Sultanate of Oman
Ministry of Health
The Royal Hospital
Department of Obstetrics and Gynecology

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Title: Caesarian Section - Clinical Guideline

1.0 Introduction

Caesarean delivery or C-Section(CS) is defined as the delivery of a fetus through surgical incisions made through the abdominal wall (laparotomy) and the uterine wall (hysterotomy). It is a surgical procedure to resolve maternal or fetal complications not amenable to vaginal delivery.

2.0 Indications

The indications have expanded to consider the patient's wishes and preferences. The leading indications for cesarean delivery (85%) are previous cesarean delivery, breech presentation, cervical dystocia, and fetal distress.

2.1 Maternal indications for cesarean delivery include the following:

- Previous uterine scar – previous cesarean or myomectomy etc
- **Severe maternal disease** when labor is contraindicated e.g. increasing intrathoracic pressure generated by Valsalva maneuvers could lead to maternal complications. These include left heart valvular stenosis, dilated aortic valve root, certain cerebral arteriovenous malformations (AVMs), Severe cardiomyopathy and recent retinal detachment.
- **Obstructive lesions** in the lower genital tract, including
    - Malignancies
    - Large vulvovaginal condylomas
    - Obstructive vaginal septa
    - Leiomyomas of the lower uterine segment that interfere with engagement of the fetal head
- **Pelvic abnormalities** that interferes with the engagement and descent of the fetal presentation in labor

2.2 Fetal indications for cesarean delivery include the following:

- Abnormal CTG indicating foetalacidemia.
- Situations in which neonatal morbidity and mortality could be decreased by the prevention of any birth injury
- Malpresentations (eg, preterm breech presentations, non-frank breech term fetuses)
- Certain congenital malformations or skeletal disorders
- Infection e.g. Viral infections- Mothers with HIV with high viral load and primary HSV infection at term.

2.3 Indications for cesarean delivery that benefit mother and fetus include following:

- Abnormal placentation (eg, placenta previa, placenta accreta)
- Abnormal labor due to cephalopelvic disproportion
- Situations in which labor is contraindicated

2.4 Cesarean delivery on maternal request (CDMR)

CDMR requires individualized counseling by the obstetrician of the potential risks and benefits of both vaginal and cesarean delivery.

- Unless there are maternal or fetal indications for cesarean delivery, vaginal delivery should be recommended.
- CDMR should not be performed before 39 weeks' gestation (due to a potential risk of respiratory problems for the baby)
- CDMR is not recommended for women who want more children (due to the increasedrisk for placenta previa/accreta and gravid hysterectomy with each cesarean delivery)
- The nonavailability of effective analgesia should not be a determinant for CDMR
- CDMR has a potential benefit of decreased risk of hemorrhage for the mother and decreased risk of birth injuries for the baby

In some cases where woman requests a CS because she has anxiety about childbirth, offer referral to a healthcare professional with expertise in providing perinatal mental health support.

3.0 Contraindications

If the fetus has a known karyotypic abnormality (trisomy 13 or 18) or known congenital anomaly that may lead to death (anencephaly)

4.0 Timing of Planned CS

Time of planned CS to be decided balancing the risk of respiratory morbidity in fetus vs risk to mother for emergency CS if she starts labor. Incidence of respiratory morbidity is increased in babies born by CS before labor, but this risk decreases significantly after 39 weeks. Therefore, planned CS are preferred at 38- 39 weeks.

Optimal time of delivery is 38 weeks for women with 2 previous cesarean deliveries and 37 weeks for those with 3 or more.

4.1 Classification of Urgency

The urgency of CS should be documented to aid clear communication between healthcare professionals about the urgency of a CS:

1. Immediate threat to the life of the woman or fetus
2. Maternal or fetal compromise which is not immediately life-threatening
3. No maternal or fetal compromise but needs early delivery
4. Delivery timed to suit woman or staff

4.2 Decision-to-Delivery Interval for Unplanned CS

- Perform category 1 and 2 CS as quickly as possible after making the decision, particularly for category 1 preferably within 30 minutes
- Perform category 2 CS in most situations within 30 - 75 minutes of making the decision.

5.0 Preoperative management

5.1 Recommended preoperative **fasting** time

- Minimum of at least 2 hours from clear liquids.
- Six hours from a light meal
- Eight hours from a regular meal
- Follow ERAS protocol for patients scheduled under ERAS

5.2 **Consent-**to be taken from the woman after explaining indication of procedure and discussing all queries or concerns. Women can sign consent even

if husband is not present. Hospital staff should try to inform husband on phone.

Consent for CS should be requested after providing pregnant women with evidence-based information and in a manner that respects the woman's

dignity, privacy, views and culture, while taking into consideration the clinical situation. A pregnant woman is entitled to decline the offer of treatment

such as CS, even when the treatment would clearly benefit her or her baby's health. Refusal of treatment needs to be one of the woman's options.

When a decision is made to perform a CS, a record should be made of all the factors that influence the decision, and which of these is the most

influential.

5.3 Placement of **an intravenous (IV) line -** Infusion of IV fluids (eg,lactated Ringer solution or saline with 5% dextrose)

5.4 Placement of a **Foley catheter** (to drain the bladder and to monitor urine output)

5.5 Placement of an **external fetal monitor and monitors for the patient**'s blood pressure, pulse, and oxygen saturation

5.6 Preoperative **antibiotic prophylaxis** (decreases risk of endometritis after elective cesarean delivery by 76%)

5.6.1Timing of antibiotic administration

- Prophylactic antibiotics at CS to be given before skin incision within one hour
- Cefazolin 2 gm I/V stat single dose
- Cefazolin 3 gm I/V stat single dose if women weighs > 120 Kg
- Dose repeated if surgery continues more than half life of drug i.e. 2 hours
- Antibiotic therapy to be continued or broader-spectrum antibiotics to be added in the postoperative period

Patients allergic to penicillin can be given injection vancomycin 1 gm 12 th hrly.

5.7 **Pre-medications** To reduce the risk of aspiration pneumonitis, women should be offered antacids and drugs (such as H_2 receptor antagonists or

proton pump inhibitors) to reduce gastric volumes and acidity before CS.

5.8 **Laboratory testing**

The following laboratory studies may be traced / obtained prior to cesarean delivery if recent results are not available

- Complete blood count
- Blood type and screen if not done before. Crossmatch if indicated
- Confirm reports of Screening tests for human immunodeficiency virus, hepatitis B, syphilis
- Coagulation studies (eg, prothrombin and activated partial thromboplastin time, fibrinogen level) if indicated

5.9 Imaging studies- If no recent report available

Ultrasonography - to document fetal position and estimated fetal weight, placental location.

6.0 Anaesthesia for Cesarean delivery

- All women planned for elective caesarean deliveries should be sent to pre-anaesthetic clinic [PAC] prior to surgery for evaluation.
- Women who are having a CS should be offered regional anesthesia because it is safer and results in less maternal and neonatal morbidity than general anesthesia. This includes women who have a diagnosis of placenta praevia.

- The 3 main regional anesthetic techniques are spinal, epidural, and combined spinal epidural. Every patient is evaluated for general anesthesia in case an emergency should arise and establishment of an airway becomes necessary.

- Women who are having a CS under regional anesthesia should be offered intravenous ephedrine or phenylephrine, and volume preloading with crystalloid or colloid to reduce the risk of hypotension occurring during CS.
- Pregnant women having a CS should be given information on different types of post-CS analgesia so that analgesia best suited to their needs can be offered (see recommendations below under Pain Management after CS
- General anesthesia for unplanned CS should include preoxygenation, cricoid pressure, and rapid sequence induction to reduce the risk of aspiration.
- Intravenous ephedrine or phenylephrine should be used in the management of hypotension during CS.
- The operating table for CS should have a lateral **tilt of 15°,** because this reduces maternal hypotension.

7.0 Technique for Cesarean delivery

The cesarean delivery includes the following steps:

- Laparotomy via or transverse (eg, Pfannenstiel) incision or rarely vertical midline
- Hysterotomy via a transverse (Monroe-Kerr) or rarely vertical incision

- Fetal delivery
- Uterine repair
- Closure

Technique

7.1 Overview

The anesthesiologist monitors the patient's vital signs and tracks fluid intake and urine output. The average blood loss associated with a cesarean delivery is approximately 1000 ml.A patient at term will have up to a 50% expansion in their blood volume and can lose up to 1500 mL without showing any change in vital signs. If a significant blood loss is encountered or anticipated, assess the hemoglobin level and cross-match blood.

7.2 Laparotomy

Transverse incision through the lower abdomen – most common, and can provide excellent visualization of the pelvis. The incision is more commonly Pfannenstiel incision and others are Maylard or Joel Cohen

Advantage of Transverse incisions

- Usually less painful
- Smaller risk of developing an incisional hernia
- Preferred cosmetically
- Less blood loss
- Shorter operating time and shorter time from skin incision to birth of the baby
- Reduced time to oral intake,
- Less risk of fever
- Shorter duration of postoperative pain, lower analgesic requirements,

The **Pfannenstiel incision** is curved slightly cephalad approximately 2-3 cm above the symphysis at the level of the pubic hairline. The incision extends 10 to 12 cm i.e slightly beyond the lateral borders of the rectus muscle bilaterally. Rectus sheath is opened transversely, rectus muscles are separated in the midline, and the peritoneum is entered.

A **Maylard incision** involves a transverse incision of the anterior rectus sheath and the medial two thirds of each rectus muscle bilaterally. The transversalis fascia and peritoneum are identified and incised transversely.

The Maylard incision with transection of the rectus muscles is associated with increased blood loss.

The **Joel Cohen incision** is a straight transverse incision made 3 cm below the level of a straight line joining the anterosuperior iliac spines. A 3-4 cm incision is made in the fascia and bluntly opened by stretching in a craniocaudal fashion. The rectus muscles are retracted laterally and the parietal peritoneum is bluntly opened by digital dissection. Blunt dissection tends to be associated with reduced blood loss.

7.3 Hysterotomy

- The uterus is palpated and correct dextrorotation if needed
- Creating a bladder flap, dissect the bladder free of the lower uterine segment at loose uterovesical peritoneum(not always necessary especially if nonlabored patient)

7.3.1 Choice of incisiona transverse (Monroe-Kerr) in >90% of cesarean deliveries or a vertical (Kronig or DeLee) incision is based on several factors,

including fetal presentation, gestational age, placental location, and presence of a well-developed lower uterine segment.

7.3.2 Site of incision - 1-2 cm above the original upper margin of the bladder. The initial incision is small and is continued into the uterine wall until either

the fetal membranes are visualized or the cavity is entered (with care taken not to injure the underlying fetus, especially in well-labored patients with

thinned out lower uterine segments).

7.4 Delivery of Fetus - The presenting part of the fetus is identified, and the fetus is delivered either as a vertex presentation or as a breech. Pair of

outlet forceps or Vacuum cup can be used to extract high head.

7.4.1 Incision to delivery time

Longer incision to delivery times are associated with worsening neonatal outcomes especially in previously compromised fetuses

7.4.2 Delivery of the impacted fetal head. The impacted fetal head can be delivered either through pushing the head up from the vagina and elevating it

up through the incision or by pulling it up as if it were a breech delivery.

After the fetus is delivered, the umbilical cord is doubly clamped and cut. Blood is obtained from the cord for fetal blood typing, and a segment of cord is placed aside for obtaining blood gas results if a concern exists regarding fetal status.

After delivery of baby oxytocin (20 U) is placed in the intravenous (IV) fluid to increase contractions of the uterus.

7.5 Delivery of Placenta

Awaiting spontaneous delivery of the placenta with gentle traction is associated with decreased blood loss, lower risk of endometritis, and lower maternal exposure to fetal red blood cells, which can be important to Rh-negative mothers delivering a Rh-positive fetus.

If there is active bleeding then the placenta is usually delivered manually as spontaneous separation is time consuming.

7.6 Repair of Uterus

The uterine cavity is usually wiped clean of all membranes with a dry sponge. A clamp is placed at the angles of the uterine incision. The incision is inspected for other bleeding vessels, and any extensions of the incision are evaluated. Inspect the bladder and lower segment inferior to the incision.

Repair of a low transverse uterine incision can be performed in 2-layer with vicryl 1-0 suture.

The first layer should include stitches placed lateral to each angle, with prior palpation **of the location of the lateral uterine vessels.**

A second layer (Lembert stitch) to imbricate the incision.

For two-layer closure the first layer includes the deep myometrial edge with minimal decidua. A continuous suturing of the uterus is more hemostatic. The second layer completes the myometrial approximation and hemostasis. Locking this layer is not necessary but extra hemostatic sutures may be required if bleeding persists. The second layer effectively buries the first layer to maintain the scar integrity and prevent future deficiency.

Closure of a vertical incision usually requires several layers because the incision was made through a thicker portion of the uterus. Again, a heavy suture material is used, and usually the first layer closes the inner half of the incision, with a second and possibly a third layer used to close the outer half and serosal edges. The extent of a vertical uterine incision influences how a patient should be counseled regarding future pregnancies

7.7 Closure of abdomen

- The uterine incision is re-inspected for hemostasis, and the bladder flap is also inspected. The paracolic gutters are visualized& cleaned.
- Visceral peritoneum is not closed. Parietal peritoneum is closed.

According to international guidelines neither the visceral nor the parietal peritoneum should be sutured at CS.But studies conducted in Royal hospital supports closing of parietal peritoneum as it prevents intraperitoneal adhesions.

- Rectus muscles if wide apart are approximated & rectus sheath closed with Vicryl 1-0 sutures 1-cm intervals and more than 1 cm away from the incision line.
- The subcutaneous tissue should be inspected for hemostasis and patients with subcutaneous depth greater than 2 cm may benefit from subcutaneous tissue closure. Placement of drains does not appear to aid in decreasing the risk of surgical site infection.
- The skin edges can be closed either with a subcuticular stitch or with staples (removed 3 or 4 d postoperatively).

8.0 Post-Procedure

8.1 Postoperative Care in recovery room

Observation - In the recovery room, vital signs are taken every 15 minutes for the first 1-2 hours, and urine output is monitored on an hourly basis. In addition to routine assessment, palpate the fundus to ensure that it feels firm and check amount of vaginal bleeding.

Analgesia -If the patient had regional anesthesia, they usually receive a long-acting analgesic with the regional anesthetic. Therefore, pain control is usually not an issue in the first 24 hours.

8.2 Postoperative care in ward

When patients recover sensation after a regional anesthetic and vital signs have been stable with minimal vaginal bleeding, they can be taken to their

room.

8.2.1 Observation Vital signs should be taken every hour for at least the first 4 hours—again, with particular attention paid to urine output.

8.2.2 I/V fluids -Overall, a patient should receive approximately 3-4 L of IV fluid from the initiation of IV fluid replacement through the first 24 hours. The\

patient can be started on clear liquids in 2-4 hours after an uncomplicated procedure, and diet can be advanced accordingly. When the patient is

able to tolerate good oral intake, the IV fluids may be stopped.

8.2.3 Analgesia – Refer to postoperative pain management guideline.

If a patient did not receive a long-acting analgesic or had general anesthesia, administer narcotics either intramuscularly (IM) or intravenously (IV), on

schedule or with a basal rate supplemented with patient-controlled boluses. When the patient is tolerating liquids, administer narcotics orally as

needed.

8.2.4 Bladder catheter can be removed 12-24 hours postoperatively once the patient is ambulatory. If the patient is unable to void in 6 hours, consider

replacing the Foley for an additional 12-24 hours.[Follow ERAS guidelines for ERAS patients]

8.2.5 Thromboprophylaxis as per guideline

8.2.6 Ambulation - On the first postoperative day, encourage the patient to ambulate.Increase ambulation every day as tolerated by the patient.

8.2.7 Dressing can be removed 24-48 hours after surgery and can be left open after that time.

8.2.8 Blood count is checked 48 hours after surgery, or sooner if a greater than average blood loss has occurred.

8.2.9 Breastfeed started as soon as possible after delivery usually in recovery room.

8.2.10 Maternal contact (skin-to-skin) Early skin-to-skin contact between the woman and her baby should be encouraged and facilitated because it

improves maternal perceptions of the infant, mothering skills, maternal behavior, and breastfeeding outcomes, and reduces infant crying.

8.2.11 Discharge If the patient has recovered well postoperatively, she can bedischarged safely 3-4 days after surgery.

Before discharge, a discussion about contraception should take place. Stress that even if a mother is breastfeeding, she still can conceive. Ask

patients to refrain from intercourse for 4-6 weeks post partum.

9.0 Complications

Major sources of morbidity and mortality

- Sequelae of infection,
- Thromboembolic disease,
- Anesthetic complications,
- Surgical injury

9.1 Intraoperative complications

9.1.1Uterine lacerations, extend laterally or inferiorly. While repair identify the uterine vessels in lateral extensions, and the

ureters when repairing inferior extensions.

9.1.2 Bladder injury is an infrequent complication; it is more common with transverse abdominal incisions and in repeat cesarean deliveries.

The bladder most commonly is injured during entry into the peritoneal cavity or when the bladder is separated from the lower uterine segment.

Bladder injury occur in more than 10% of uterine ruptures and in approximately 4% of cesarean hysterectomies.

If the dome of the bladder is lacerated, it can be repaired simply with a 2-layer closure of 2-0 or 3-0 vicryl sutures, with the Foley catheter left in place

for 7-10 days.

If the bladder is injured in the region of the trigone, consider ureteral catheterization with assistance from a urologist.

9.1.3 Injury to the ureter occurs in up to 0.1% of all cesarean deliveries and up to 0.5% of cesarean hysterectomies. It is most likely to occur in the repair of

extensive lacerations of the uterus. Ureteral injury, most commonly occlusion or transection, is usually not recognized during the time of the operation.

If recognized Urologist assistance is indicated.

9.1.4 Bowel injuries occur in less than 0.1% of all cesarean deliveries. The most common risk factor for bowel injury at the time of cesarean delivery is

adhesions from prior cesarean deliveries or prior bowel surgery.

Injuries to the serosa can be repaired with interrupted sutures. If the injury is into the lumen, perform a 2-layer closure. The mucosa can be closed with

interrupted 3-0 absorbable sutures placed in a transverse fashion for a longitudinal injury. For multiple injuries and injury to the large intestine, consider

intraoperative consultation with a general surgeon or colorectal surgeon.

9.1.5 Uterine atony is common in patients with a multiple gestation, polyhydramnios, or a failed attempt at a vaginal delivery in which the patient was on

oxytocin augmentation for a prolonged period(Management as in PPH guideline)

9.2 Postoperative complications

9.2.1 Postpartum endomyometritis is 20-fold higher than with a vaginal delivery. The post cesarean rate of endomyometritis can be decreased to

approximately 5% with the use prophylactic antibiotics.

Major risk factors for endomyometritis include emergency cesarean delivery, socioeconomic status of the patient, duration of membrane rupture,

duration of labor, number of pelvic examinations, length of time with internal fetal monitors in place, and the presence of chorioamnionitis prior to

initiating cesarean delivery. Blood cultures are positive in approximately 10% of patients with postoperative febrile morbidity, and broad-spectrum

antibiotics should be used.

9.2.2 Wound infection occur at a rate of approximately 7% after cesarean section when prophylactic antibiotics are not givenand this incidence is reduced to

2% with the use of prophylactic antibiotics. If chorioamnionitis is present at the time of the procedure, the risk for a wound infection can be as high as

20%. Wound infections that occur after cesarean section include endomyometritis, pelvic abscess, incisional abscess, and wound cellulitis. The

antibiotic of choice for each infection depends on the location of the infection and the suspected pathogen.

9.2.3 Fascial dehiscence is an infrequent complication in approximately 5% of patients with a wound infection and is suggested when excessive discharge

from the wound is present. If a fascial dehiscence is observed, the patient should be taken immediately to the operating room, where the wound can be

opened, débrided, and reclosed in a sterile environment.

9.2.4 Urinary tract infection (UTI): The incidence ranges from 2-16%, and the process of placing an indwelling catheter for the surgery is a risk factor in

itself. The incidence of UTIs is increased in patients with diabetes, those who have other comorbidities, and those who have a longer duration of use of

the indwelling catheter.

9.2.5Thromboembolic complications: Approximately 0.5-1 in 500 pregnant women experience deep venous thrombosis (DVT) The risk for developing a

thrombus is increased 3- to 5-fold with a cesarean delivery and in the postpartum period. Other risks include obesity, advanced maternal age, higher

parity, and poor postoperative ambulation.

Management – Refer to Guideline for Treatment of Venous thromboembolism.

9.2.6 Septic pelvic thrombophlebitis: As 2% of patients with an endomyometritis or wound infection can develop this complication, and it is largely a

diagnosis of exclusion. Suspect this diagnosis if a patient fails to respond initially to broad-spectrum antibiotics.

Physical examination may detect a tender cordlike mass lateral to the uterus. Ultrasonography, pelvic computed tomography (CT) scanning, or magnetic

resonance imaging (MRI) may aid in the diagnosis.

10.0 Long-Term Monitoring

After a cesarean delivery, the patient can be observed as a patient who delivered vaginally.

11.0 References

1. National Institute for Health and Clinical Excellence (NICE). Caesarean section. London (UK): National Institute for Health and Clinical Excellence (NICE);Clinical guideline [CG132]Published date: 23 November 2011 Last updated: 04 September 2019

2. The American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) have released joint guidelines for the safe prevention of primary cesarean delivery. Updated: Feb 24, 2016

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