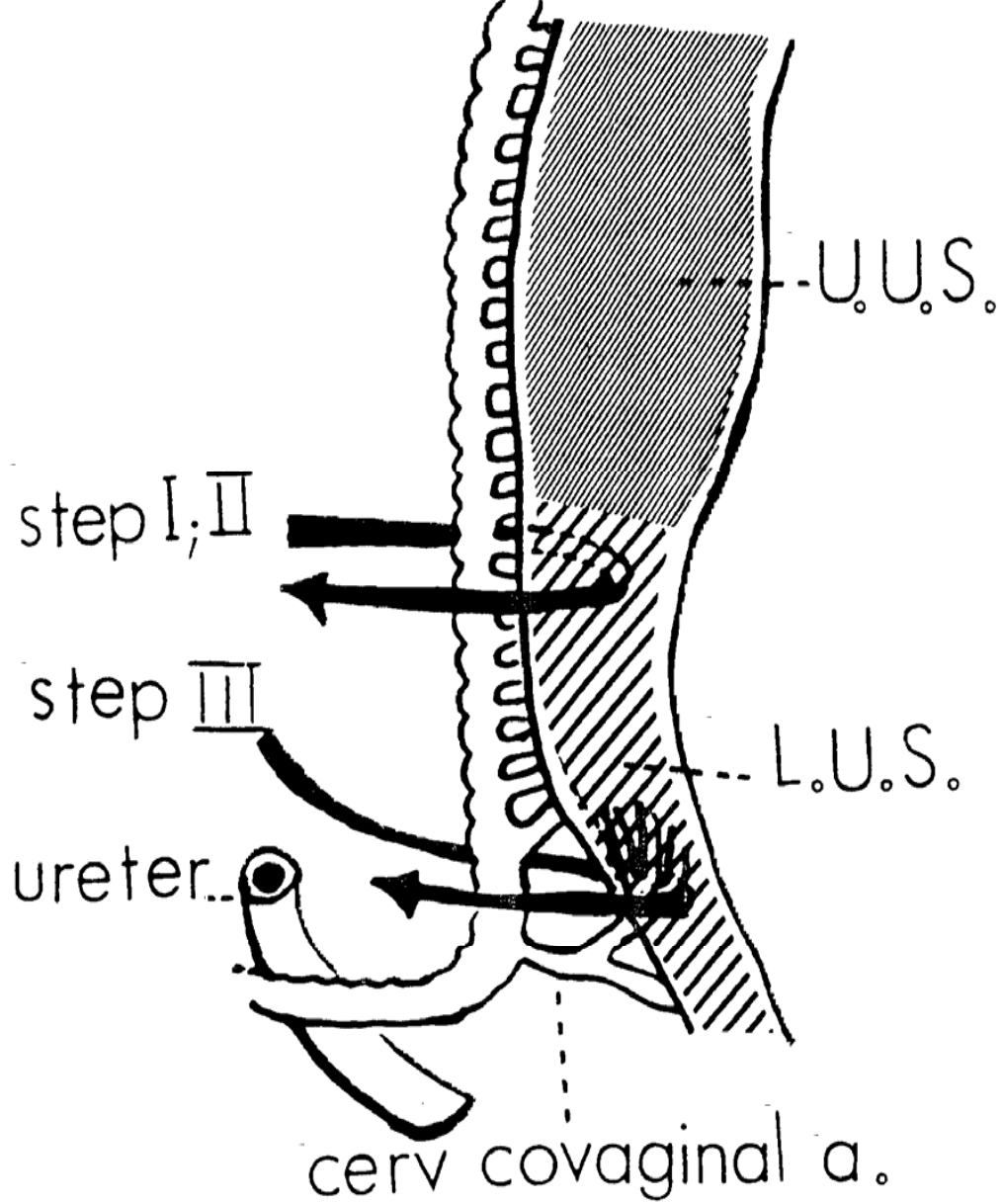


Fig. 1. Sites of uterine artery ligation in steps 1, 2 (*upper arrow*), and 3 (*lower arrow*). U.U.S., Upper uterine segment; L.U.S., Lower uterine segment.

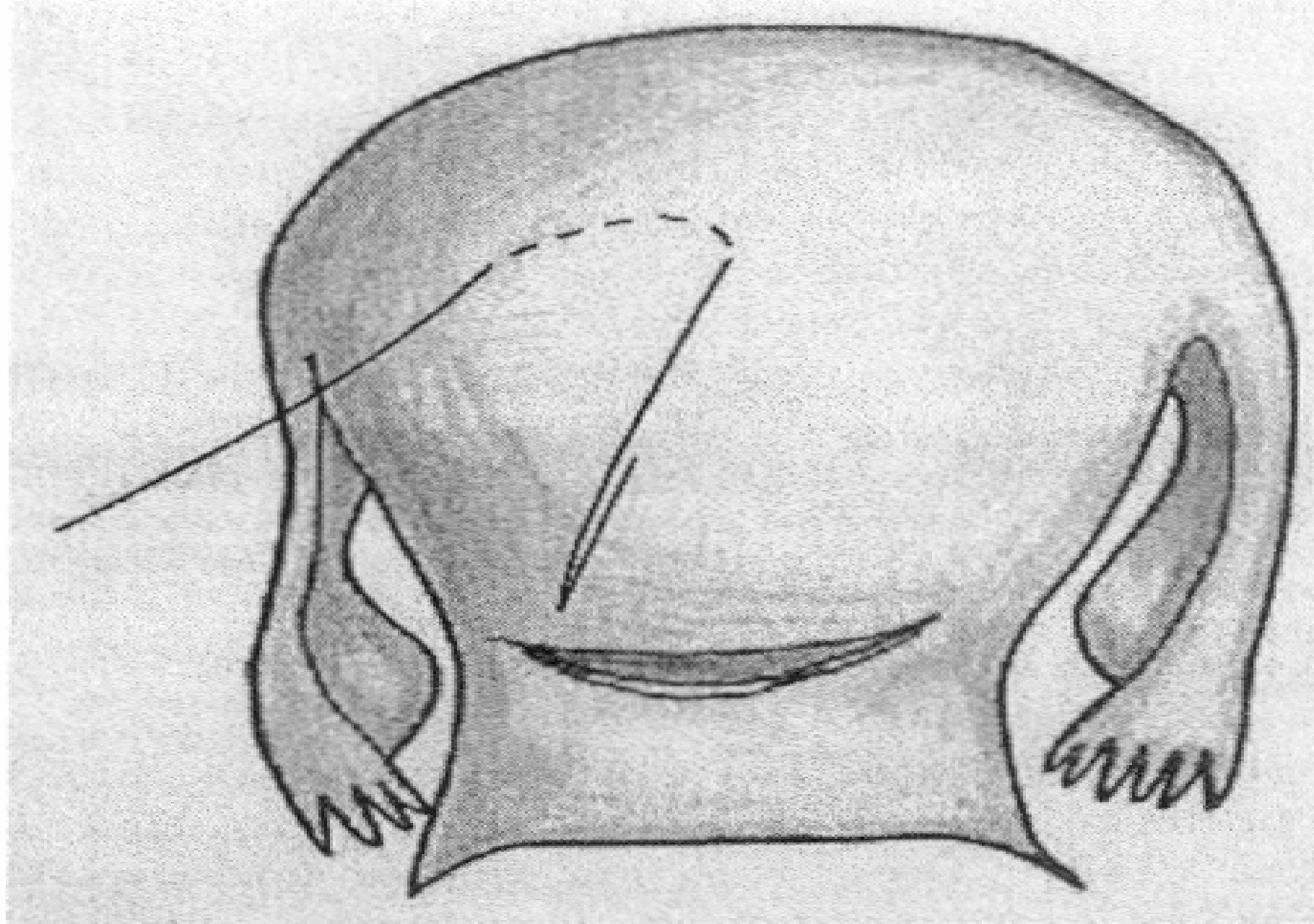


Figure 1. Hemostatic multiple square suture method.

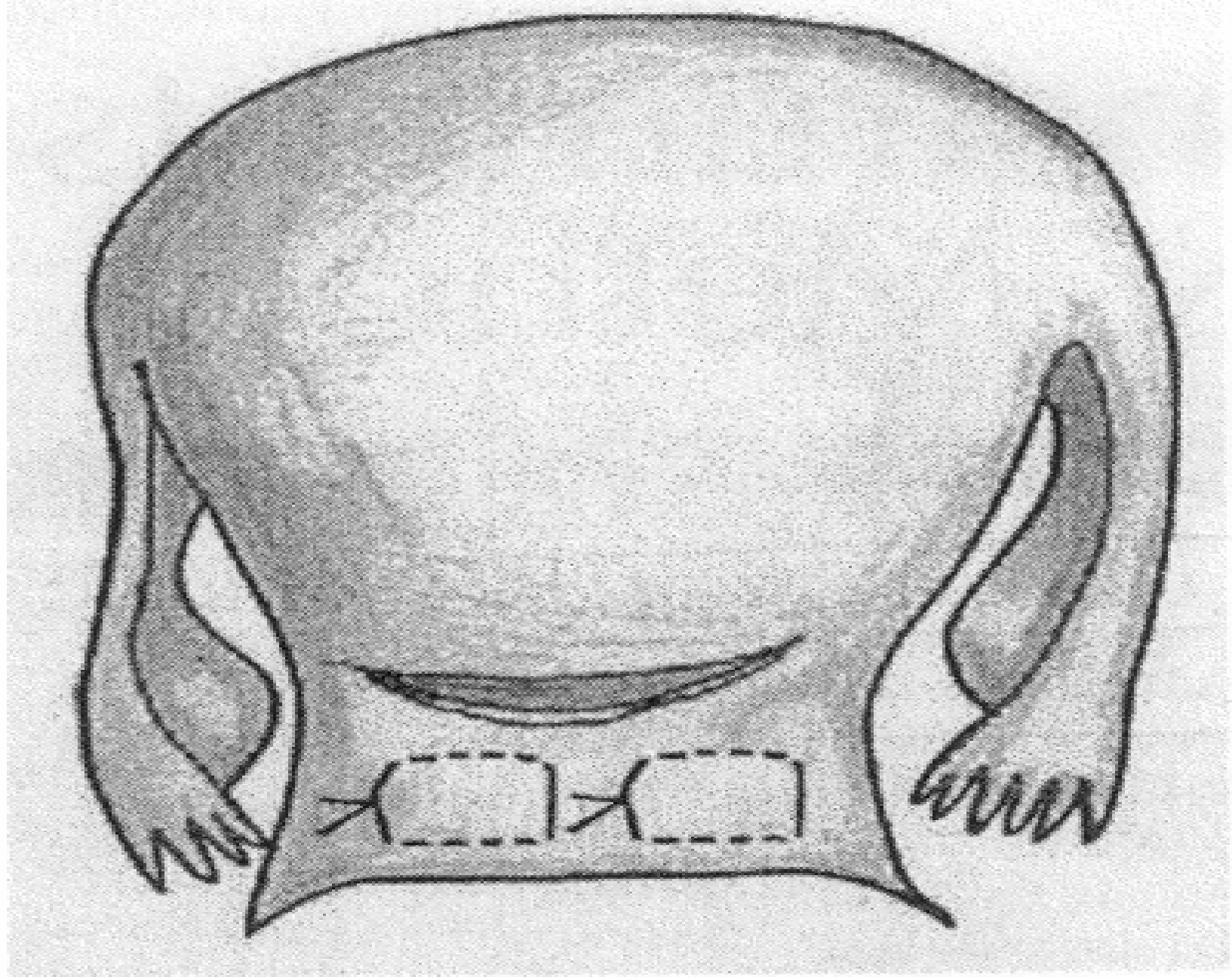


Figure 3. Bleeding because of placenta previa or accreta.

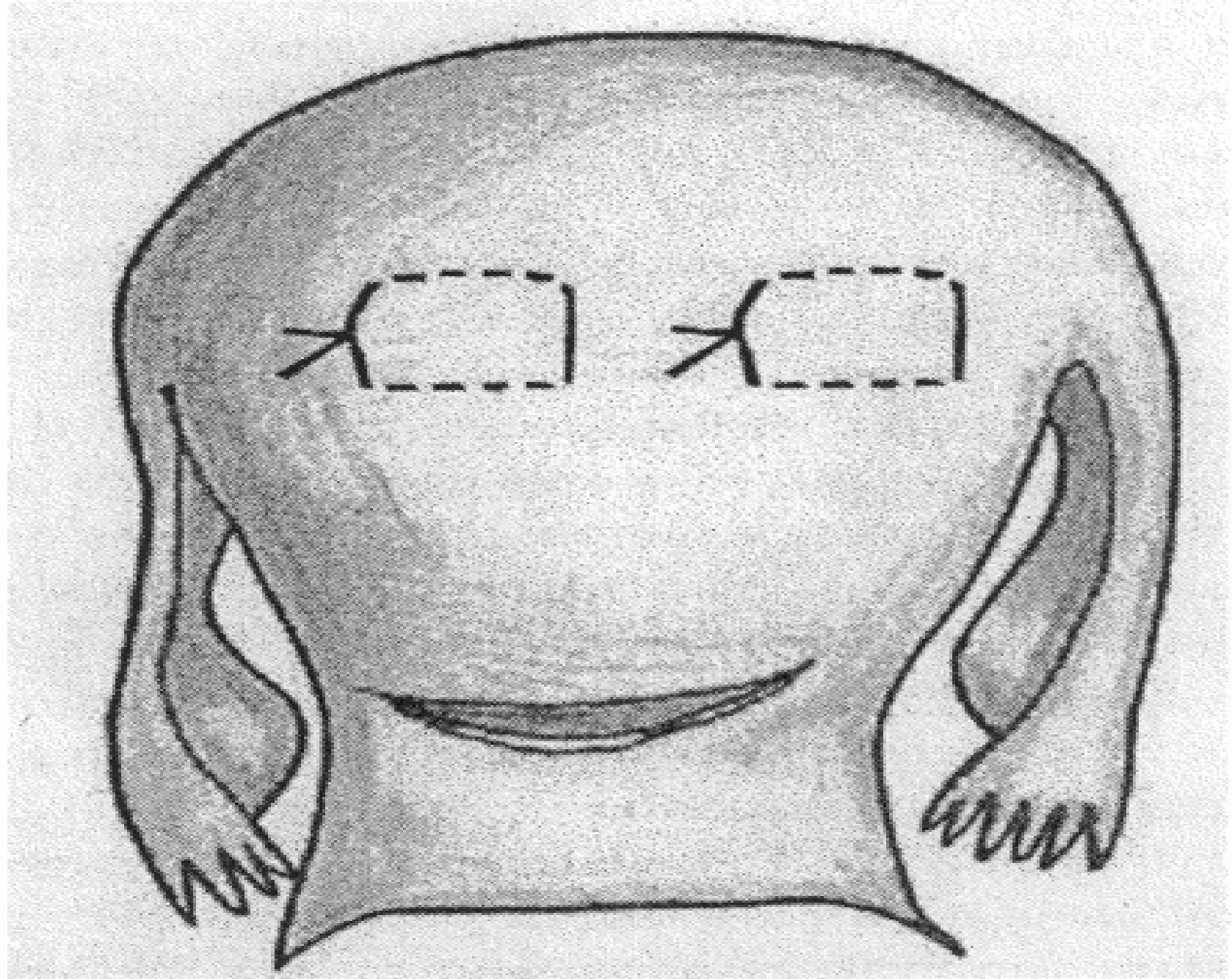


Figure 2. Bleeding because of uterine atony or placenta accreta.

Maternal Mortality

- Placenta Accreta -

Clinical Risk Factors

- Placenta previa
- Previous C/S
- Adv maternal age



Sonographic markers

Biochemical markers



Suspect Placenta accreta

Maternal Mortality

- Placenta Accreta -

Classic management

Cesarean Section



Attempt Placental removal → Hemorrhage



- *Local sutures*
- *Uterine artery ligation*
- *Embolization*
- *TAH*

Maternal Mortality

- Placenta Accreta -

Classic management

- Significant blood loss
- MOF (*ARDS, DIC, ARF*)
- Injury to other organs -*Bladder, Urether*
- Need for Hysterectomy

Maternal Mortality

- Placenta Accreta -

A survey of members of SPO identified 109 cases of placenta accreta.

- *Antepartum Dg suspected in 50%.*

- *Management*

Surgical 93%

Conservative 7%

- *Maternal Mortality 8 (7%)*

- *Maternal Morbidity*

Transfusions 90%

Massive transfusion (>10u.) 40%

Serious infections 28%

Maternal Mortality

- Placenta accreta -

Objective

A group of patients suspected of having Pl. accreta and managed conservatively was compared with a similar group of patients that delivered during the same time interval but were managed in a traditional fashion

Jurczak, A Fleischer, A et al ACOG-2005

Maternal Mortality

- Placenta Accreta -

Conservative approach

Amnio at 37wks gestation for FLM



Day of C/S catheters are placed in the abd. aorta



Intraop : - Sono maps the position of the Placenta
-Uterine incision just above placental edge
(High transverse incision)

Maternal Mortality

- Placenta Accreta -

Conservative approach

Delivery of infant: - Leave placenta intact
- Insure hemostasis of uterine incision



Selective embolization of the uterine arteries under fluoroscopic guidance (20-25 min)

Maternal Mortality

- Placenta Accreta -

Conservative approach

Successful embolization



Attempt made to remove placenta

\oplus Pl accreta

\emptyset Pl accreta

Leave placenta in situ

Remove placenta

Maternal Mortality

-Placenta Accreta -

Conservative → A total of 17 patients with the presumptive Dg of Placenta accreta were managed in this fashion.

Traditional → A total of 18 patients were managed by removing placenta first then insuring hemostasis .

HDI
5000

LONG ISLAND JEWISH MED.

01/07/09:150109

C8-4v OB/Gen > 10wks

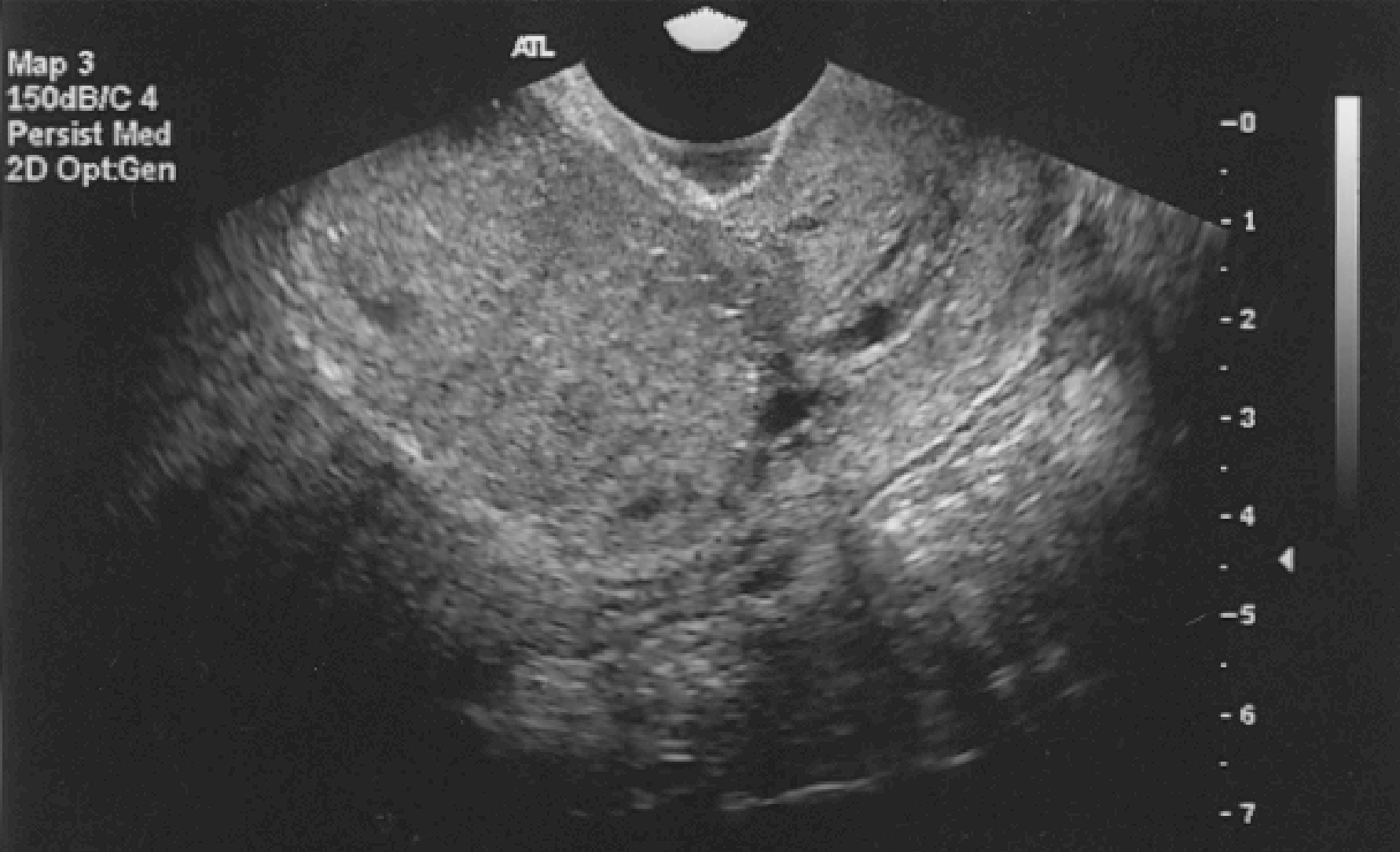
3:10:38 pm

Tib0.2 MI 0.57

Fr #234 7.2 cm

Map 3
150dB/C 4
Persist Med
2D OptGen

ATL



2 wks P-Partum

LOWER UTERINE SEGMENT



LONG ISLAND JEWISH MED

C5-2 40R OB/General

19 Jul 01

1:53:10 pm

T1b 0.3

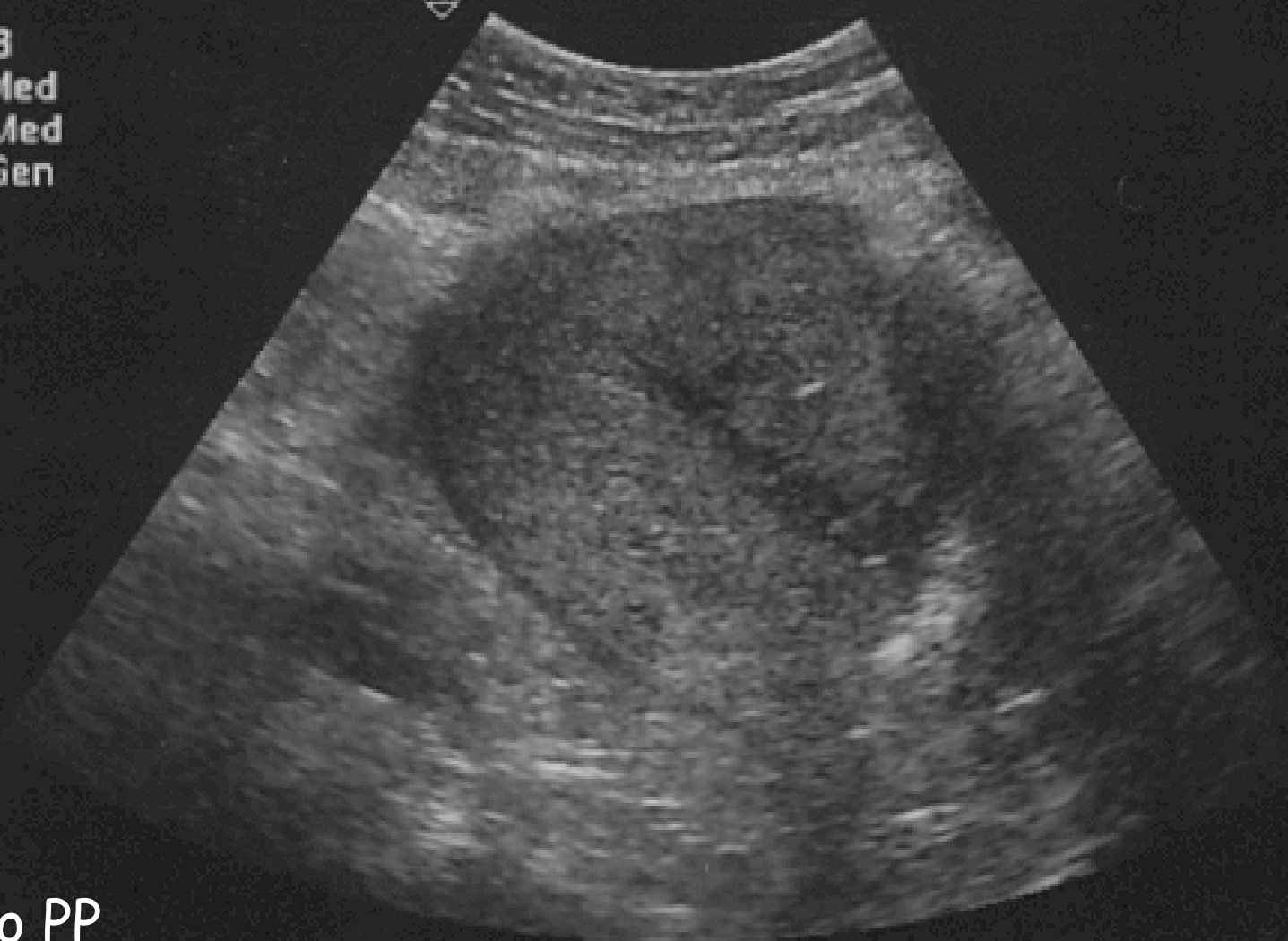
Fr #70

MI 1.3

11.5cm

Map 3
150dB/C3
Persist Med
Fr Rate Med
2D Opt:Gen

HDI



6mo PP

UTERUS FUNDUS

Maternal Mortality

- Placenta Accreta -

Group 1.
n=13

Embolized; Placenta left

→ Entire Pl → 6pat

→ Part of Pl → 7pat

Group 2.
n=2

Embolized; Placenta removed (No Pl accreta)

Group 3.
n=2

Not Embolized

→ Ut incision through Pl
→ Bleeding → TAH

Maternal Mortality

- Placenta Accreta -

<u>Group</u>	<u>Blood Tr</u>	<u>Massive Blood Tr</u>	<u>TAH</u>
Traditional (n=18)	13(72%)	8(44%)	11(61%)
Conservative (n=15)	5* (33%)	1** (6%)	2(12%)

*2 pat → Medical reasons for tranfusion

** attempt for vaginal removal of placenta 2mo PP

Maternal Mortality

-Placenta Accreta -

Objective

A retrospective comparison of a new "conservative" approach to the classic management of Placenta accreta

Kayem et al Ob-Gyn 2004

Maternal Mortality

-Placenta Accreta -

Conservative → A total of 20 patients had their Placenta left in situ after Dg of PI accreta. UAE not done routinely

Traditional → A total of 13 patients were managed by removing placenta first then insuring hemostasis .

Maternal Mortality

- Placenta Accreta -

<u>Group</u>	<u>Blood Tr</u>	<u>Massive Blood Tr</u>	<u>TAH</u>
Traditional (n=13)	12(92%)	8(38%)	11(85%)
Conservative (n=20)	16 (80%) ^{ns}	1 (5%)*	3(15%)*

*p < 0.05

Kayem et al Ob-Gyn 2004

Maternal Mortality

-Placenta Accreta -

Intraoperative management

1.-Map exact position of placenta → Make high transverse uterine incision to avoid cutting through placenta

2.- Deliver fetus → Rapid hemostasis of uterine incision (clamps, sutures)

Definitive Rx



Do not remove pl



TAH

Dg uncertain



UAE



Remove pl

Avoid TAH



UAE



Leave Pl in situ

Maternal Mortality

-Placenta Accreta -

Conservative approach

- *Wants to avoid TAH (religious/cultural)*
- *Inability to transfuse (Jehovah's witness, etc)*
- *Desires subsequent pregnancies*
- *Significant Bladder involvement*
- *Tolerates poorly large hemodynamic shifts (IHSS, Eisenmenger syndrome etc)*

Maternal Mortality

-Placenta Accreta -

Follow-up management

- 1.- *Ultrasound exams → Vascularity*
- 2.- *HCG titers (If → consider Mtx)*
3. *Daily Temps, Other S&S of infection*
- 4.- *Bleeding*
- 5.- *Coagulation profile*

Maternal Mortality

- Placenta Accreta -

Follow-up management

If Intervention necessary for

- Bleeding*
- Infection*
- DIC*



Proceed directly to TAH