New developments Reducing complications associated with a deeply engaged head at caesarean section: a simple instrument

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Key content:
- There has been a disproportionate increase in caesarean section performed in the second stage of labour in the last few years.
- Difficult delivery of the fetal head during caesarean section carries a higher risk of complications for both mother and baby.
- The sentinel audit report published by the Royal College of Obstetricians and Gynaecologists recommends a consultant presence when caesarean section is performed at full dilatation.

Learning objectives:
- The obstetrician needs to anticipate the possibility of difficult delivery of the fetal head during caesarean section.
- Using an assistant to push the fetus can cause trauma, as the force required to push is uncontrolled.
- The Foetal Disimpacting System® seems to be effective in elevating the fetal head when it is deeply engaged.

Ethical issues:
- There is a need for more data before the fetal disimpacting device is adopted in routine obstetric practice.
- Use of this device when preparing for an emergency caesarean section, for instance in a situation of umbilical cord prolapse, might be justified.

Keywords caesarean section / deeply engaged head / delivery complications / failed instrumental delivery / fetal disimpacting device
New developments

The device described in this article is manufactured by Safe Obstetric Systems UK Ltd (Essex, UK), which is owned by Rajiv Varma. While we would not normally include an article which describes one manufacturer’s device alone, this section aims to highlight new developments in our practice and, as such, this device is showing a novel technique which has the potential to save lives.

Introduction

The incidence of caesarean section has risen steadily in the last two decades: in most developed countries the incidence is now around 25%. The high rate of caesarean section is now regarded as a major public health problem. This concern is well placed, because it is likely that this upward trend will continue.

The reasons for the increased rates are complex: safety of the operation leading to complacency, relative lack of skill in younger obstetricians, fear of litigation and pressure from the consumer have all been cited. There has been a disproportionate increase in caesarean section being performed in the second stage of labour in the last few years.

Preferential use of ventouse, particularly the Kiwi™ OmniCup vacuum delivery system (Clinical Innovations Europe Ltd, Oxon, UK), over forceps delivery might also have played a role in the increase in caesarean section in the second stage, due to a significantly higher failure rate.

Deeply engaged head at caesarean section

The true incidence of a caesarean section with a deeply engaged head is unknown but it probably accounts for 25% of all emergency caesarean sections. Women who have had a failed instrumental delivery followed by caesarean section in late labour account for most of these cases. It may also be as a consequence of deep transverse arrest, arrest in the occipitoposterior position and unanticipated cephalopelvic disproportion late in labour. A relatively smaller number of caesarean sections in early labour and those performed electively might also occasionally have a deeply engaged head. Contributory factors are listed in Box 1.

Caesarean section in late labour or at full dilatation with reduced liquor and an engaged fetal head is a difficult procedure and carries a higher risk of complications for both mother and baby. This is reflected in a high rate of extension of the uterine incision (a rate of up to 35% has been reported). The extensions occur due to excessive manipulation that might be required to deliver the fetal head when the lower uterine segment is already thin, oedematous and overstretched. This results in higher rates of major obstetric haemorrhage, injury to uterine vessels, trauma to the urinary tract and an increased length of hospital stay.

The risks for the fetus include difficulty in delivering the fetal head, leading to delay between uterine incision and delivery in an already compromised fetus, and direct fetal trauma resulting from attempts at extracting a deeply engaged head from the pelvis, such as skull fractures, cephalhaematoma and subgalea haematoma.

Techniques described for the delivery of a deeply engaged head

The difficulty in delivering the fetal head arises because of lack of space between the bony pelvis, pelvic soft tissues and the fetal head and the degree that the head has moulded into the pelvis. This lack of space makes it difficult for the surgeon to insert their hand to dislodge the fetal head from the pelvis. Several techniques have been reported in the literature for delivery of a deeply engaged head:

• Use of an assistant to push up the fetal head vaginally when attempts to deliver abdominally have failed. It is important that the push is only applied when the uterus is not contracting. This may lead to a significant delay in uterine incision to delivery time. It can also be associated with direct fetal trauma due to uncontrolled force used by the assistant to dislodge the head from below.

• Abdominovaginal delivery has been described by Landesman. The woman is placed in the Whitmore position (a modified lithotomy position where the thighs are moderately abducted and flexed to an angle of approximately 135 degrees relative to the trunk) and an assistant introduces their hand into the vagina to push the head up, the surgeon at the same time places an upward traction on the shoulders to help in dislodging the head.

• Breech extraction can be achieved if a high transverse incision is made or a J-shaped extension is made to the normal lower segment incision. Extension of the incision is very common with this manoeuvre. Anticipating difficulty and making a vertical incision is the ideal course of action when attempting a breech extraction.

• A prospective randomised trial reported by Fasubaa et al suggested a lower risk of fetal and maternal injury when the fetus was delivered by pull method as compared to the push method.

All these techniques rely on extensive experience that is often not immediately available on the labour ward. Caesarean sections are usually performed by the doctors in training who are unlikely to be experienced enough to deviate from the normal techniques of performing a caesarean section. The sentinel audit report published by the
Royal College of Obstetricians and Gynaecologists recommended a consultant presence when caesarean section is performed at full dilatation."

Anticipation of a difficult delivery at caesarean section is important. Failed instrumental delivery, occipitoposterior position, secondary arrest in labour and excessive moulding should alert the obstetrician to the possibility of this complication occurring. A careful abdominal palpation and bimanual examination to assess the engagement of head could further help to predict the difficulty in the delivery of fetus by caesarean section. The simple device shown in Figure 1, used in this situation prophylactically, could reduce some the complications associated with a deeply engaged head that can lead to serious maternal and fetal morbidity. It could also be used instead of an assistant to elevate the fetal head when attempts to delivery the head during caesarean section have failed.

The Foetal Disimpacting System® is manufactured by Safe Obstetric Systems UK Ltd (Essex, UK). It consists of a base plate 11 cm long and 4.5 cm wide, foldable along the midline of the short axis towards the superior surface, to which a balloon is attached. The balloon is attached through a connector to a tube 80 cm in length that is in turn attached to a 60 ml syringe through a two-way connector.

It is inserted vaginally below the fetal head at the time of inserting a Foley catheter or after a failed attempt at an instrumental delivery. Before insertion, the device is filled with 40 ml of normal saline. The saline is aspirated along with any air in the system then the device is ready for use (Figure 2). It is folded along its short axis and aligned so that the fold of the device is in the anteroposterior diameter of pelvis, and inserted using generous amount of obstetric cream (the process is no different from inserting a ventouse cup). Once in the vagina, the device is placed posteriorly, like a ventouse cup for an occipitoposterior position.

Once inserted, the woman’s legs are straightened (this closes the vaginal opening and prevents the downward movement of the base plate) and she is prepared for caesarean section. The time taken for this manoeuvre is around 30 seconds. An assistant uses between 100–120 ml of saline to inflate the balloon using a syringe. The inflation is maintained only for a short time just before making the uterine incision and delivery of fetus.

Ultrasonographic examination was performed transabdominally with the woman in a supine position. The fetal skull was identified with anterior and posterior tabula clearly depicted in the imaging plane. The ultrasound probe was held at a constant angle during the entire procedure by the operator and hard copies of images were taken. The device was inserted by an assistant and inflated with 120 ml of normal saline and the image seen at the 60 ml syringe and tubing.

The base plate straightens and opens to become flat against the pelvic floor during the inflation process. The balloon inflates and gently elevates the fetal head 2–3 cm from its position, making it easier to deliver. As soon as the delivery is achieved, the balloon is deflated and can be removed after finishing the caesarean section: the device can be gently pulled out using the attached tubing or by hooking a finger into the base plate.

We carried out a pilot study in 30 women in advanced labour with a deeply engaged head at the Institute of Obstetrics and Gynaecology and Government Hospital for Women and Children, Chennai, India. The indications for caesarean section are detailed in Table 1. Ethical approval was obtained and an informed consent was received from all the participants. The device was inserted in the manner described and ultrasound was used after the insertion and during the inflation to see the movement of fetal head. For the purpose of this study and to allow for scanning, the balloon was inflated before making the skin incision. Women requiring an urgent or emergency caesarean section were excluded from the trial.

Indication for caesarean section

<table>
<thead>
<tr>
<th>Indication</th>
<th>Women (n)</th>
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<tbody>
<tr>
<td>8–10 cm failed progress</td>
<td>6</td>
</tr>
<tr>
<td>Failed forceps delivery (midcavity)</td>
<td>3*</td>
</tr>
<tr>
<td>Failed forceps delivery (rotational)</td>
<td>6</td>
</tr>
<tr>
<td>Failed ventouse delivery</td>
<td>12</td>
</tr>
<tr>
<td>Excessive moulding</td>
<td>3</td>
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*2 in the occipitoposterior position

Table 1: Indications for caesarean section in 30 women in advanced labour with a deeply engaged head
scan was printed. The two images were compared and change in position of fetal head was measured in centimetres using a ruler.

A mean elevation of 3 cm was achieved with fluid volumes of 60–120 ml. There was no device expulsion and the fetal head was delivered with ease in all women. Both the vagina and fetal head were examined carefully after the caesarean section to look for trauma and none was seen.

**Conclusion**

The risks related to caesarean section in advanced labour are significant and this simple device seems to be effective. The initial experience is small but promising and further, larger trials are required. This device could also be used when cord prolapse has occurred, to elevate the fetal head and relieve the pressure on the cord before performing caesarean section. It could also have an application in and potentially increase the success rate of external cephalic version by lifting the breech from beneath. A prospective randomised trial of its use in caesarean section with a deeply engaged head is presently underway.

**References**