Evidence Based Cesarean Delivery

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“There is increasing evidence that for many techniques, short-term maternal outcomes are equivalent. Until long-term health effects are known, surgeons should continue to use the techniques they prefer and currently use.”
Recommendations with High levels of Certainty

• Favor:
  • Pre-skin incision prophylactic antibiotics, cephalad-caudad blunt uterine extension, spontaneous placental removal, surgeon preference on uterine exteriorization, single-layer uterine closure when future fertility is undesired, and suture closure of the subcutaneous tissue when thickness is \( \geq \) 2 cm.

• Do Not Favor:
  • Manual cervical dilation, subcutaneous drains, or supplemental oxygen for the reduction of morbidity from infection.

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Preoperative preparation

• Prophylactic antibiotics
  • Single dose of Ampicillin or a 1st generation Cephalosporin within 15-60 minutes of incision

• Preoperative vaginal preparation with povidone-iodine scrub
  • significantly reduced the incidence of post-cesarean endometritis

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Entry

• Joel-Cohen type incisions
  • Higher (3cm below the ASIS border)
  • Straighter
  • mostly blunt dissection to enter the abdomen

• Pfannenstiel type approach (Described in 18
  • Curvilinear
  • 2-3 cm above the symphysis pubis
  • generally involves more sharp dissection

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Pfannenstiel
Pfannenstiel vs Joel-Cohen incision

- 3 meta-analyses of randomized trials
- Lower rates of fever, postoperative pain, and use of analgesia;
- Less blood loss (avg -58mL)
- Shorter operating time (avg -11 minutes less)
- Joel-Cohen incision resulted in a 65 percent reduction in reported postoperative febrile morbidity


Abdominal surgical incisions for caesarean section. Mathai M, Hofmeyr GJ. Cochrane Database Syst Rev. 2007;
<table>
<thead>
<tr>
<th>Variable</th>
<th>PKM</th>
<th>JCM</th>
<th>MLM</th>
<th>MMLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin incision</td>
<td>Pfannenstiel&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Joel-Cohen&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Joel-Cohen&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Pfannenstiel&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Subcutaneous layer closure</td>
<td>Sharp dissection</td>
<td>Blunt dissection</td>
<td>Blunt dissection</td>
<td>Blunt dissection</td>
</tr>
<tr>
<td>Fascia opening</td>
<td>Sharp extension</td>
<td>Blunt extension</td>
<td>Blunt extension</td>
<td>Blunt extension</td>
</tr>
<tr>
<td>Peritoneal opening</td>
<td>Sharp entry</td>
<td>Blunt entry</td>
<td>Blunt entry</td>
<td>Blunt entry</td>
</tr>
<tr>
<td>Uterine incision</td>
<td>Sharp superficial, then blunt entry</td>
<td>Sharp superficial, then blunt entry</td>
<td>Sharp superficial, then blunt entry</td>
<td>Sharp superficial, then blunt entry</td>
</tr>
<tr>
<td>Placenta removal</td>
<td>Manual</td>
<td>Spontaneous</td>
<td>Manual</td>
<td>Spontaneous</td>
</tr>
<tr>
<td>Uterine closure</td>
<td>Single layer, interrupted</td>
<td>Single layer, interrupted</td>
<td>Single layer, running</td>
<td>Single layer, running</td>
</tr>
<tr>
<td>Peritoneal closure</td>
<td>Closed</td>
<td>Not closed</td>
<td>Not closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Fascia closure</td>
<td>Interrupted</td>
<td>Interrupted</td>
<td>Continuous</td>
<td>Continuous</td>
</tr>
<tr>
<td>Subcutaneous closure</td>
<td>Not sutured</td>
<td>Not sutured</td>
<td>Not sutured</td>
<td>Not sutured</td>
</tr>
<tr>
<td>Skin closure</td>
<td>Continuous suture</td>
<td>Mattress sutures</td>
<td>Continuous suture</td>
<td>Continuous suture</td>
</tr>
</tbody>
</table>

CD, cesarean delivery; JCM, Joel-Cohen method; MLM, Misgav-Ladach method; MMLM, Modified Misgav-Ladach method; PKM, Pfannenstiel-Kerr method.

Modified from Hofmyr, Naki, and Xavier. Some studies report slight variations to these techniques.


<sup>a</sup>Pfannenstiel skin incision is slightly curved, 2-3 cm or 2 fingers above the symphysis pubis, with the midpoint of the incision within the shaded area of the pubic hair.

<sup>b</sup>Joel-Cohen incision is straight, 3 cm below the line that joins the anterior superior iliac spines, slightly more central than Pfannenstiel.
Tenets of Halsted

• Gentle handling of tissue
• Meticulous hemostasis
• Preservation of blood supply
• Strict aseptic technique
• Minimum tension on tissues
• Accurate tissue apposition
• Obliteration of deadspace
Blunt Dissection

- https://youtu.be/rEh55T7GZ-Q

The Misgav Ladach method for cesarean section: method description.
AUHolmgren G, Sjöholm L, Stark M
SOActa Obstet Gynecol Scand. 1999;78(7):615
Bladder Flap
Bladder Flap

• 2 trials randomized, assigned women to undergo or omit development of a bladder flap
  • (2001) Vienna: reduction of operating time and incision-delivery interval, reduced blood loss, and need for analgesics. Long-term effects remain to be evaluated
  • (2012) WashU: does not increase intraoperative or postoperative complications. Incision-to-delivery time is shortened but total operating time appears unchanged

• May be unavoidable in certain circumstances

Is the formation of a bladder flap at cesarean necessary? A randomized trial.
AUHohlagschwandtner M, Ruecklinger E, Husslein P, Joura EA

Utility of the bladder flap at cesarean delivery: a randomized controlled trial.
Tuuli MG, Odibo AO, Fogertey P, Roehl K, Stamilio D, Macones GA
Hysterotomy expansion

• Cromi et al. Italy (2008)
• Randomized Controlled trial
• Blunt Cephalad-caudad traction
• Less risk of unintended extension and excessive blood loss compared with “transversal expansion”

Blunt expansion of the low transverse uterine incision at cesarean delivery: a randomized comparison of 2 techniques.
Fetal Extraction

• Usually uncomplicated
• Should be expeditious (uterine incision to delivery)
• Prolongation associated with lower fetal blood gas pH values and Apgar scores
  • Hysterotomy-induced increased uterine tone

Head pushing versus reverse breech extraction I Levy R, Chernomoretz T, Appelman Z, Levin D, Or Y, Hagay Z
Difficult Extraction
Deeply Impacted Fetal Head

• 1.5% of Cesarean Deliveries
• Fong (Singapore) first described the Reverse Breech extraction
• Levy et al. (2005) compared this…“push” vs “pull”
• ‘Pull’ method (Reverse Breech extraction) compared to those that were delivered by the 'push' method.
  • significantly lower rate of postpartum fever
  • significantly lower rate extensions of the uterine incision
  • Neonatal outcomes were good in all cases

Difficult Extraction

• Adequate abdominal exposure
  • Pfannenstiel to Maylard (incision of the rectus muscles)

• Adequate Uterine exposure
  • J vs T, extension of classical

• Adequate Anesthesia
  • General if necessary

• Uterine Relaxation
  • Nitroglycerin 50 micrograms intravenously, can re-dose every 60 seconds, as needed to achieve adequate uterine relaxation

Prevention of Post Partum Hemorrhage
Prevention of Post Partum Hemorrhage

- **Tranexamic Acid**
  - significantly decreased intraoperative and postpartum blood loss (100-200 mL) in RCT

- **Oxytocin**
  - infusion (10-40 IU in 1 L crystalloid over 4-8 hours) is effective in uterine atony prevention, with unknown benefit from oxytocin bolus.


Uterine Exteriorization For Repair
Uterine Exteriorization For Repair

• 7 RCT’s, 1 Meta-analysis
• Febrile complications and surgical time were similar between uterine exteriorization and intraabdominal repair
• Surgeon preference

Uterine Closure

• Single vs double-layer closure / Locked vs Un-locked

• 1 RCT
  • Caesarean section surgical techniques: a randomized factorial trial (CAESAR)*. BJOG 2010;117:1366-76.

• 1 metaanalysis
Locked or Unlocked

• Single-layer **Locked with Chromic**, was associated with the highest uterine rupture risk

• An unlocked single-layer closure with a modern suture material (vicryl) was **Not associated with a significantly higher risk of uterine rupture or uterine scar dehiscence** than a double-layer closure

• Jelsema et al - suggested that an unlocked single-layer closure leads to better uterine scar healing based on the fact that “locked sutures increase pressure at the suture–tissue interface, which can cause ischemic necrosis, impairing coaptation”


Uterine Closure

• “Definitive recommendations regarding subsequent uterine rupture risk are not possible in women with desired future fertility....In women with undesired fertility, there does not appear to be any benefit of a 2-layer uterine closure” - Dahlke


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Peritoneal Closure

• 7 RCT’s, 3 Meta-Analyses
• Parietal, Visceral
• Both, one, or neither


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Peritoneal Closure

• 1\textsuperscript{st} Wilkinson CS1, Enkin MW
  • Cochrane Database Syst Rev. 2000;(2):CD000163. Peritoneal non-closure at caesarean section

• 2\textsuperscript{nd} Bamigboye, Anthony A, Hofmeyr GJ
  • Cochrane Database Syst Rev. 2003;(4):CD000163. Closure versus non-closure of the peritoneum at caesarean section

• 3\textsuperscript{rd} Bamigboye, Anthony A, Hofmeyr GJ
  • “Closure versus Non-Closure of the Peritoneum at Caesarean Section: Short- and Long-Term Outcomes.” The Cochrane Database of Systematic Reviews 8 2014: 1–79. PMC
Peritoneal Closure

- A metaanalysis including 4423 women retrospectively evaluated intraabdominal adhesion formation among 3 different CD surgical techniques

- Within the cohort of “modified Misgav-Ladach” Non-closure of the peritoneum demonstrated an increased risk of intraabdominal adhesions

Peritoneum Closure vs Non-closure

• “Surgeons must balance the advantage of nonclosure in regard to less postoperative fever, less operating time, and reduced hospital stay and understand that limited data suggest parietal peritoneal closure may decrease the risk of future adhesions”

  • Dahlke ‘2013

• “There is currently insufficient evidence of benefit to justify the additional time and use of suture material necessary for peritoneal closure.”

  • Bamigboye ‘2014


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Fascial Closure

- 1 cm x 1 cm
- Running (continuous – not interrupted), unlocked
- In midline or those at highest risk of incisional hernia or dehiscence
- “Slowly” absorbable suture (preferred over rapidly – Vicryl/Dexon) Polydioxanone (PDS, MonoPlus) and polyglyconate + trimethylene carbonate (Maxon)
  - Avoid non-absorbable sutures (prolene, ethibond)
- “No further trials should be conducted for evaluation of technique and available materials for elective midline abdominal fascial closure, according to the results of our cumulative meta-analysis”

Elective midline laparotomy closure: the INLINE systematic review and meta-analysis.
Diener MK, Voss S, Jensen K, Büchler MW, Seiler CM
Skin Closure

• 5 recent RCT, 2 metaanalysis, and 1 Cochrane review

• “Given conflicting data, it is uncertain whether sutures or staples are superior, making a definitive recommendation difficult” – Dahlke et al.

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Subcuticular Staple Closure

- Retrospective cohort study of cesarean sections performed from January through September of 2014 (UMKC/St Lukes)
- Complication incidence among the suture and subcuticular staple closure was not significantly different, however there were significantly less complications in the suture and subcuticular staple closure groups when compared to traditional staple closure
- Decreased incidence of composite wound complications with subcuticular staple closure versus traditional staple closure

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Thank you
Bloodletting, the backbone of medical therapeutics for centuries is vividly portrayed in this mid-nineteenth century photograph. In a classic pose the physician opens the vein of his patient; the purpose to drain blood and thereby change the body fluids in order to treat disease and restore health. Bloodletting was also often performed as a “preventative health measure”. A universal remedy it was practiced in all societies for a variety of conditions. In America its general use continued into the early part of the twentieth century. It is still practiced today but for specific disorders.

“Heroic Therapy”, popular in the early nineteenth century involved alternately massive bloodletting, chemical blistering and purging. These drastic treatments often resulted in death. Eventually clinical statistics showed bloodletting actually did more harm than good.

Although commonly practiced, bloodletting was rarely photographed. This tintype, circa 1860’s is one of two known surviving photographs both now in The Burns Archive of Historic Medical Photography, © 1983.

*photo © 1983, The Burns Archive
FIGURE 1. William Osler, M.D., at work in pathology dissecting laboratory at Philadelphia General Hospital, 1884 (dry)

He was at this time professor of clinical medicine at the University of Pennsylvania. The greatest physician of the nine
century, Sir William Osler (1849–1919), one of the founders of the Johns Hopkins Medical School and organizer of its m
service (1889), has been the subject of hundreds of articles and numerous books. Many photographs of him have p
published. This view has been chosen for our study for many reasons, among them are: (1) the photograph is an ex
of the use of the camera with the new dry plate and artificial lighting technique enabling pictures to be taken in various s
without the old posing constraints and considerations. (2) It is an excellent example of physician genre (at work) port
and depicts a famous personality. (3) The subject is unusual; this is not anatomic class cadaver photography, which b
popular in the 1890s and still is popular, but pathology dissecting laboratory photography, documenting teaching of pat
how diseases affect the body, few other such photographs are extant from this era (courtesy the Osler Library, McGill u
versity).

to medical publications; (2) a presentation for the
photohistorian, archivist, bibliophile, and collector,
of checklists of medical publications with
of making prints for illustrations: relief print
intaglio printing, and planographic printing.

method starts off with a flat piece of wood, ston

metal. In other f
Sources


• Surgical techniques for uterine incision and uterine closure at the time of caesarean section. Dodd JM, Anderson ER, Gates S, Grivell RM Cochrane Database Syst Rev. 2014


• Caesarean section surgical techniques: a randomised factorial trial (CAESAR)*. BJOG 2010;117:1366-76.


Sources


Sources


• Tuuli MG, Rampersad RM, Carbone JF, Stamilio D, Macones GA, Odibo AO. Staples compared with subcuticular suture for skin closure after cesarean delivery: a systematic review and meta-analysis. Obstet Gynecol 2011;117:682-90