

- Lecture **“Cesarean Section for the Non-Obstetrician”**
- Speaker **Allan Sawyer, MD**
- Objectives **By the end of this lecture/presentation, a clinician should be able to**
- 1) Discuss two examples of potential areas problems areas during cesarean delivery and cite how to avoid these problems**
 - 2) Cite a reasonable understanding of the technique of cesarean delivery**
 - 3) Name two examples of how to get out of difficult situations during cesarean delivery**

Lecture Outline

- I. Rationale for this presentation
 - A. Clinicians in third world hospitals are stretched daily to the limits of their expertise. Specialty lines are blurred, especially in comparison to standards of care in the United States.
 - B. Cesarean delivery is performed, with minor technical variation, in very similar fashion throughout the world. Non-obstetricians practicing in third world countries may be expected to be able to perform cesarean delivery if called upon to do so.
 - C. This presentation is not a substitute for hands-on experience in learning the technique of cesarean delivery. Preparation and hands-on training are essential in order to master these techniques.
 - D. Antisepsis (sterile surgical technique) and anesthesia are critical to the success of cesarean delivery and are outside the scope of this presentation.
- II. Preparation
 - A. Practice and learn before an emergency arises.
 - B. Develop your surgical skills
 1. Learn knot tying (1).
 - a) Download Ethicon surgical knot tying manual at http://www.jnigateway.com/public/CAENG/Knot_Tying_Manual.pdf
 2. Assist often in surgery.
 3. Learn sterile technique, sterile gowning and gloving.
 - a) Sterile surgical technique is absolutely essential. Asepsis combined with anesthesia are the critical ingredients which over the last 200 years have allowed both the mother and the baby to survive this procedure (2).
 4. Ask questions of those who are more experienced with this procedure.
 - C. Sutures & gloves
 1. **Place all the sutures you need for a cesarean section in Zip lock bags, label them, and keep them in the operating room. This is particularly helpful for middle-of-the-night cesarean sections.**
 - a) Likewise, anesthesiologists and nurse anesthetists should consider having everything they need set out for the emergency middle-of-the-night cesarean section.
 2. Sutures for cesarean delivery
 - a) Uterus:
 - (1) Use two absorbable sutures (Vicryl, chromic), large (0 or 1) with large taper needles (CT, CT-1, CT-X)
 - (2) Two layer closure of uterine incision.
 - b) Peritoneum (optional) and Bladder Flap (optional)
 - (1) Use absorbable sutures (Vicryl, chromic) medium (2-0) with medium taper needles (CT-2) needles.

- c) Fascia
 - (1) Use absorbable or permanent sutures (Vicryl, PDS, Prolene, Maxon), large (0 or 1) with large taper needles (CT, CT-1, CT-X)
 - d) Subcutaneous layer (optional, especially with thin patients)
 - (1) Use absorbable sutures (vicryl, chromic) medium (2-0) with medium taper needles (CT-2) needles.
 - (2) More important to close this layer for obese patients.
 - (3) Patients less likely to be obese in third world countries.
 - e) Skin
 - (1) Recommend using skin stapler.
 - (2) May use subcuticular closure if experienced or if skin stapler is not available.
 - (a) 3-0 or 4-0 monocryl or vicryl on PS-1, PS-2 or Keith (straight) needle.
 - (b) Alternatively can close with mattress suture closure and nylon sutures if that is the only option available.
- D. Know the position of the baby
1. Vaginal exam
 2. Leopold examination
 - a) Determining position of baby by abdominal examination.
 3. Ultrasound examination
 - a) It is especially important to know if there is a back-down transverse lie of the baby (where the baby is lying in the pelvis as if it were lying in a hammock).
- E. **Staying Out of Trouble:**
1. **Perform low vertical uterine incision for:**
 - a) Back down transverse lie (baby lying in the pelvis as if it were lying in a hammock).
 - b) Prolapsed extremity through cervix
 2. Inverted "T" Incision (see "Uterine Incision" below)
 - a) There is an increased risk of uterine rupture with an inverted "T" incision.
 - (1) In a third world setting, consider obligatory tubal ligation if an inverted "T" incision is made.
- F. Patient preparation
1. Foley catheter
 - a) Recommend either placing the Foley catheter yourself, or observe the insertion of the Foley catheter.
 - (1) Be certain that the Foley catheter is placed in the urethra and not in vagina.
 - (2) Watch for back flow of urine into the catheter during insertion.
 2. Skin preparation
 - a) Consider drawing a line with a permanent marker or surgical skin marker of exactly where you are going to make your incision. Do this prior to prepping the patient.
 - (1) Recommend vertical incision from umbilicus to symphysis pubis until experienced with Pfannenstiel (3) (horizontal suprapubic) incision.
 - (a) Pfannenstiel incision: A transverse incision through the external sheath of the recti muscles, about an inch above the pubes. It follows natural folds of the skin and curves over mons pubis in such a way that the pubic hairs subsequently cover the surgical scar.
 - b) Shave or clip pubic hair down to just below pubic symphysis immediately prior to starting the surgery. Although most authorities would recommend that clipping the hair is preferable to shaving, sterile razors are in much greater abundance and cost much less than sterile shavers in the third world arena.
 - c) Use iodine (Betadine) to prep the abdomen.
 - (1) Recommend thirty second prep over the surgical incision prior to prepping the remainder of the abdomen.

d) Antibiotics

- (1) Use a broad spectrum antibiotic (cephalosporin).
 - (a) May administer prior to the initial incision or at the time of delivery of the baby.
- (2) Chloramphenicol is extensively used in third world countries and is excellent to reduce risk of postpartum endometritis.
 - (a) Dose is 100 mg/kg/day in divided doses every six hours.
 - (b) Risk of serious and fatal blood dyscrasias (aplastic or hypoplastic anemia, thrombocytopenia and granulocytopenia) are rare.
 - (i) Consider the risk of infection compared to the risk of rare blood dyscrasia.
 - (ii) Low cost, broad spectrum, and low risk of blood dyscrasia make chloramphenicol an excellent antibiotic in third world medicine.

III. Pray

- A. Ask for wisdom, guidance, protection for everyone in the room.
- B. Pray in language(s) so that everyone in the room, including the patient, can understand what is being said. Use a translator if necessary

IV. Anesthesia

- A. Anesthesia techniques for cesarean delivery are beyond the scope of this presentation, however, it is vital to be aware of the options for anesthesia at the particular facility and also who is responsible for administration of the anesthesia.
 1. Spinal (regional) anesthesia
 2. Epidural (regional) anesthesia
 3. General endotracheal anesthesia
 4. IV Sedation + Local (suboptimal), but sometimes necessary
 - a) Ketamine IV + local administration of lidocaine
- B. Allis Test with regional anesthesia
 1. Pinch along the incision line prior to initial incision to ascertain that the patient does not feel pain. Testing for appropriateness of level of anesthesia.
 - a) Patient may be able to feel pressure sensation, but should not feel pain.

V. Aseptic Technique

- A. Although this topic is outside the scope of this presentation, it cannot be left unsaid that adherence to sterile technique is essential to performing a cesarean delivery. This is a major factor in morbidity and mortality during the puerperal period. Aseptic technique is also what has primarily contributed to the maternal survival improvements seen over the past 200 years.
 1. Learn surgical hand washing.
 - a) Keep fingernails trimmed short.
 - b) Removal all jewelry (rings and watches).
 - c) Scrub for at least five minutes.
 2. Learn how to gown and glove in a sterile fashion.
 3. In many third world settings, there will be inevitable breaks in sterile technique that cannot be avoided (e.g. a fly landing in the surgical field during the procedure). Although these can be frustrating, just do your best.
 - a) Remember the adage "*irrigation is the solution to pollution*" and use an appropriate amount of surgical irrigation during surgery and administer antibiotics as recommended in this treatise.

VI. Skin incision

(This presentation is limited to discussing a vertical skin incision. Consult Williams Obstetrics (4), or other standard obstetrical text, for description of Pfannenstiel incisions).

- A. Using a scalpel, press down firmly to make the skin incision.
- B. This incision should be large enough to allow delivery of the baby, and should extend from just below the umbilicus to just above the symphysis pubis.
- C. The initial incision should be several millimeters deep, cutting completely through the skin and exposing the subcutaneous fatty layer.

VII. Subcutaneous layer

- A. Use electrocautery, if available, to cauterize any bleeding vessels.
- B. Use the scalpel to perform sharp dissection down to the anterior rectus sheath of fascia (a thick white layer).
- C. Using sharp and blunt dissection, expose about a 2 centimeter width of fascia along the entire length of the incision.

VIII. Fascia layer

- A. Create a small (2-3 centimeter) incision through the fascia and then use Mayo scissors to incise the fascia layer along the entire length of the exposed surgical field, stopping two centimeters above the pubic symphysis.

IX. Rectus abdominus muscle, pyramidalis muscle and peritoneum.

- A. Separate the rectus and the pyramidalis muscles in the midline by sharp and blunt dissection. This will expose the peritoneum.

X. Bladder flap

- A. The risk of bladder injury can be reduced by dissecting the bladder off of the lower uterine segment. This is commonly referred to as “developing the bladder flap.”
 1. Using forceps, raise the loose reflection of peritoneum over the anterior lower uterine segment and above the uppermost part of the bladder.
 2. Incise this with scissors to create a 2 centimeter incision.
 3. Then laterally undermine and separate this loose layer with the tips of the scissors, placing the closed blades just underneath the reflection, and then opening the scissors to bluntly separate the layers laterally.
 4. The dissected layer can then be safely cut with the scissors and bluntly pushed down over the lower uterine segment, protecting the bladder from injury.
 5. The bladder flap only needs to be dissected 2-4 centimeters to avoid injuring the bladder or inadvertently entering the vagina.

XI. Uterine incision

- A. **Low Transverse Incision (recommended for vertex, breech, and back-up transverse lie).**
 1. **Staying Out of Trouble: Avoiding Uterine Artery Injuries**
 - a) If cervix is 8 or more centimeters dilated, then make the incision four inches (10 cm) above the symphysis pubis. This reduces the likelihood of extending into the uterine arteries and cervix as the incision is extended to allow delivery of the baby.
 - b) Locate the vesico-uterine serosal reflection (the uppermost loose reflection of tissue where the bladder flap was developed), use this as your guide.
 - c) Clinical Axiom (if cervix is 8 or more centimeters dilated):
 - (1) *“Making your uterine incision two centimeters higher than you think you should will make you end up two centimeters lower than you thought you would be.”*
 2. “For most cesarean deliveries, the transverse incision is the operation of choice. Its advantages are that it 1) is easier to repair, 2) is located at a site least likely to rupture during a subsequent pregnancy, and 3) does not promote adherence of bowel or omentum to the incisional line.” (4).

3. Carefully make a 2 centimeter wide incision in the lower uterine segment with the scalpel. This must be performed very carefully to avoid cutting the infant. If necessary, use Allis clamps to raise the myometrium away from the infant and carefully incision between the Allis clamps. Once the amnion or infant is visualized, the incision can be extended using bandage scissors. If the myometrium is very thin from labor, the incision can be extended bilaterally using blunt pressure from both index fingers. ***“It is very important to make the uterine incision large enough to allow delivery of the head and trunk of the fetus without tearing into or having to cut into the uterine arteries and veins that course through the lateral margins of the uterus.”***(4).

B. Low vertical incision (consider using for all non-vertex presentations and multiple gestations, and for severe prematurity.)

1. Some physicians recommend a low vertical incision to be performed for all non-vertex presentations, severe prematurity and for multiple gestations in order to reduce the risk of needing to perform an inverted “T” incision (see below).
2. The technique involves developing a bladder flap as described above to decrease the risk of bladder injury. Using a scalpel, carefully make a vertical incision from the lower uterine segment vertically up to approximately the mid-corpus of the uterus. Be very careful to avoid cutting the infant. The myometrium can be very thin due to labor.

C. Classical uterine incision

1. The classical incision is a vertical incision from the uterine fundus to the lower uterine segment. This incision is rarely used today, as it has a high risk for uterine rupture with a subsequent pregnancy. Tubal ligation performed during the same surgical setting should be considered in third world countries if access to repeat cesarean section is limited. This can tremendously reduce the risk of both fetal and maternal mortality due to uterine rupture with subsequent childbirth following a prior classical uterine incision.

D. Inverted “T” incision

1. An inverted “T” incision is performed in an emergent situation, when after creating a transverse uterine incision, it is discovered that the fetus cannot be delivered through the incision because of the positioning of the fetus. This situation should best be avoided by knowing the position of the fetus prior to starting the cesarean, either by preoperative vaginal, Leopold, or ultrasound examination.
2. The inverted “T” incision is essentially the creating of a low vertical incision after a low transverse incision has already been created. The inverted “T” incision also can tremendously increase the risk of subsequent uterine rupture with a future pregnancy, and the same recommendation for tubal ligation in the third world should be considered as was recommended for a classical uterine incision.

XII. Amniotomy (breaking the bag of water)

- A. If the membranes have not been ruptured during labor, then amniotomy must be performed. This can easily be accomplished by grasping the bag of water with an Allis clamp. Be aware that this can be associated with the loss of a large amount of amniotic fluid. Be prepared to rapidly suction this fluid.

XIII. Delivering the Baby

- A. If the placenta is encountered upon incision through the myometrium, then it must be rapidly incised or detached to permit rapid delivery of the infant, or else severe fetal hemorrhage can occur. If rapid hemorrhage develops at this point, consider rapid blunt perforation of the placenta to locate the umbilical cord and clamp the umbilical cord immediately to prevent fetal hemorrhage. The infant must immediately be delivered to prevent hypoxic injury, however.

B. Vertex (head down) presentation

1. The surgeon's hand is slipped between the infant's head and the lower uterine segment. The infant's head is then raised to bring it into the view of the uterine incision. If the patient has been in labor, then the head may be wedged into the pelvis, making this task somewhat difficult. Once the head is brought through the incision, the infant's nose and mouth should be suctioned using a bulb suction. Using moderate fundal pressure, the remainder of the infant is delivered through the uterine incision. The cord is clamped twice, and cut between the clamps. The newborn is then passed to the resuscitation team.

C. Delivery of the non-vertex presentation

1. If the infant is in a transverse position, first attempt to manually rotate the infant into a vertex presentation. If this is not possible, then palpate the infant for the lower extremity. Deliver the legs, pelvis and chest. Then gently deliver the arms by bringing them gently down across the infant's chest. Support the infant in a vertical position and deliver the head.

XIV. Delivery of the Placenta

- A. Immediately after delivery of the infant, begin uterine massage and deliver the placenta. Some physicians deliver the placenta by vigorously massaging the uterus to expel the placenta, while others bluntly dissect with the surgeon's fingertips between the endometrium and the placenta. Inspect the placenta to be certain that it is intact. The uterus may then be lifted out of the pelvis, and the fundus wrapped in a moist laparotomy sponge for traction and massage. The endometrial cavity can then be wiped with a moist laparotomy sponge to remove any remaining membranes.

XV. Staying Out of Trouble:

A. **Preventing Excessive Blood Loss from Uterine Atony (failure of the uterus to contract)**

1. **Suture and close the uterine incision.**

- a) Elevate the uterus out of the abdomen and pelvis for better exposure.
 - (1) A minority of surgeons will leave the uterus in the abdomen to repair the uterine incision, however, it is technically easier to elevate the uterus gently out of the abdomen for the repair.
- b) Have the assistant hold the uterus with a moist laparotomy sponge.
- c) The uterine incision must be closed in order for the uterus to contract.
 - (1) Use recommended sutures in a continuous running locking suture line. The first suture placement should be just beyond the angle of the incision, penetrating the full thickness of the myometrium. Continue this running locking full thickness closure until just beyond the opposite angle.
 - (2) Two layer closure of uterus is preferred to reduce risk of uterine rupture in future childbirth. The second layer does not need to be full thickness, and may be either locking or non-locking depending on hemostasis.
- d) Administer one or more of the following.
 - (1) Oxytocin (pitocin) 20 units per liter of crystalloid solution IV 250 mL per hour for one liter.
 - (2) If bleeding persists from uterine atony, administer an additional 10 units of oxytocin (pitocin) by IM injection into deltoid or thigh.
 - (3) If bleeding persists from uterine atony, administer Methergine (methylergonovine) 0.2 milligrams deep IM injection.
 - (a) **DO NOT ADMINISTER METHERGINE IV.**
 - (4) If bleeding persists from uterine atony, administer 0.2 milligrams of Methergine directly into uterine muscle (myometrium).

- B. Preventing Excessive Blood Loss from Bleeding at Uterine Incision**
 - 1. If bleeding persists along the uterine incision, perform figure of eight sutures with same suture material (may need additional sutures, consider using a smaller needle (SH) and smaller suture material (2-0) for figure of eight sutures).
 - 2. If bleeding (oozing) persists, apply pressure with laparotomy sponge against incision for 3-5 minutes for hemostasis to occur.

- XVI. Abdominal exploration
 - A. While elevating the uterus, use sterile normal saline (crystalloid solution) or even sterile water (less optimal) to irrigate the blood from the abdomen and reduce bacterial load.
 - B. Suction out blood and irrigation.

- XVII. Closure of bladder flap and peritoneum (optional)
 - A. There is no consensus as to whether this layer needs to be closed or not. If it is to be closed, then an absorbable suture (2-0 chromic) on a taper needle should be used in a running non-locking fashion.

- XVIII. Irrigation, inspection and initial sponge count
 - A. The pelvis and abdomen are irrigated with a sterile crystalloid solution (normal saline, Hartmann's solution, lactated ringers) and blood and the irrigation fluid are gently suctioned. Carefully inspect the incision for persistent bleeding, and return the uterus to the abdomen and pelvis. Inspect again for any persistent bleeding or hematoma formation. Additional figure-of-eight sutures may be necessary for hemostasis. A careful sponge count should be performed, along with visual and manual palpation adjacent to the uterus, to account for all of the surgical sponges utilized during the procedure.

- XIX. Peritoneal and rectus muscle closure (optional)
 - A. Many surgeons omit this step because it is of no proven clinical value, with the exception to close this layer if the bowel is protruding into the operative field. Any 2-0 absorbable suture may be used, such as Vicryl or chromic catgut suture.

- XX. Closure of fascia
 - A. The fascia is identified as the thick white layer above the rectus muscle. The fascia is closed with a running non-locking or intermittently locking long-lasting absorbable or non-absorbable suture that is an "0" or "1" suture. Appropriate sutures include Vicryl, Prolene, Maxon or PDS sutures. These sutures should be placed just beyond the apex of the incision and at least one centimeter beyond the edge of the fascia incision. They should also be placed one centimeter apart.

- XXI. Closure of subcutaneous layer (optional)
 - A. The subcutaneous layer closure is also optional. If the subcutaneous layer is more than 2 centimeters thick, as in an overweight or obese patient, then this layer can be re-approximated with interrupted 2-0 absorbable sutures.

- XXII. Closure of skin
 - A. The skin can be closed using a surgical stapler, or may also be closed with a running 4-0 subcuticular stitch.

- XXIII. Dressing
 - A. A sterile surgical dressing should be applied and kept in place for 24 hours.

XXIV. Post op orders

- A. Standard post op order sheet
 1. Check to see if there are standard pre-printed post op orders used in the hospital.
- B. Diet
 1. Sips of water until bowel sounds heard.
 2. Liquid diet after bowel sounds heard and nausea resolved.
 3. Regular diet after passage of flatus
- C. IV: crystalloids (normal saline, Hartman's solution, lactated ringers) at 125 mL per hour until patient tolerating liquid diet, then heparin lock IV.
 1. Keep in mind that in some third world hospitals, there is limited availability of crystalloid solutions, and these can be expensive for the hospital. Early heparin lock may be necessary to conserve IV fluids.
- D. Antibiotics
 1. Check to see if there is a routine at the hospital.
 2. Generally, administer two additional doses of broad spectrum antibiotics.
 3. Examples include:
 - a) Chloramphenicol 1 gram IV every six hours for two doses (dose is 50-100 mg/kg/day in divided doses given at 6 hour intervals)
 - b) Cephalosporin such as cephazolin 1 gram IV every 6 hours for two doses.
 - c) Gentamicin 80 milligrams IV every six hours for two doses. (less broad spectrum, but may be more available than other antibiotics.)
- E. Medications
 1. Analgesics
 - a) Remember that many third world patients have not been exposed to analgesics compared to first world patients. They will typically require much less medication.
 - b) Narcotic analgesic administered parenterally until tolerating oral medications.
 - c) Non-narcotic analgesics administered parenterally.
 - (1) Personally, I take a large supply of ketorolac (Toradol) on short term mission trips and administer ketorolac 30 milligrams IV or IM every 8 hours for 48 hours post op.
 - (a) This is equivalent to narcotics without the gastrointestinal side effects.
- F. Vitals
 1. Use hospital routines as much as possible.
 2. Check vital signs every 15 minutes in recovery room.
 3. Vital signs every 1 hour for 2 hours, then every four hours for two times, then every eight hours.
- G. Activity
 1. Bedrest for 8-12 hours then ambulate with assistance until able to ambulate independently.
- H. Dressings
 1. Remove gauze dressing the day after surgery (post operative day #1)
- I. Foley catheter
 1. Remove Foley catheter on post operative day #1 (approximately 24 hours post surgery).
- J. Labs
 1. Check hemoglobin and hematocrit or CBC approximately 12-24 hours after surgery.

- K. Removal of surgical staples or mattress sutures
1. These can be removed 4-7 days postoperatively.
- XXV. Post operative Care and Pearls
- A. If persistent fever is present:
1. Antibiotics should include aerobic gram positive and gram negative coverage as well as anaerobic coverage.
 - a) Consider what parental antibiotic coverage is available where you are practicing.
 - b) Puerperal infection is defined as a temperature greater than 38°C (100.4°F) on two successive measurements at least 6 hours apart (5).
 - (1) Also consider dehydration, UTI, pyelonephritis, lower respiratory infection, endometritis.
 - (2) Consider **malaria** in differential for persistent post op fever if patient is in a malaria endemic region. Consider also presumptive therapy for malaria as laboratory testing may not be conclusive.
- XXVI. Consultation
- A. If I can answer any questions or be of service to missionaries in third world countries, whether short term or long term, please do not hesitate in writing me by email at allantsawyer@cox.net. I am a board certified obstetrician gynecologist with third world experience, and understand the environment in which the practice of obstetrics and gynecology is administered.

References

- 1) Johnson & Johnson, *Knot Tying Manual*, www.jnjgateway.com/public/CAENG/Knot_Tying_Manual.pdf.
- 2) Sewell JE, **Cesarean Section – A Brief History**, A brochure to accompany an exhibition on the history of cesarean section at the National Library of Medicine, 30 April 1993 – 31 August 1993. Available online at: http://0-www.nlm.nih.gov.ilsprod.lib.neu.edu/exhibition/cesarean/cesarean_1.html.
- 3) Pfannenstiel HJ, *Ueber die Vortheile des suprasymphysären Fascienquerschnitts für die gynäkologischen Koeliotomien*. Sammlung klinischer Vorträge, Leipzig, 1900. n F. 269. (Gynäk. Nr. 97), 1735-1756.
- 4) Cunningham FG, Hauth JC, Leveno KJ, Gilstrap L, Bloom SL, Wenstrom KD, *William's Obstetrics*, 22nd Edition, Chapter 25, 2005.
- 5) Palmer D, Wolf CE, *Handbook of Medicine in Developing Countries*, Second Edition, 2002.

NOTES

Lecture **“Case Presentations: Medicine”**

Speaker **Steven Manchester, MD**

- Objectives
- 1) To present a case of HIV-associated nephropathy.
 - 2) To discuss the differential diagnosis of end-stage renal disease in HIV-positive patients.
 - 3) To discuss the treatment of HIVAN.

Lecture Outline

Dates	Creatinine	Proteinuria	CD4
4/4/06			175
2/6/06	52	1+	
5/7/06		4+	
2/8/06	173		
16/8/06	134	4+	
14/9/06	73	3+	

1. Which of the following associated diseases continue to gain prevalence despite increasingly successful management of HIV?
 - A. Kidney disease
 - B. Heart disease
 - C. Liver disease
 - D. Wasting/cachexia
 - E. A, B, and C

2. HIV-Associated Nephropathy (HIVAN) is most likely to occur in which of the following groups?
 - A. African American
 - B. Middle Eastern
 - C. Asian
 - D. Scandinavian
 - E. Caucasian

3. Which of the following are predictors of mortality in patients with HIV?
 - A. CD4 lymphocyte count
 - B. Prior history of AIDS-defining illness
 - C. Age
 - D. History of hypertension
 - E. Proteinuria