

# Maternal and perinatal morbidity after Caesarean delivery at full cervical dilatation

Pandian Radha<sup>1</sup>, MBBS, MRCOG, Shephali Tagore<sup>1</sup>, MD, MRCOG, Muhammad Fairuz Abdul Rahman<sup>1</sup>, MBBS, John Tee<sup>1</sup>, MMed, FAMS

**INTRODUCTION** This study aimed to assess maternal and perinatal outcomes following second stage Caesarean sections.

**METHODS** A retrospective study was conducted in a Singapore-based tertiary referral centre from January 1, 2009 to December 31, 2009. The medical records of all the women who underwent emergency Caesarean sections in the second stage of labour were reviewed.

**RESULTS** Out of 2,501 emergency Caesarean sections performed, 116 were Caesarean sections in the second stage of labour. Women with non-vertex, twins and preterm deliveries were excluded, and 110 (4.4%, 110/2,501) Caesarean sections were recruited. The majority of the Caesarean sections were determined and performed by registrars or consultants. With regard to maternal outcome, 2.7% (3/110) of patients had primary postpartum haemorrhage and 4.5% (5/110) of patients had vertical or lateral lower uterine segment tears. As for neonatal outcome, although the Apgar scores of newborns were low at birth for 8.2% (9/110) of patients, the Apgar score was > 4 at 5 minutes for all patients.

**CONCLUSION** Overall, there was no statistically significant adverse maternal or perinatal outcome.

*Keywords: Caesarean section, maternal morbidity, perinatal morbidity*  
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## INTRODUCTION

The rising trend of delivery by Caesarean section is a major concern in many regions. In developed countries, births by Caesarean section account for nearly 25% of all deliveries. For instance, Caesarean deliveries in NHS hospitals in England during 2007–2008 and 2008–2009 were both 24.6%,<sup>(1)</sup> and in Wales hospitals, 26.6% of all deliveries during 2008–2009 were by Caesarean section.<sup>(2)</sup> Interestingly, Black et al, who also reported an overall increase in Caesarean sections (including second stage Caesarean section), attributed this trend mainly to a reduction in the number of instrumental deliveries being performed.<sup>(3)</sup>

Allen et al found that maternal operative trauma and perinatal asphyxia were significantly increased in women undergoing Caesarean section at full cervical dilatation compared to Caesarean section at less than full dilatation.<sup>(4)</sup> Moreover, maternal morbidity may be higher when a Caesarean section is done during the second stage of labour, as it is more difficult, especially in cases of malposition (such as in the occipitoposterior position), cephalopelvic disproportion (CPD) or after attempted instrumental delivery. The major maternal risks that lead to increased maternal morbidity and mortality during second stage Caesarean sections include major haemorrhage, trauma to the surrounding structures (such as the bladder, bowel and urethra), lacerations of the lower segment and involvement of the broad ligament.

As the number of Caesarean sections remains alarming and significant, it would be beneficial to shift additional focus on to increasing the number of instrumental deliveries during the

second stage of labour with optimum selection of patients, so as to reduce not only second stage Caesarean sections but also its associated complications. However, to encourage instrumental delivery during the second stage, it would be necessary to ensure that there is not much difference in maternal and perinatal outcomes irrespective of whether instrumental delivery has been attempted prior to second stage Caesarean sections or not.

In general, difficult instrumental deliveries are associated with foetal trauma (such as cerebral haemorrhage, fracture or brachial plexus injuries) and maternal trauma (such as third and fourth degree tears, and lower uterine segment tears in patients with previous Caesarean sections, which may, rarely, end up in hysterectomy). For instance, Murphy et al, who looked into the maternal and neonatal outcomes associated with instrumental deliveries in operating theatres and Caesarean sections at full cervical dilatation,<sup>(5)</sup> found that maternal morbidity for immediate Caesarean section did not differ much from failed vaginal instrumental delivery, and that neonatal trauma was greater after failed vaginal delivery but still less than that of a successful vaginal instrumental delivery. Such complications are associated with medico-legal issues as well. Not surprisingly, many obstetricians prefer not to attempt difficult instrumental deliveries – as failed trials of instrumental deliveries are reported to be associated with increased foetal and maternal morbidities – and opt for immediate Caesarean section instead.

For these reasons, it is vital that the requisite vaginal assessments and decision-making regarding the mode of

<sup>1</sup>Department of Obstetrics and Gynaecology, KK Women's and Children's Hospital, Singapore

**Correspondence:** Dr Pandian Radha, Senior Service Registrar, KK Women's and Children's Hospital, 100 Bukit Timah Road, Singapore 229899. radhahk@gmail.com

**Table I. Characteristics of patients who underwent Caesarean sections (n = 110) at full cervical dilatation in the second stage of labour.**

Characteristic	No.
Mean age (yrs)	28
Weight at delivery (kg)	78
No. of women requiring induction or augmentation	48
No. of women requiring regional anaesthesia	46
Mean range of duration of 2nd stage of labour (min)	30–195
Mean gestation (wks)	≥ 39
Mean birth weight (kg)	3.2
No. of instrumental deliveries attempted	17
<b>Indication for 2nd stage Caesarean section</b>	
CPD	79
NRFS	9
Failed vacuum	11
CPD + NRFS	5
Failed forceps	3
Failed vacuum followed by failed forceps	3

CPD: cephalopelvic disproportion; NRFS: non-reassuring foetal status

delivery during the second stage of labour be made by a competent authority (e.g. a consultant) in order to reduce maternal and perinatal morbidity related to difficult instrumental delivery.<sup>(6)</sup> Such good practice would enhance safety by increasing the number of safely conducted instrumental deliveries and thus help to reduce the number of second stage Caesarean sections as well as future repeat Caesarean sections that might be associated with higher rates of placenta praevia and placenta accreta.<sup>(7,8)</sup>

The main aim of the study was to ascertain the factors influencing maternal and perinatal outcomes during second stage Caesarean sections in our hospital and to compare the associated maternal and perinatal morbidities. The findings of this study will help in the auditing of current practices at our hospital and improve standards of care.

## METHODS

The medical records of all the women who had term Caesarean sections in the second stage of labour (at full cervical dilatation) at a tertiary referral centre in Singapore between January 1, 2009 and December 31, 2009 were analysed retrospectively. The data excluded women who had Caesarean sections for non-vertex presentation, twins and preterm deliveries (gestation < 37 weeks).

Data collected included obstetric history, whether the labour was spontaneous or induced, indications for Caesarean section, whether an attempt was made at instrumental delivery, duration of the second stage of labour, findings of the vaginal examination just before the Caesarean section, the authority making the decision (i.e. seniority of the obstetrician), decision-to-delivery interval, foetal outcome at delivery (such as birth weight, neonatal trauma and Apgar score), operative complications (such as primary postpartum haemorrhage [PPH], need for blood transfusion or hysterectomy, lower uterine segment tear, broad

**Table II. Maternal and perinatal outcomes of patients who underwent Caesarean section (n = 110).**

Outcome	No. of patients	
	No attempted instrumental delivery (n = 93)	After attempted instrumental delivery (n = 17)
Birth weight > 4 kg	1	0
2nd stage of labour > 2 hrs	6	1
Administration of epidural anaesthesia	42	12
OP/OT position	36	9
Non-reassuring foetal status	12	2
Uterine tear	4	1
Blood loss > 1,000 mL	2	1

OP: occipitoposterior; OT: occipitotransverse

ligament haematoma and bladder injury), and postoperative complications (such as wound infection and puerperal febrile morbidity).

Statistical analyses and comparisons were made for maternal and perinatal morbidities between patients undergoing Caesarean section at full dilatation, with and without prior instrumental delivery. A p-value < 0.05 was considered to be statistically significant. The Fisher's exact test was used for comparison purposes.

## RESULTS

There were 11,903 deliveries in 2009, of which 7,657 (64.3%) were vaginal deliveries. In 2009, 3,596 (30.2%) patients had lower segment Caesarean sections and there were 650 (5.5%) assisted deliveries. Of the 2,501 (20.0%) emergency Caesarean sections, 110 (4.4%) patients had second stage Caesarean sections. Six patients were excluded for non-vertex presentation, twins and preterm deliveries.

The indications for Caesarean section in these 110 patients included CPD (71.8%, 79/110), CPD and non-reassuring foetal status (NRFS; 4.5%, 5/110), NRFS (8.2%, 9/110), failed vacuum (10.0%, 11/110), failed forceps (2.7%, 3/110), and failed vacuum followed by failed forceps (2.7%, 3/110) (Table I). Table II shows the maternal and perinatal outcomes in our cohort (n = 110). Tables III and IV show the results of the analysis of maternal morbidity in patients who had Caesarean section with and without glyceryl trinitrate (GTN) administration as well as those with and without attempts at instrumental delivery, respectively. Further analysis of maternal outcome indicated that: (a) patients with PPH (2.7%, 3/110) did not require blood transfusion or hysterectomy; (b) patients with lower uterine segment tear (4.5%, 5/110) did not have injury to the bladder or broad ligament haematoma; (c) instrumental delivery was attempted prior to Caesarean section in 15.5% (17/110) of patients; and (d) 61.8% (68/110) of patients received GTN to facilitate easy delivery of the foetal head. All these patients were discharged within five days of hospitalisation and none of them showed severe wound infection or puerperal febrile morbidity.

**Table III. Maternal morbidity based on glyceryl trinitrate (GTN) administration.**

Morbidity	No. of patients		p-value
	GTN (n = 68)	No GTN (n = 42)	
Lower uterine segment tear	2	3	0.3680
Early postpartum haemorrhage	2	1	0.3987
Blood transfusion	0	1	0.3987
Apgar score 4–9 at 5 min	8	1	0.4943

**Table IV. Maternal morbidity in patients who delivered via Caesarean section with and without attempted instrumental delivery (n = 110).**

Morbidity	No. of patients		p-value
	No attempted instrumental delivery (n = 93)	After attempted instrumental delivery (n = 17)	
Blood transfusion	0	1	0.1545
Early postpartum haemorrhage	2	1	0.3987
Intraoperative trauma	4	1	0.5754
Apgar score 4–9 at 5 min	3	1	0.4943

As for neonatal outcome, although the Apgar scores of newborns were low at birth for 8.2% (9/110) of patients, the Apgar score was > 4 at 5 minutes for all newborns. No severe asphyxia or adverse perinatal outcome was noted. Among the nine newborns with low Apgar scores, six were delivered by Caesarean section following attempted instrumental delivery. Of these six, 50% were associated with NRSF. The three newborns who were delivered via Caesarean section without attempted instrumental delivery were not associated with NRSF. The umbilical arterial pH was measured in five of the nine newborns with low Apgar scores. The pH was > 7 and the base deficit was < 12 mmol/L, with no severe asphyxia found in all five newborns. Overall, the umbilical arterial pH was measured in 33 of the 110 newborns (30.0%), and none was found to have neonatal sepsis or trauma.

## DISCUSSION

There is growing concern among practitioners as the number of Caesarean sections continues to rise.<sup>(4)</sup> For instance, the National Sentinel Caesarean Section Audit revealed that nearly one in five (21.5%) births were delivered by Caesarean section.<sup>(9)</sup> A majority (63%) of Caesarean sections were emergency cases, with only 37% of these being elective procedures. Our findings for 2009 revealed that 30.2% of all deliveries were by Caesarean section, 20.0% of all Caesarean sections were emergency procedures and 10.0% were elective.

A recent study demonstrated a statistically significant increase in maternal intraoperative trauma and perinatal asphyxia following Caesarean section at full dilatation when compared to Caesarean section in early labour.<sup>(4)</sup> However, we did not find statistically significant adverse maternal and perinatal outcomes after second stage lower segment Caesarean sections regardless of whether instrumental delivery was attempted. Although no adverse outcomes were noted in our study, it is possible that we were unable to pick up potentially serious morbidities, as the number of failed instrumental deliveries in our cohort was small.

Most patients were attended to by registrars, senior registrars or consultants as per hospital protocol, which necessitates that all second stage Caesarean sections be assessed and managed by a competent specialist (ranked either registrar or consultant) to ensure effective outcomes. Although senior medical officers are also trained to deal with such patients, they operate strictly under the supervision of a consultant or specialist registrar. The decision-to-delivery interval did not influence foetal outcome for any patient, which may be due to the systems in place at our hospital, such as the availability of an immediate crash Caesarean section facility through the public announcement system and the presence of neonatal standby during Caesarean section.

Over 50% of second stage Caesarean section patients were administered GTN in our study, and this may have helped to facilitate delivery by relaxing the uterus and thereby reducing the risk of lower uterine segment tear. The incidence of atonic PPH was also low due to the routine use of PPH prophylaxis following GTN administration. However, we found no statistically significant difference in maternal and neonatal outcomes, irrespective of GTN administration prior to delivery. Our results indicate that it may be worth exploring a more limited use of GTN during second stage Caesarean sections, as the prevalent use of GTN in our cohort did not elicit any statistically significant difference in the outcomes.

The duration of the second stage of labour was < 2 hours for all of our patients, except for four patients in whom labour extended to three hours. These four patients were administered epidural anaesthesia. According to Allen et al, a prolonged second stage of labour has an impact on the anal sphincter mechanism<sup>(10)</sup> and also increases the risk of scar dehiscence. These authors have also suggested an increased risk of adverse maternal and perinatal outcomes, unrelated to the mode of delivery, to be associated with a lengthened second stage of labour, especially if > 3 hours in nulliparous women and > 2 hours in multiparous women.<sup>(9)</sup> However, we found that the duration of the second stage of labour had no impact on maternal or foetal outcomes in our study; birth weight > 4 kg was noticed in only one patient, who had emergency lower segment Caesarean section for CPD early in labour.

In order to reduce the number of second stage Caesarean sections and its associated complications, safer instrumental delivery under proper supervision should be encouraged in

general. Yet, most obstetricians remain concerned regarding the elevated risks of maternal and foetal morbidities – especially foetal trauma (including asphyxia) and its long-term implications for the neurodevelopment of the newborn, and maternal morbidity (such as pelvic floor trauma, including vaginal and anal sphincter tears) and its long-term implications for the patient's quality of life – that are associated with difficult instrumental deliveries. For instance, studies have reported pelvic floor trauma, particularly bladder and bowel problems, in 50% of women at the five-year follow-up,<sup>(11)</sup> and an impaired anal sphincter mechanism after Caesarean section late in labour, even without attempted vaginal delivery.<sup>(12)</sup> Similarly, Allen et al noted that Caesarean sections in either the early or late stages of labour were associated with slightly increased maternal and perinatal morbidities irrespective of whether instrumental delivery was attempted.<sup>(4)</sup> According to Clark et al, an extension of the uterine incision, as well as increased risk of Caesarean hysterectomy and febrile morbidity, was observed in 35% of patients.<sup>(8)</sup>

As the decision on performing a second stage lower segment Caesarean section is critical, it is imperative that the decision should be made by a senior obstetrician so as to reduce not only the number of second stage Caesarean sections, but also its associated complications. This was highlighted by a recent study by Govender et al, who concluded that although maternal morbidity was higher in second stage Caesarean sections, and neonatal complications were not when compared to first stage Caesarean sections, there was little guidance from consultants in the decision-making stages related to second stage Caesarean sections.<sup>(13)</sup> The protocol in our hospital necessitates that decisions regarding the mode of delivery during the second stage of labour are made by either a specialist registrar or consultant, and this might have contributed to the reduced morbidity and mortality observed in our patients. As it is likely that consultant expertise and supervised training of residents may help to further reduce the number of such procedures, this possibility should be explored.

Overall, maternal and perinatal morbidities during second stage Caesarean sections were low in our study. A combination of factors, such as the involvement of experienced obstetricians at the decision-making phase and when performing the procedure, as well as the avoidance of possibly difficult instrumental deliveries, may have played important roles in determining these outcomes.

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