CAESAREAN SECTION OR VAGINAL DELIVERY IN THE 21ST CENTURY

Until the 20th Century, caesarean section (C/S) was a feared operation. The ubiquitous classical uterine incision meant high maternal mortality from bleeding and future uterine rupture. Even with aseptic surgical technique, sepsis was common and lethal without antibiotics. The operation was used almost solely to save the life of a mother in whom vaginal delivery was extremely dangerous, such as one with placenta previa. Foetal death and the use of intrauterine foetal destructive procedures, which carry their own morbidity, were often preferable to C/S.

With the advent of Munro Kerr's lower-segment uterine incision and the discovery of antibiotics in the second half of the 20th century, the safety of C/S improved dramatically. As maternal risk dropped, C/S gained routine use for foetal indications. Debates arose as to how small a level of foetal risk warranted the maternal risk of C/S; and routine C/S for breech presentation, for example, became commonplace.

Modern refinements in C/S technique have improved safety further. Regional anaesthesia, antibiotic chemoprophylaxis, oxytocin, secondary ebolics, crystalloid resuscitation and blood transfusion have reduced mortality and morbidity to very low levels. As C/S has become safer, tolerance for foetal risk during labour has decreased and C/S rates have increased dramatically around the world. The average C/S rate in 24 OECD countries in 2011 was 26% and it was over 40% in Turkey, Mexico and Brazil. C/S is now so safe that some affluent women are being offered and are seeking elective C/S without indication. The downstream effects of this are only beginning to be appreciated. In the United States, for the first time in history, maternal mortality and morbidity are increasing (1).

Maternal Risks

Maternal mortality and morbidity is approximately five times greater with caesarean than with vaginal birth: specifically, the risks of hemorrhage, sepsis, venous thromboembolism and amniotic fluid embolism. The absolute risk of death with C/S in high and middle-resource settings is between 1/2000 and 1/4000 (2, 3). In subsequent pregnancies, the risk of placenta previa, placenta accreta and uterine rupture is increased. These conditions increase maternal mortality and severe maternal morbidity cumulatively with each subsequent C/S. This is of particular importance to women having large families.

Maternal Benefits

C/S has a modest protective effect against urinary stress incontinence later in life (4). Approximately 10% of women who have delivered vaginally will have moderate to severe urinary stress incontinence compared with 5% of women who have delivered by C/S: a reduction of 5%, meaning 20 C/S would need to be performed to prevent one case of moderate to severe urinary incontinence.

Neonatal Morbidity and Mortality

C/S can be a life-saving operation for a foetus in jeopardy. Paradoxically, however, countries with higher C/S rates now have higher rates of neonatal morbidity and mortality. Iatrogenic late preterm and early term deliveries carry a significant risk of neonatal pulmonary complications, particularly for infants born by C/S without labour. Compliance with recommendations to delay pre-labour C/S until 39 weeks gestation is variable and iatrogenic prematurity remains a significant cause of neonatal morbidity and mortality. A higher rate of stillbirth in pregnancies after C/S also contributes to an increase in perinatal mortality.

Childhood Considerations

Transition from sterile foetal life to newborn life involves rapid epithelial colonization with micro-organisms. Contact with the maternal vagina during labour and maternal skin post-partum exposes the foetus to the normal maternal microbial flora. The maternal immune system has a symbiotic relationship with this microbiome. Maternal immune globulins are transferred antenatally, trans-placentally to the foetus, preparing the foetus to adopt its mother's microbiome. C/S interferes with neonatal exposure to maternal vaginal and skin flora, leading to colonization with other environmental microbes and an altered microbiome. Routine antibiotic exposure with C/S likely alters this further.

Microbial exposure and the stress of labour also lead to marked activation of immune system markers in the cord blood of neonates born vaginally or by C/S after labour. These changes are absent in the cord blood of neonates born by pre-labour C/S. Immunological diseases including asthma, atopic dermatitis and celiac disease are more common in children born by pre-labour C/S compared with those exposed to labour. The mechanisms through which C/S may cause these differences are not well understood; however, optimal establishment of the early microbiome and priming of the neonatal immune system appear to have long-term effects on childhood health. Animal studies suggest that disruption of this process has negative direct and epigenetic effects on later metabolism and immune system function (5).

Indications for C/S

Analyzing indications for C/S is difficult. Labour is a dynamic process involving varying levels of risk and many foetal, placental and maternal factors. Clinician and maternal preference also play an increasing role in decisions about delivery.

In 1996, Michael Robson published an innovative system to classify C/S. Birthing women are grouped into ten mutually exclusive groups based on objective, routinely recorded obstetrical parameters. The number of women in each group is recorded as well as the C/S rate for each group, allowing groups with high C/S rates to be identified, as well as their contribution to the overall C/S rate based on the size of the group. This system has been used to analyze C/S rates around the world, revealing a wide variation in rates, but common themes (6). In high-resource settings, most C/S are performed in three groups of birthing women:

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parous women with a history of a prior C/S; nulliparous women in spontaneous labour; and nulliparous women being induced. Efforts to reduce C/S rates using the Robson Ten Group Classification System typically concentrate on these three groups (7).

Reasons for increasing C/S rates:

For decades, the WHO has specified 15% as the ideal C/S rate, yet rates around the world keep climbing. Many factors are responsible, including:

- Decreasing tolerance for foetal risk (e.g. routine C/S for breech presentation);
- Decreasing tolerance for perineal trauma (C/S instead of forceps delivery);
- Over-estimation of risk with labour after prior C/S (decreased VBAC rates);
- Lack of access to doula support in labour;
- Loss of obstetrical skills among obstetricians (vaginal breech; operative vaginal delivery; vaginal twin delivery);
- Use of electronic foetal monitoring without access to foetal scalp sampling (C/S for false positive atypical or abnormal foetal heart rate);
- Increasing maternal obesity;
- Increasing induction of labour (convenience, avoidance of post-dates risk);
- Increasing use of epidural analgesia with inadequate labour augmentation;
- Maternal preference (scheduling, fear, avoidance of labour, convenience); and
- Obstetrician preference (scheduling, income generation).

Reducing C/S rates

With so many factors at play in modern obstetrics, the concept of an "ideal" C/S rate seems outdated. Among OECD nations, only Holland and Scandinavia maintain C/S rates near 15%. However, C/S carries greater risk and cost than vaginal birth; and efforts to safely avoid unnecessary cesareans are warranted from the perspectives of beneficence and justice.

Currently, many women desiring a vaginal birth who could achieve one deliver instead by C/S. Those with a breech foetus, a deep transverse arrest, or a history of a prior C/S often do not have access to an obstetrician or setting that can or will provide a vaginal birth. Although the presence of a doula in labour reduces the chance of C/S, few women around the world have access to one. Instead, epidural analgesia, which interferes with the progress of normal labour, is used ever more frequently. Maternal obesity increases the risk of C/S; and average or excessive weight gain during pregnancy in obese women increases that risk further. Improvement in labour management has the potential to avoid C/S by confirming abnormal electronic foetal monitoring and assiduously augmenting women laboring with epidural analgesia before resorting to surgical delivery.

Although C/S solely based on maternal choice occurs, it accounts for a small portion of the overall C/S rate. Within the bounds of maternal autonomy, there is opportunity in many jurisdictions to reduce the number of C/S.

Summary

In 21st century high-resource settings, C/S has become safe enough to allow a rapid expansion in accepted indications and a dramatic increase in its frequency. The reasons for this increase are multifactorial. For many, C/S provides a relatively safe way of avoiding small degrees of foetal and/or maternal risk. For others, compared with the effort required for vaginal birth, elective C/S has become an easy way out - an efficient, predictable, if expensive means of delivery.

It is clear that C/S can be life-saving; however it is also clear that many unnecessary caesareans are performed. Compared with vaginal delivery, C/S involves increased maternal risk, financial cost and sometimes foetal risk. Most women desire a normal vaginal birth. We have an ethical duty to help them achieve one.

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