Anesthetic Management of the Parturient with Abnormal Placation

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Case example: 31-yr-old woman, 39 wk gestation, presents for elective cesarean delivery (CD) and bilateral tubal ligation; history significant for 3 previous CDs, hypothyroidism, and gestational diabetes; pregnancy complicated by partial placental previa (risk for placenta accreta 61%)

Abnormal placation: includes 3 variations of placenta accreta (accreta, increta, and percreta); placenta accreta — placenta abnormally adherent to uterine wall and does not detach normally; placenta increta — placenta grows into myometrium; placenta percreta — placenta grows through uterus to uterine serosa (visible outside uterus) and often attaches to other organs (eg, bladder, omentum, bowel); incidence 1 in 500 pregnancies and increasing exponentially; accounts for 50% of CD

Risk factors: major — previous CD or uterine surgery (eg, myomectomy, vigorous curettage) and current placenta previa; minor — include advanced maternal age (AMA) and fertility treatments

Placenta previa: occurs 1 in 250 births; placenta located in lower uterine segment rather than fundus; classified marginal (≥1 cm above cervical os), partial, or complete (partially or completely covering cervical os); dilation of cervix causes placenta to separate from uterus, with resulting vaginal bleeding

Maternal morbidity and mortality: in developed countries, death rate associated with abnormal placationation 7%; hemorrhage — uterus (at term) receives blood flow of 600 to 700 mL/min; average blood loss during cesarean hysterectomy (CD immediately followed by hysterectomy) 3 to 5 L, and 90% of patients receive transfusions (>10 U packed red blood cells [PRBC] in 40%); blood loss limits visualization of surgical field and increases chance of injury to ureters, bowel, or bladder; other morbidities include acute respiratory distress syndrome (ARDS), transfusion reactions, and renal failure; CD rate increasing; Yale New Haven Hospital found CD rate increased 73% from 1996 to 2009 (consistent nationwide); primary CD accounts for 50% of risk in occurrence, with overall CD rate >35% of births; reasons for primary CD — maternal request; multiple gestation; subjective indications (eg, arrest of cervical dilation, fetal distress, macrosomia); vaginal birth after cesarean (VBAC) — concerns about safety caused large decline in rate (in-house anesthesia provider recommended as of 2000)

Placenta accreta: risk for accreta, even with previous CD, very low without placenta previa; risk rises exponentially with number of previous CDs and presence of placenta previa (eg, risk for accreta 61% with 3 previous CDs); antepartum diagnosis improves outcome (decreases transfusion requirements and risk for disseminated intravascular coagulation); diagnose with ultrasonography (US) or magnetic resonance imaging (MRI); US — performed for initial screening or evaluation of placenta previa; findings include vascular lacunae with turbulent flow (visualized with color Doppler) and loss of hypoechoic boundary between urinary bladder and placenta; MRI — identifies structures of placenta and depth of invasion; hematuria often primary presenting symptom

Surgical options: cesarean hysterectomy remains gold standard; conservative options — resection of affected portion of uterus and placenta, with reconstruction of uterus or leaving placenta in situ (more common), followed with arterial balloon occlusion and uterine artery embolization; patient observed for placental reabsorption (with or without methotrexate) or scheduled for delayed hysterectomy (risks equal to those with standard hysterectomy); avoidance of nitrous oxide necessary when balloons in place to prevent balloon rupture

Preparing for delivery: planned CD at 34 wk gestation (with early diagnosis), in tertiary care hospital with multidisciplinary team, reduces maternal morbidity by 50% and decreases need for massive transfusion; team includes maternal-fetal medicine specialist, gynecologic oncologist (more experienced in hysterectomy), anesthesiologist, blood bank, interventional radiologist, urologist (for ureteral injury or stent placement), perfusionist (for cell salvage), and neonatal and adult intensive care units

Patient preparation: adequate intravenous (IV) access and immediate blood availability essential; place 2 to 3 large-bore IV catheters above level of diaphragm; activate obstetric massive transfusion protocol (blood and fresh frozen plasma [FFP] in room, checked and ready for use); alert transfusion medicine (if no standing protocol) of need; cell salvage, rapid infuser, and airway equipment should be readily available

Anesthesia choice: general anesthesia (GA) and regional anesthesia (RA) viable options; rate of conversion from RA to GA 30% (for patient discomfort, unsatisfactory surgical condi-
tions, or patient instability); RA — candidates have reassuring airway (easy intubation if conversion necessary) and realistic patient expectations; combined spinal-epidural best choice of RA relative to length of procedure; position patient for GA and airway management; GA — candidates include those with

Educational Objectives

The goals of this program are to improve anesthetic management of obstetric patients with abnormal placationation and to decrease the risk of injury associated with peripheral nerve blockade. After hearing and assimilating this program, the clinician will be better able to:

1. Recognize risk factors for abnormal placationation.
2. List the advantages and disadvantages of cell salvage in obstetric surgery.
3. Establish an anesthesia protocol for placenta accreta and unexpected cesarean hysterectomy.
4. Explain potential mechanisms of nerve injury.
5. Provide appropriate evaluation and treatment of patients with nerve injuries.

Faculty Disclosure

In adherence to ACCME Standards of Commercial Support, Audio-Digest requires all faculty and members of the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that this educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, the following has been disclosed: Dr. Hardman is a primary investigator for Pacira Pharmaceuticals. Dr. Smith and the planning committee reported nothing to disclose.
maternal instability, fetal distress, nonreassuring airway, or presence of percreta with extensive invasion of surrounding structures; performed with rapid-sequence induction; prophylaxis for aspiration (eg, sodium citrate, famotidine, H2 blocker, metoclopramide) recommended; patient should be optimally positioned, with emergency airway equipment ready (ie, be prepared for “cannot intubate, cannot ventilate” situation)

Intraoperative management: speaker recommends placement of arterial line (central venous catheter only if peripheral access poor); vasoactive drugs should be readily available, and normothermia maintained; laboratory values should be checked frequently (every 30 min) for goal-directed transfusion therapy; obstetric hemorrhage protocol should be followed (if available) for patients with transfusion of ≥3 U PRBC

Cell salvage: helpful but controversial in obstetric patients; advantages — deemed safe by American Congress of Obstetrics and Gynecology; minimizes risks associated with allogeneic blood, and costs less per unit; accepted by most Jehovah’s Witnesses; disadvantages — requires trained personnel (not available in all hospitals); anaphylactoid syndrome of pregnancy — formerly called amniotic fluid embolism; theoretic risk from anamniotic fluid in intraluminal blood; concentration of fetal cells in intraluminal blood lower than that found in maternal serum after vaginal delivery; fetal debris removed with filters during process; alloimmunization — possible anytime during pregnancy and delivery; protocol — delay salvage until after delivery; perform one suction before delivery and one after; use leukocyte depletion filter; salvage blood contains only RBCs (supplement with FFP, platelets, and cryoprecipitate)

Postoperative care: ensure patient fully awake and ready for extubation; most adverse airway events occur in postanesthesia care unit or during emergence; verify cuff leak, and that patient able to follow commands, has adequate tidal volume, and able to protect airway; consider postoperative ventilation if intubation difficult, massive or continuing fluid resuscitation required, or persistent hemodynamic instability present; manage pain with patient-controlled analgesia (PCA) or epidural; beware of transfusion-related coagulopathy; delay epidural catheter removal ≥24 hr postoperatively

Surprise accreta: request blood and obtain additional IV access at first sign of difficulty in extracting placenta; mobilize resources — request additional anesthesia support, call for cell salvage and rapid infuser, notify blood bank, and convert to GA

For patients at high risk for accreta: obtain adequate IV access; type and crossmatch blood; consider having blood in operating room

Nerve Injury After Peripheral Nerve Blockade

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Introduction: case example — young female patient with torn labrum and rotator cuff presents for outpatient repair; majority of anesthesiologists would choose combined RA and GA; other common practices — most providers use combined nerve stimulator and US techniques; despite expecting blame for complications, most remain willing to perform blocks; major take-home point — serious permanent injury after peripheral nerve block rare event with multifactorial causes (unlikely to be related to anesthesia)

Anatomy of peripheral nerves: protective structures include perineurium (loose tissue) and endoneurium (surrounding axons), with extrinsic and intrinsic vascular supply for support of high metabolic activity; fascicles densely packed structures; irregular proximal to distal arrangement accommodates stretch and compression over joints; nerves sensitive to stretch (injury occurs with >5% stretch); architectural changes with connective tissue increases with progression from proximal to distal nerve injury: injection sites — extraneural injections safe; intraneural (touching epineurium or penetrating subepineurial space) often causes swelling of nerve; intraneural — should be avoided; difficult to get needle into fascicle Morphology: neuropraxic — most common (>75% of injuries); changes to myelin structure cause slowing of conduction; often self-limiting; axonotmetic — more severe; results in degeneration of axon; less common; causes mixed deficit (sensory and motor); mixed resolution (some not self-limited); neurotmetic — worst possible lesion; disruption of connective tissue structure; nerve cannot regenerate (no structure to follow for regrowth); requires surgical repair with scar lysis (and possibly) nerve grafting

Mechanisms: mechanical trauma — sharp or blunt surgical dissection, or needle trauma from block placement; stretch and compression — major cause of injury; related to positioning, tourniquets, mass effect (from hematomas and edema), and injections of local anesthetic into nerve bundle; thermal — cauter; ischemic — caused by direct vascular injury, mass effect (compression), tourniquet, or injection of epinephrine; toxic — due to local anesthetic exposure; double crush injury — 2 subclinical injuries along nerve (with different or same mechanism of injury) may result in clinical neuropathy

“Bad guy” classification: patient factors — some at high risk for injury and require thorough evaluation of risks and benefits; anesthesia factors — related to techniques and provider; surgeon factors — include surgical proficiency and specific procedure performed

Evidence: from large observational studies; French study with voluntary reporting showed 0.02% incidence of permanent injury after upper extremity blocks; more recent data show higher incidence of temporary injury, with similar findings for permanent injury; prospective study designed to determine causation found 3 of 30 neurologic complications attributed to peripheral nerve block (incidence 0.04%); data show peripheral nerve block not independent risk factor for perioperative nerve injury

Summary: serious permanent nerve injury rare in setting of peripheral nerve block, but temporary minor injuries common (causes other than block likely); no differences between catheter and single injections, but some risk related to patient and surgery-specific causes

Anesthesia-related causes: benefits modest and limited (consider risk-to-benefit ratio before performing block); need — sharp-bevel and large needles increase risk; longitudinal approach decreases risk; sterility — high colonization rate of continuous catheters (but incidence of infection low); level of sedation — controlled by provider and addressed in practice advisory; light sedation allows patient feedback about paresthesias; nerve localization — all techniques comparable; paresthesia techniques — have limited sensitivity and specificity; no signal indicates proximity to nerve; nerve must be mechanically deformed to elicit paresthesia (also occurs with penetration); US — confusion possible about which structures or portion of needle visualized; anatomic resolution limited

Dealing with complications: use algorithms to differentiate types of injuries; follow-up with patients to diagnose complications; use US or MRI to establish whether severe injury has treatable cause; observe minor injuries; nontreatable causes sort into above-noted injury categories; initial treatment same for all (medical management, treatment of neuropathic pain, and follow-up studies); "inching" — nerve conduction study performed from distal to proximal until dramatic reduction of velocity and amplitude (or complete loss of signal) found; needle electromyography (EMG) provides valuable information (dennervated injuries show increased spontaneous activity); studies expensive and uncomfortable; timing of studies — obtain relatively early for severe injuries to determine age of injury (may predate surgery) and prognosis; older, recovering injury may indicate double crush injury; electrical activity indicates
recovery potential; repeat monthly, then every 2 to 3 mo if no improvement noted; determine whether surgical intervention necessary (must occur ≤ 2 yr after injury to avoid irreversible degeneration); MRI — shows highlighted signal and location of injury; studies confirm abnormality but not cause

Strategies to reduce medicolegal risk: obtain true informed consent; patients often not informed of serious risks (e.g., seizure, cardiac arrest, death); standardize practice and documentation; perform preprocedure focused examination and history for detection of remote injury, or preexisting paresthesias or dysesthesias; provide written discharge instructions with 24-hr contact phone numbers; continue daily phone contact and documentation until block resolves; follow on regular basis, and refer to pain clinic or neurologist for unresolved block

Conclusion: peripheral nerve structure well engineered and protective; avoid intrafascicular injections; 3 different classifications of injuries not exclusive to anesthetists’ needles; causative factor may be patient-, surgeon-, or anesthesia-related; risk low and unlikely related to anesthetist’s actions; level of sedation most important controllable factor; early neurologic consultation advised; minimize risk for liability

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ABNORMAL PLACENTATION/NERVE INJURY

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1. In the presence of a placenta previa, a patient with _______ previous cesarean deliveries has a 61% chance of placenta accreta.
   (A) 1 (B) 2 (C) 3 ** (D) ≥4

2. Which of the following is a frequent presenting symptom of placenta accreta?
   (A) Hematuria (B) Abdominal pain (C) Decreased fetal movement (D) Preterm contractions

3. Nitrous oxide is safe to use when balloons are in place for a planned arterial balloon occlusion if the flow is discontinued 5 min before inflation of the balloons.
   (A) True ** (B) False

4. When a patient with a known placenta accreta presents for a scheduled cesarean delivery, which of the following steps should be performed in preparation?
   (A) Type and screen blood only
   (B) Type and crossmatch blood only
   (C) Have blood and fresh frozen plasma in the room and checked
   (D) Have cell salvage and rapid infuser primed and ready in room

5. Choose the correct statement about blood recovered from cell salvage.
   (A) The American Congress of Obstetrics and Gynecology has deemed it risky
   (B) Cost per unit higher than that of allogeneic blood
   (C) Concentration of fetal cells in salvaged blood higher than that found in maternal serum after vaginal delivery
   (D) Accepted by most Jehovah’s Witnesses **

6. Nerve injury occurs with as little as _______ of stretch.
   (A) 5% ** (B) 10% (C) 15% (D) 20%

7. Which type of nerve injury requires surgical repair?
   (A) Neuropraxic (B) Axonotmetic ** (C) Neurotmetic (D) None of the above

8. Which of the following mechanisms of injury is most specifically related to the use of local anesthesia?
   (A) Mechanical (B) Thermal (C) Ischemic (D) Toxic

9. Choose the true statement about the anesthetist’s role in causing and preventing complications.
   (A) Continuous catheters are associated with a high incidence of infection
   (B) All nerve localization techniques are comparable **
   (C) Paresthesia techniques have high specificity and sensitivity
   (D) Risk for nerve injury is decreased with use of a transverse approach for nerve blockade

10. The initial treatment for _______ nerve injuries consists of medical management, treatment of neuropathic pain, and performance of follow-up studies.
    (A) Neuropraxic (B) Axonotmetic (C) Neurotmetic ** (D) All the above

NOTE: The correct answers to Audio-Digest Anesthesiology Volume 55, Issue 27, are as follows: 1-D, 2-A, 3-A, 4-B, 5-C, 6-D, 7-C, 8-A, 9-B, 10-D

Answers to Audio-Digest Anesthesiology Volume 55, Issue 39: 1-C, 2-D, 3-D, 4-D, 5-A, 6-B, 7-B, 8-A, 9-B, 10-D

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