

David H. Chestnut, M.D.

Birmingham, Alabama

**A Reevaluation of the Role of Crystalloid Preload in the Prevention of Hypotension Associated with Spinal Anesthesia for Elective Cesarean Section**

Rout CC, et al.  
Anesthesiology 79: 262, 1993

- Although fluid preloading reduces the incidence of postspinal hypotension, the reduction is not sufficient to justify delay in the administration of spinal anesthesia when this is the most appropriate anesthetic technique for patients who require urgent cesarean section.
- The authors now begin preloading as rapidly as possible, but they do not await administration of a fixed volume of crystalloid before administration of spinal anesthesia in patients who require urgent cesarean section.

Rout CC, et al.  
Anesthesiology 79: 262, 1993

**Effects of Crystalloid and Colloid Preload on Blood Volume in the Parturient Undergoing Spinal Anesthesia for Elective Cesarean Section**

Ueyama H, et al.  
Anesthesiology 91: 1571, 1999

- The incidence of hypotension was 75% for the RL group, 58% for the 500 mL HES group, and 17% for the 1000 mL HES group.
- Augmentation of blood volume with preloading -- regardless of the fluid used -- must be large enough to result in a significant increase in cardiac output in order to prevent hypotension effectively.

Ueyama H, et al.  
Anesthesiology 91: 1571, 1999

- Increasing central blood volume by using colloid and leg wrapping decreases but does not abolish the incidence of hypotension before spinal anesthesia for elective cesarean delivery.

Morgan PJ, et al.  
Anesth Analg 92:997, 2001

**DISADVANTAGES OF COLLOID**

- Risk of postpartum pulmonary edema?
- Expense
- Small risk of allergic reaction

### Prevention of Hypotension by a Single 5-mg Dose of Ephedrine During Small-Dose Spinal Anesthesia in Prehydrated Cesarean Delivery Patients

Vercauteren MP, et al.  
Anesth Analg 90: 324, 2000

### PROPHYLAXIS OF HYPOTENSION

- Since 1968 various solutions (colloid versus crystalloid), amounts (10-30 mL/kg), and vasopressors (for prophylaxis and treatment) have been investigated in a vain effort to eliminate hypotension during the administration of spinal anesthesia for cesarean section.

Douglas J, Choi D  
Can J Anesth 47:833, 2000

### BEST PRACTICE

- Modest hydration with 1000 to 1500 mL of crystalloid immediately before spinal blockade, when time allows
- Adequate left uterine displacement
- Early, aggressive pharmacologic treatment of hypotension
- Immediate delivery if hypotension persists

### PROPHYLACTIC EPHEDRINE?

- I give prophylactic ephedrine – 5 or 10 mg – intravenously immediately after spinal injection of bupivacaine.
- Overall, published studies do not support the efficacy of this practice.

### Spinal *versus* Epidural Anesthesia for Cesarean Section in Severely Preeclamptic Patients

Hood DD, Curry R  
Anesthesiology 90: 1276, 1999

- Spinal anesthesia resulted in a decrease in blood pressure that was similar to that observed after administration of epidural anesthesia in women with severe preeclampsia.
- The study was retrospective. Thus the authors could not exclude the potential for selection bias, with the possibility that the two groups were at dissimilar risk.

Hood DD, Curry R  
Anesthesiology 90: 1276, 1999

### PREECLAMPSIA: ADVANTAGES OF SPINAL ANESTHESIA

- Rapid onset
- Reliability
- Avoidance of general anesthesia
- Less risk of epidural venous trauma than epidural anesthesia

### PREECLAMPSIA: DISADVANTAGES OF SPINAL ANESTHESIA

- Abrupt onset of sympathetic blockade
- Hypotension is not tolerated well in patients with preexisting uteroplacental insufficiency.
- Published studies are small and excluded women with nonreassuring FHR tracings.

### PREECLAMPSIA: CHOICE OF ANESTHESIA

- When time allows, incremental administration of epidural anesthesia seems preferable to spinal anesthesia for women with severe preeclampsia.
- Spinal anesthesia may be a better choice in cases of urgent – but not stat – cesarean section.
- Encourage early administration of epidural anesthesia in laboring women with preeclampsia.

### BLOOD LOSS

- Uterine rupture
- Uterine atony
- Placenta accreta

### EMERGENCY CESAREAN DELIVERY

- Consensus has been that hospitals should have the capability of beginning a cesarean delivery within 30 minutes of the decision to operate. Not all indications for a cesarean delivery will require a 30-minute response time. Examples of those mandating the need for expeditious delivery include hemorrhage from placenta previa, abruptio placentae, prolapse of the umbilical cord, and uterine rupture.

Guidelines for Perinatal Care, fourth edition, 1997

### LABOR IN WOMEN WITH PREVIOUS CESAREAN DELIVERY

- Spontaneous labor is associated with a tripling of the risk of uterine rupture, and induction of labor with prostaglandins is associated with an increase in that risk by a factor of 15.
- Should a rupture occur, the risk of perinatal mortality increases by a factor of 10.

Lydon-Rochelle M, et al.  
N Engl J Med 345:3, 2001

### LABOR IN WOMEN WITH PREVIOUS CESAREAN DELIVERY

- This study... was an observational study of the results of clinical practice and not a randomized trial.
- These risk estimates reflect broad experience in a wide range of clinical-practice settings. There is no reason to believe that improvements in clinical care can substantially reduce the risks of uterine rupture and perinatal mortality.

Green MF  
N Engl J Med 345:54, 2001

- A Portland, Maine, jury awarded \$9 million to a girl who suffered brain damage as a result of uterine rupture during attempted VBAC. This was the largest medical malpractice award ever in Maine; the amount of the award exceeded the defendant's malpractice coverage. The defendant was an obstetrician, and the case occurred in 1993, prior to implementation of the ACOG "immediately available" policy for VBAC. Nevertheless, the case directly involved the requirement that the physician be immediately available, since this was required by hospital policy, and the defendant was unavailable for 40 minutes while seeing patients.

Quill TJ  
ASA District Director Annual Report, September, 2001

### ACOG GUIDELINES FOR VBAC

- Because uterine rupture may be catastrophic, VBAC should be attempted only in institutions equipped to respond to emergencies, with physicians immediately available to provide emergency care.
- The operational definition of *immediately available* remains the purview of each local institution.

American College of Obstetricians and Gynecologists  
July, 1999

- Why this "revisionist" view of the risks of VBAC, in light of earlier publications that suggested low maternal and fetal risk?
  - Bias toward publication of favorable results
  - The inability to duplicate favorable results from large academic centers in smaller community hospitals
  - Familiarity may breed complacency

### UTERINE ATONY: MAJOR RISK FACTORS

- Uterine overdistention
- Chorioamnionitis

### UTERINE ATONY: TREATMENT

- Oxytocin
- Methylergonavine (Methergine)
- 15-Methylprostaglandin F<sub>2α</sub> (Hemabate)

## METHYLERGONOVINE (Methergine)

- The package insert states that methylergonavine “should not be administered intravenously routinely because of the possibility of inducing sudden hypertensive cerebrovascular accidents. If intravenous administration is considered essential as a life-saving measure, Methergine should be given slowly over a period of no less than 60 seconds with careful monitoring of blood pressure.”

## 15-METHYL PROSTAGLANDIN F<sub>2α</sub> (carboprost, Hemabate)

- A very effective uterotonic agent
- May be administered intramuscularly or directly into the myometrium
- May result in bronchospasm and/or altered ventilation/perfusion ratios

## PLACENTA PREVIA – ACCRETA

- Placenta previa alone is associated with increased blood loss at cesarean section.
- When placenta accreta accompanies placenta previa, massive hemorrhage may occur after delivery.

## PLACENTA ACCRETA: RISK FACTORS

- Previous cesarean section
- Placenta previa in current pregnancy

## PLACENTA ACCRETA

- Prepare for major blood loss and likely need for hysterectomy.
  - Large-gauge intravenous access
  - Immediate availability of blood and blood products
- Choice of anesthetic technique?

## REGIONAL ANESTHESIA IN THE PATIENT AT RISK FOR PLACENTA ACCRETA:

- Will the patient remain comfortable during prolonged surgery?
- Will operating conditions remain optimal for potentially difficult surgery (i.e., cesarean hysterectomy)?
- Will anesthesia-induced sympathectomy exacerbate hypotension during intraoperative hemorrhage?
- Can the patient protect her airway during potentially difficult abdominal surgery, hemorrhage, and hypotension?

### INTRAOPERATIVE CELL SALVAGE IN OBSTETRIC PATIENTS

- A combination of cell-salvage washing and leukocyte-depletion filtration significantly reduces particulate contaminants to a concentration equivalent to maternal venous blood.
- The resulting blood product is comparable with maternal blood with the exception of the fetal hemoglobin concentration.

Waters JH, et al.  
Anesthesiology 92:1531, 2000

### INTRAOPERATIVE CELL SALVAGE IN OBSTETRIC PATIENTS

- The incidence of amniotic fluid embolism is very low (i.e., 1/8000 to 1/80,000).
- There are 4 published reports of 174 patients who underwent transfusion following intraoperative cell salvage during cesarean section.
- A prospective randomized study with 80% power to show that erythrocyte salvage is not likely to cause a five-fold increase in the incidence of AFE would require a study population of between 27,000 and 275,000 patients.

Weiskopf RB  
Anesthesiology 92:1519, 2000

### INTRAOPERATIVE CELL SALVAGE IN OBSTETRIC PATIENTS

- The etiology of amniotic fluid embolism is not clear.
- The term *amniotic fluid embolism* may be a misnomer. Some have suggested that this syndrome should be designated as *anaphylactoid syndrome* of pregnancy.
- Thus studies cannot evaluate whether the processing of salvaged blood from the surgical field reduces the triggering component(s) of amniotic fluid to concentrations below the pathologic threshold.

Weiskopf RB  
Anesthesiology 92:1519, 2000

### POSTDURAL PUNCTURE HEADACHE: PATHOPHYSIOLOGY

- Decreased intracranial pressure
- Compensatory cerebral vasodilation

### POSTDURAL PUNCTURE HEADACHE: CLINICAL COURSE

- Not always self-limited
- Not always benign
  - Abducens nerve palsy
  - Auditory disturbances
  - Subdural hematoma

### CRANIAL SUBDURAL HEMATOMA

- At least eight published cases after unintentional dural puncture in obstetric patients
- Diagnosis made between 8 and 42 days postpartum
- One death, and another case of permanent morbidity (i.e., visual deficits)

Loo CC, et al.  
Internat J Obstet Anesth 9:99, 2000

## AUTOLOGOUS BLOOD PATCH

- Rationale: Prevent further leakage of CSF.
- Immediate relief often results from restoration of intracranial pressure.

## TIMING OF BLOOD PATCH

- The evidence supporting a delay in performing blood patch – until more than 24 hours after dural puncture – is tenuous.

## TECHNIQUE OF BLOOD PATCH

- The lateral position is more comfortable for the patient.
- When in doubt, choose the more caudad interspace.
- Inject 15 to 20 mL of blood, obtained by an assistant using sterile technique.
- If correct needle placement in doubt, consider giving a test dose.

## PRECAUTIONS DURING BLOOD PATCH

- Avoid in patients with coagulopathy.
- Avoid in febrile patients at risk for bacteremia.
- There is no evidence that epidural blood patch should be avoided in HIV-infected patients.

## PRECAUTIONS DURING BLOOD PATCH

- Discontinue injection with onset of back pain.
- Two hours of recumbent bedrest seems to improve the likelihood of success.
- Patients should avoid a Valsalva maneuver and heavy lifting.
- Prescribe a stool softener and/or cough suppressant as indicated.

## PROPHYLACTIC BLOOD PATCH

- Unnecessary in as many as 50% of patients with unintentional dural puncture
- Risk of injecting blood through a catheter that is not sterile
- Uncertain location of catheter tip relative to dural puncture site
- Should be avoided in patients with residual epidural anesthesia