Cesarean section: evidence based technique

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References

# US Preventive Services Task Force standard recommendation language

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level of certainty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong>- strongly recommends</td>
<td><strong>High</strong>- consistent results from well-designed, well-conducted studies in representative populations</td>
</tr>
<tr>
<td><strong>B</strong>- recommends</td>
<td><strong>Moderate</strong>- evidence strength is limited by number, quality, or consistency of individual studies</td>
</tr>
<tr>
<td><strong>C</strong>- makes no recommendation (balance of benefits and harms is too close)</td>
<td><strong>Low</strong>- insufficient evidence to assess effects</td>
</tr>
<tr>
<td><strong>D</strong>- recommends against</td>
<td><strong>I</strong>- insufficient evidence for recommendation</td>
</tr>
</tbody>
</table>
Prophylactic antibiotics

- Decrease in incidence of
  - endometritis
  - wound infection
  - UTI

- Timing:
  - 15-60 min prior to incision

- Agents:
  - Single dose Ampicillin or 1st generation cephalosporins
    - No improve with triple antibiotics

Recommend, strongly

A, high
Preoperative vaginal preparation

- Vaginal preparation immediately before cesarean delivery significantly reduced the incidence of post-cesarean endometritis
- Especially in women with ruptured membranes

Recommend B, moderate
Preoperative hair removal

- Hair removal at time of surgery is not associated with lower postoperative surgical skin infection (SSI) rates thus should be done only if deemed necessary for better visualization during the procedure.

- Shaving surgical site with razor is thought to cause microscopic skin breaks in the skin and has been shown to be associated with significantly more SSI than clipping.

- Not studied for cesareans

Recommend against
Lateral tilt

- Lateral tilt involves tilting the woman towards her left side $10^0$-$15^0$ to avoid vena caval compression by the uterus.
- Lateral tilt did not provide fetal/neonatal benefit in
  - Apgar scores
  - Umbilical artery pH

Insufficient evidence
Supplemental oxygen

- Supplemental oxygen for the prevention of cesarean delivery morbidity from infection:
- 2 RCT:
  - neither trial reported a reduction in morbidity from infection

Recommend against
Skin incision – part 1

- A transverse skin incision is recommended, because this is associated with less postoperative pain and improved cosmetic effect compared with a vertical incision.
Skin incision – part 2

- The Pfannenstiel incision (slightly curved, 2 to 3 cm or 2 fingers above the symphysis pubis, with the mid portion of the incision within the shaved area of the pubic hair)
- Joel-Cohen incision (straight, 3 cm below the line that joins the anterior superior iliac spines and therefore slightly more cephalad than the Pfannenstiel)
- Both have similar results
  - Intra-operative complications
  - Post-operative complications
    - No data on long-term

No recommendation
Skin incision – part 3

- Skin incision length has not been studied in a trial.

- 2 non-randomized studies suggest that abdominal surgical incision size should provide at least 15 cm (size of a standard Allis clamp) of exposure to assure optimal outcome of both mother and fetus.

Insufficient evidence
Changing to 2\textsuperscript{nd} scalpel

- Has never been evaluated in a trial or in any obstetric literature
- 1 RCT in general surgery concluded that one scalpel is adequate to use throughout the whole surgical procedure

Recommend against

D, moderate
Subcutaneous incision/opening

- Has not been studied separately in a trial.
- Most clinicians use scalpel as little as possible, opening layers bluntly to avoid injury to inferior epigastric vessels.
- Blunt dissection has been associated with shorter operating times.
- There are no trials to evaluate the safety or efficacy of electrosurgery, electrocautery, or diathermy (Bovie) during CS

Insufficient evidence
Fascial incision

- Has not been studied separately in a trial.
- Most experts recommend a transverse incision that is performed with the scalpel and extended with scissors.
- Some clinicians have advocated digital extension, which can be accomplished by separating the forefingers in a cephalad-caudad direction after the fingers are inserted into a small, midline transverse fascial incision.

Insufficient evidence
Dissection of fascia off rectus

- Several investigators have cast doubt on the necessity of this commonly used technical step of cesarean

- Non-dissection of inferior rectus fascia in 1 small RCT was associated with:
  - With lower decline of postop Hb
  - Less postop pain

Insufficient evidence
Rectus muscle cutting

- Maylard (muscle cutting) vs Pfannenstiel (no muscle cutting) techniques:
  - No difference in postoperative complications or pain scores
  - 3 months later abdominal muscle strength was better in the Pfannenstiel group

Recommend against
Opening of the peritoneum

- Has not been studied separately in a trial.
- The peritoneum usually is opened carefully with blunt or sharp dissection and blunt expansion, high above the bladder, which avoids injury to the organs below.
Bladder flap development

- Incision & opening of the bladder flap vs direct incision 1 cm above the bladder fold.
  - Bladder flap development was associated with:
    - Longer incision to delivery interval (7 vs 5 minutes)
    - Longer total operating time (40 vs 35 minutes),
    - Greater change in hemoglobin level
    - More postoperative microhematuria (47% vs 21%)
    - Greater need for postop analgesia (55% vs 26%)

- Studies were underpowered to detect bladder injury

Recommend against
Uterine incision – part 1

- The transverse incision in the lower uterine segment is recommended by most experts and by retrospective case-control studies.

Recommend

**B, high**
Uterine incision – part 2

- Sharp vs. blunt expansion of incision:
  - sharp expansion significantly increases blood loss and the need for transfusion
  - Is associated with more extensions
- Blunt cephalad-caudad expansion is recommended

Recommend, strongly

A, high
Instrumental delivery of fetal head

- A pilot randomized trial of 44 women with cephalic presentation in CS.
- Because instrumentation has been associated with maternal (especially for forceps) or fetal (especially for vacuum) harm in VD, the principle of primum non nocere should be applied.

Insufficient evidence

, low
Spontaneous placental removal

- RCT: either spontaneous (with gentle cord traction) or manual placental removal
- Significant decrease in endometritis in spontaneous placental removal
- Hypothetical reduction in blood loss in manual removal

Recommend, strongly

A, high
Uterine exteriorization for repair

- Compared with leaving the uterus intra-abdominally:
  - Exteriorization was associated with a significant decrease in fever for >3 days
  - There were no other statistically significant differences for other important outcomes, which included bleeding.

No recommendation
Cleaning of uterus

Cleaning any placental remnants or blood clots from the uterus with a sponge or other means is a technique that is used frequently after placental removal but that has not been studied in any trial.

Insufficient evidence
Cervical dilation

- There was no difference in morbidity from infection between groups,
- Hematometra was not assessed in the trials

Recommend against
Prevention of PPH

- The prevention of postpartum hemorrhage using oxytocin infusion, oxytocin bolus, misoprostol, carbetocin, and tranexamic acid has been studied.
- These studies suggest that oxytocin infusion (10-40 IU in 1 L crystalloid over 4-8 hours) is more effective in uterine atony prevention, with unknown benefit from oxytocin bolus than others.

Recommend

B, high
Closure of uterine incision p1

- The role of a single- vs double-layer closure for reducing a subsequent uterine rupture remains controversial.

- All of the short-term outcomes including morbidity from infection, surgery duration, pain, the need for blood, hospital readmission, breast-feeding, and transfusion were no different between the groups.
Closure of uterine incision p2

Women with desired future fertility: 
Rupture risk with single vs double layer

Women with undesired fertility: 
No benefit of a 2-layer uterine closure
Elective Appendectomy

- 1 small RCT
- Coincidental appendectomy was associated with:
  - significant increase in operative time by ~ 8 minutes
  - with no increase in febrile morbidity

Recommend against
Intra-abdominal irrigation

- Irrigation with 500 to 1000 mL of normal saline solution versus no irrigation
- The rate of intraoperative nausea was significantly increased
- There were no other statistically significant differences in any parameter including infection

Recommend against
Peritoneal closure vs. non-closure

- Some trials focused specifically on parietal or visceral peritoneum closure, whereas others reported both together.

- Peritoneal non-closure:
  - less postoperative fever
  - less operating time
  - reduced hospital stay
  - 1 study of Misgav Ladach:
    - increased risk of intraabdominal adhesion

No recommendation
Sharp vs blunt needles

- Studies not only cesarean included.
- Use of blunt needles reduced number of percutaneous exposure incidents in surgical staff (glove perforations and needle stick injuries during operation)

Recommend, strongly

A, moderate
Reapproximation of rectus muscles

- Has not been studied separately in a trial.
- Most clinicians agree that the muscles find the right anatomic location by themselves

Insufficient evidence
Techniques of fascial closure

- Has not been studied in a trial at CS.
- Most experts suggest continuous nonlocking closure with delayed-absorbable suture
Irrigation of the subcutaneous tissue

- Intention of irrigation of the subcutaneous tissue is to minimize wound infections
- Has not been studied in a trial at CS.
Subcutaneous drain placement

- Subcutaneous drain placement, regardless of tissue thickness, does not appear to offer any additional benefit in reducing wound morbidity

Recommend against

D, high
Suture closure of subcutaneous tissue

- Suture closure of subcutaneous fat > 2 cm was associated with:
  - A significant decrease in wound disruptions
  - A significant decrease in seromas

Recommend, strongly

A, high
Closure of skin

- **Meta-analysis:**
  - Staple closure was associated with a 2-fold higher risk of wound infection or separation compared with subcuticular suture closure

- **Cochrane:**
  - Wound complications and cosmetic outcomes are similar among both groups.

No recommendation

C, moderate
# TABLE 4

**Recommended cesarean delivery techniques**

<table>
<thead>
<tr>
<th>Cesarean delivery techniques</th>
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<td>Expansion of uterine incision</td>
<td>Blunt, cephalad-caudad direction</td>
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<td>Oxytocin infusion (10-40 IU in 1 L crystalloid over 4-8 h)</td>
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<td>Placental removal</td>
<td>Spontaneous</td>
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<tr>
<td>Uterine exteriorization</td>
<td>Surgeon preference</td>
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<tr>
<td>Uterine closure</td>
<td>One-layer if future fertility undesired</td>
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<tr>
<td>Subcutaneous closure</td>
<td>Suture closure if ≥2 cm</td>
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<tr>
<td><strong>Not recommended</strong></td>
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<tr>
<td>Supplemental oxygen</td>
<td>Does not reduce morbidity from infection</td>
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</tr>
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