Second-stage primary Caesarean deliveries: Are maternal complications increased?

[a] **Moodley J,** MBChB, FCOG, FRCOG, MD [b] **Devjee J,** MBChB [a] **Khedun SM,** MMedSci [c] **Esterhuizen T,** MSc
[a] Women's Health and HIV Research Unit and Department of Obstetrics and Gynaecology, University of KwaZulu-Natal [b] Department of Obstetrics and Gynaecology, Addington Hospital, Durban [c] Programme of Biostatistics, Research Ethics and Medical Law, College of Health Sciences, University of KwaZulu-Natal
Correspondence to: Dr Jagidesa Moodley, e-mail: jmog@ukzn.ac.za
Keywords: Caesarean sections; second-stage labour; complications

Abstract

Background: Second-stage Caesarean sections (CSs) are known to be associated with increased complications but most reports originate from tertiary hospitals, which attend to high-risk patients. Complication rates may differ in district hospitals, which attend to low-risk patients.

Methods: This was a retrospective study carried out at a district maternity unit in Durban. The hospital records of all CSs over an eight-month period were reviewed and obstetric and neonatal complications of second-stage CSs were compared with a group of first-stage CSs performed during the study period.

Results: There were 4 654 deliveries, including 1 257 CSs, in the study period. The CS rate was 27.2%. Of 617 (8.5%) emergency CSs, 53 were performed in the second stage of labour.

The maternal and neonatal complication rates were low and no statistical differences were found between the patients who had second-stage or those who had first-stage CSs, except for increased blood loss, blood-stained urine, prolonged operative times and postoperative fever for second-stage CSs.

Conclusions: Second-stage CSs performed in a district hospital are associated with increased maternal complication rates but not with neonatal complications.

Ⓟ **This article has been peer reviewed.** **SA Fam Pract 2009;51(4):328-331**

Introduction

There has been considerable debate in recent years on the duration of the second stage of labour. Historically, the second stage of labour was limited to ≤ 2 hours.[1,2] Recently, some authors have extended the duration of the second stage to three hours because most nulliparous women who underwent regional anaesthesia were found to deliver within three hours of second-stage labour in comparison to two hours in those without regional analgesia.[3,4] More importantly, the extension of time given to the second stage of labour has been shown to increase the overall rate of vaginal births without adversely affecting neonatal morbidity.[3,4] However, maternal morbidities are increased and include operative vaginal delivery, anal sphincter tears, postpartum haemorrhage and emergency Caesarean sections (CSs).[5–8] Furthermore, the rates of CS have risen steadily in the past two decades and may be associated with a disproportionate rise in second-stage CS due to a decline in the use of instrumental deliveries.[9]

Most reports on second-stage CS originate in well-resourced countries[3–8] and tertiary academic institutions and have led to the Royal College of Obstetricians and Gynaecologists recommending the presence of a consultant obstetrician whenever a CS is performed in the second stage of labour.[9] In under-resourced settings, CSs are performed by medical doctors of varying experiences at different levels of health care. Level 1 hospitals are staffed by medical officers, community service doctors and general practitioners. There are no specialist obstetricians and these hospitals are unlikely to be staffed by registrars in training. The researchers therefore hypothesised that CSs performed in the second stage of labour in district hospitals may be associated with a high incidence of immediate maternal and perinatal complications.

Methods

This was a chart review of all CSs performed between the months of May and December 2007 at a district hospital in Durban, South Africa. This health facility conducts between 5 000 and 7 000 deliveries per year. Most patients attending the maternity unit are regarded as low risk. The hospital, however, acts as a referral centre for a number of community clinics.

The CSs are performed by medical officers, general practitioners and interns under supervision. The surgical technique of CS is standardised. In cases where the fetal head is low down in the pelvis, an assistant pushes the head digitally by the vaginal route, prior to the uterine incision being performed. The surgeon then insinuates his or her hand below the fetal head, between uterine contractions and delivers the fetus by flexion and lateral rotation of the fetal head. All CSs are performed under regional anaesthesia, either spinal or epidural, and all receive intravenous prophylactic antibiotics.

The hospital records of all CSs in the eight-month study period were reviewed following institutional ethical approval. The information was collected in a structured format and included demographic data, relevant obstetric data, indications for CS and the intrapartum complications associated with CS. Any complications for the mother and baby that developed during their hospital stay were also noted. All the data were pooled and no individual patient details were recorded.

For the purpose of this study, the second stage of labour was defined as the full dilation of the cervix between uterine contractions and the duration of the second stage of labour was divided into two phases, viz. 0–2 hours and ≥ 2 hours. The data of only those women who had a primary emergency CS for a singleton cephalic presentation were analysed.

For the purposes of comparison, 53 first-stage emergency CSs were obtained from the 120 first-stage CSs by computer-generated stratified random sampling.

Statistical analysis

Descriptive statistics were utilised and all results are presented as frequencies, means ± standard deviation and percentages. The Mann Whitney-U or Students t-test was used for quantitative comparative data where appropriate. Categorical data were compared using the Chi-Square test and Fisher's exact test if appropriate. Statistical significance was $p < 0.05$. Adjusted relative risk (RR) and 95% confidence intervals (95% CI) for selected maternal and neonatal outcomes were calculated using logistic regression since the outcomes were very rare and the relative risk approximated the odds ratio. Potential confounding variables in the regression model included mother's age, gravidity, gestational age, baby's weight and mother's HIV status. Statistical analysis was performed using SPSS Version 15.0 (SPSS Inc, Chicago, Illinois, USA).

Results

During the eight-month period, there were 4 654 deliveries. Twenty-four patients were excluded from the analysis because their medical records were either unavailable or incomplete. A total of 1 257 CSs were available for analysis, of which 640 were electives and 617 emergency CSs. The overall CS rate was 27.2%. There were 53 second-stage CSs. The rate of second-stage emergency CS was 8.6%. In 32 (60.4%) of the 53 patients, the second stage lasted ≤ 2 hours and for the remaining 21 it exceeded two hours.

Cephalo-pelvic disproportion (CPD) and fetal distress were the most common indications for CS in the second stage (55% and 23% respectively), while fetal distress and previous CS were the commonest indications in the first-stage CSs (36% and 23% respectively).

Table I shows the demographic data of the mother and neonate in the second stage, compared to the first stage of labour. There were statistically significant differences in maternal age, gravidity, operative times and birth weight between the first- and second-stage CSs.

Table II summarises the crude and adjusted comparison of selected maternal and neonatal outcomes among women undergoing CS in the second versus the first stage of labour. Significantly more patients had blood-stained urine in the second-stage than the first-stage CSs

Table I: Demographic data of mother and neonate following Caesarean delivery in the first and second stages of labour

Demographics	Caesarean delivery 2nd stage (n = 53)	Caesarean delivery 1st stage (n = 53)	P-value
Maternal			
• Age (yrs)	23.79 + 5.7	20.23 + 4.2	< 0.001
• Parity	0 (0–1)	0 (0–1)	NS
• Gestational age (wks)	39 (38–40)	39 (38–40)	NS
• Gravidity	1 (1–3)	1 (1–2)	0.013
HIV serostatus (No. & %)			
• Positive	12 (22.6%)	8 (15.1%)	NS
• Negative	35 (66.0%)	37 (69.8%)	
• Unknown	6 (11.3%)	9 (15.1%)	
Decision-delivery interval	75 (30–210)	90 (30–285)	NS
Operative time (mins)	35 (10–90)	30 (10–60)	0.021
Length of stay in hospital (days)	4 (3–15)	5 (3–12)	NS
Neonatal			
Birth weight (kg)	3.3 + 0.4	3.07 + 0.5	0.030
Length of stay in nursery (days)	2 (1–4)	2 (0–4)	NS
Length of stay in hospital (days)	4 (2–10)	4 (2–6)	NS
Death	0	2	NS

NS = nonsignificant; p > 0.05
Data are presented as mean (SD), median (IQR) or frequencies and percentages

($p = 0.046$) and the risk was 4.5 times higher in second-stage women vs. first-stage women. Adjustment for confounders increased the relative risk slightly but the 95% CI overlapped with one, indicating that the risk was not statistically significant. This could have been due to low power of the statistical test.

Overall there were low rates of wound infection, low five-minute Apgar scores and low rates of intraoperative injury. Twelve patients required blood transfusion, seven in the second-stage and five in the first-stage group; the reason for blood transfusion was postpartum haemorrhage in nine patients and three had an Hb level < 5 post-CS. Second-stage CSs were associated with occasional postoperative fever (4 vs 1; $p = 0.363$). The unadjusted relative risk increased to 9.3 after adjustment for confounders, but this risk was not statistically significant. Four neonates required resuscitation, one in the second stage for postoperative pneumonia and three in the first stage for neonatal asphyxia. Postoperative blood loss of > 300 ml and < 500 ml was seen in eight patients, six in the second stage and two in the first stage ($p = 0.270$). Adjustment for confounders resulted in the relative risk of second-stage CS increasing to a statistically significant 8.5 times. No differences were seen in the need for neonatal resuscitation between the groups; however, a low five-minute Apgar score was six times more likely in second-stage CS after adjustment for confounders. However, this increase in risk was not statistically significant.

The demographic data of mother and neonate based on the duration of the second stage of labour only showed that the decision-delivery interval was shorter in the ≤ 2 hour group compared to the > 2 hour group (70 [30–135] vs 100 [50–210] min; $p < 0.006$). All the other comparative variables were nonsignificant. None of the women or their babies needed readmission to hospital or transfer to an intensive care unit.

Table II: Comparison of selected maternal and neonatal outcomes among women undergoing a Caesarean delivery in the second and first stage of labour

	Total no of events	Caesarean section in 2nd stage (n = 53)	Caesarean section in 1st stage (n = 53)	P-value	Crude (unadjusted) RR (95% CI)	Adjusted RR (95% CI)
Maternal outcome						
• Early postpartum haemorrhage	7	3	4	NS	0.74 (0.16–3.46)	0.81 (0.15–4.47)
• Wound infection	3	1	2	NS	0.49 (0.04–5.58)	0.46 (0.03–11.1)
• Blood transfusion	12	7	5	NS	1.46 (0.43–4.93)	1.89 (0.48–7.37)
• Blood loss (> 300 < 500 ml)	8	6	2	NS	3.26 (0.63–6.9)	8.51 (1.07–67.61)
• Postoperative fever (≥ 38 °C)	5	4	1	NS	4.25 (0.46–39.3)	9.29 (0.69–125.5)
• Intraoperative injury (bladder and uterus)	2	0	2	NS	a	a
• Blood-stained urine	10	8	2	0.046	4.53 (0.92–22.47)	4.62 (0.77–27.76)
• Meconium-stained liquor	10	7	3	NS	2.54 (0.62–10.4)	2.73 (0.58–12.86)
Neonatal outcome						
Five-min Apgar score < 4	4	3	1	NS	3.12 (0.31–31.0)	6.12 (0.38–98.7)
Resuscitation	4	1	3	NS	0.32 (0.03–31.19)	0.47 (0.04–6.58)

NS = nonsignificant
a = not possible to analyse due to zero value

Discussion

In this retrospective study, 53 of 617 emergency CSs were performed in the second stage of labour. This figure is in keeping with other reports.[8] What is surprising is that neonatal complications in this study were similar to those found in a control group of emergency first-stage CSs. Estimated blood loss, blood-stained urine, postoperative fever and operative times were, however, greater in the second-stage CS group. However, these maternal complications did not affect eventual clinical outcomes. It has been previously reported that maternal and neonatal complications in second-stage CS are increased. Cebekulu and Buchmann from Johannesburg, South Africa, reporting on 39 cases and 39 controls, found that second-stage CS was associated with more postoperative fever, a significantly greater number of neonatal complications and a significantly greater operative time.[10] The difference in findings on neonatal outcomes and severe maternal complications is probably related to the fact that Baragwanath Hospital in Johannesburg is a tertiary hospital and attends to mostly high-risk patients, probably those with very prolonged second-stage labour and even obstructed labour.

Cebekulu and Buchmann reported that in one-third of women in their study, the fetal head was deeply impacted in the pelvis.[10] This not only indicates the fact that severe CPD was a factor but also resulted in high rates of neonatal encephalopathy. Other reports, like that of the researchers, suggest that second-stage CSs are associated with increased maternal complication rates but not with increased neonatal morbidity.[8,11,12]

There is controversy over the technique of choice for delivery of the fetal head impacted in the maternal pelvis. In South Africa, traditionally the fetal head is 'pushed' up from the vagina by an assistant. More recently, a report suggests that the deeply impacted fetal head can be delivered more safely by using the reverse breech delivery technique (the pull method).[13] Furthermore, Singh and Varma describe a device that, when applied vaginally to the fetal head after failed instrumental delivery, causes constant pressure to elevate the fetal head,[14] making delivery easier. In the current study, it appears that none of the second-stage CSs had a deeply impacted fetal head as no difficulties in delivering the fetal head were documented.

The fact that none of the patients in the current study had impacted fetal heads in the maternal pelvis does raise the question whether many of the patients may have fulfilled the criteria for ventouse or forceps delivery. The policy at the study hospital is that the outlet forceps or the ventouse should be considered when there is a prolonged second stage of labour and the fetal head is no more than one-fifth above the pelvic brim. However, there is a general trend of declining instrumental delivery rates in South Africa; even in a tertiary hospital such as Baragwanath Hospital, Cebekulu and Buchmann report a rate of instrumental deliveries of 1.1% of vaginal births.[10] These low rates are probably more pronounced in district hospitals due to the lack of experienced staff.

Decision making, specifically for second-stage CS, requires an experienced clinician to evaluate the level of the fetal head above the pelvic brim by bimanual pelvic examination, the degree of moulding of the fetal skull bones and the need to request the woman to bear down in the lithotomy position to assess descent of the fetal head and CPD. Documentation of findings on pelvic examination was poor in the current study; only 45 of the 53 cases had caput, moulding and level of the fetal head recorded. In addition, no management plan to consider an instrumental delivery either in the labour ward or in the operating theatre prior to CS was documented. Although controversy exists over early and late maternal pushing, delayed pushing after a period of rest probably results in a better fetal outcome.[15] Other obstetrical parameters that may affect the duration of both first- and second-stage labour include parity, maternal age, duration of the first stage, birth weight, position of the fetal head, oxytocin augmentation and epidural analgesia.[16] Schiessl et al investigated these parameters and found that in their study, the impact of epidural analgesia on the second stage of labour should be considered in obstetrical management. None of the patients in the current study had epidural analgesia for pain relief in labour. However, oxytocin augmentation, maternal positioning and the position of the fetal head were not taken into account during the assessment of delay in the second stage of labour.

The decision-delivery interval was particularly long in this study but did not seem to have an effect on perinatal outcomes. Even in a study performed in Oxford, UK to establish what is a reasonable time from decision to delivery by CS, only 71% of 230 emergency intrapartum CSs without fetal distress and fewer than 40% of intrapartum deliveries for fetal distress were achieved within 30 minutes of the decision for CS being made.[17] In the current study, all the CSs were performed under spinal or epidural anaesthesia. This may have contributed to the delay in surgery but it is more likely that the delay may have been due to the lack of a dedicated operating theatre and nursing staff at the study site.

Decision making in labour wards is of obvious importance, particularly in the second stage of labour. The Royal College of Obstetricians and Gynaecologists in the UK suggests that a consultant be present at all second-stage CSs to make an informed decision and to reduce complications arising from such operations. This is not possible in underresourced countries but experienced medical officers may be available to assist in decision making and perform instrumental deliveries if appropriate and assist in second-stage CS.

Retrospective studies do have built-in biases and most studies on this topic, including the current one, are flawed; therefore, any recommendations that are suggested for the management of the second stage of labour are made with caution. Nonetheless, the focus should be on ensuring normal progression of labour, proper use of the partogram, appropriate maternal positioning, pain relief measures, oxytocin augmentation and the promotion of effective pushing techniques. A longitudinal population-based prospective cohort study is necessary to make firm recommendations on the management of the second stage of labour.

References

1. Friedman EA. Primigravid labour: a graphico-statistical analysis. Obstet Gynecol 1955;6:567–89.
2. Kilpatrick SJ, Laros RK. Characteristics of normal labour. Obstet Gynecol 1989;74:85–87.
3. Myles TD, Santolaya J. Maternal and neonatal outcomes in patients with a prolonged second stage of labour. Obstet Gynecol 2003;102:52–58.
4. Cheng YW, Hopkins LM, Caughey AB. How long is too long: does prolonged second stage of labour in nulliparous women affect maternal and neonatal outcomes? Am J Obstet Gynecol 2004;191:933–38.
5. O'Connell MP, Hussain J, MacLennan FA, Lindow SW. Factors associated with a prolonged second stage of labour: a case controlled study of 364 nulliparous labours. J Obstet Gynaecol 2003;23:255–57.
6. Spencer C, Murphy D, Bewley S. Caesarean delivery in the second stage of labour. Br Med J 2006;333:613–14.
7. Sung JF, Daniels KI, Brodzinsky L, El-Sayed YY, Caughey AB, Leyell DJ. Cesarean delivery outcomes after a prolonged second stage of labor. Am J Obstet Gynecol 2007;107:306.e1–306.35.
8. Altman MR, Lydon-Rochelle MT. Prolonged second stage of labour and risk of adverse maternal and perinatal outcomes: a systematic review. Birth 2006;33(4):315–322.
9. Royal College of Obstetricians and Gynaecologists. RCOG Clinical Effectiveness Support Unit. The National Sentinel Caesarean Section Audit Report. London; 2001. Available from www.rcog.org.uk/resources/public/pdf/nscs_audit.pdf
10. Cebekulu L, Buchmann EJ. Complications associated with caesarean section in the second stage of labour. Int J Gynaecol Obstet 2006;95:110–14.
11. Alexander JM, Leveno KJ, Rouse DJ, et al. Comparison of maternal and infant outcomes from primary caesarean delivery during the second compared with first stage of labour. Obstet Gynecol 1007;109(4):917–21.
12. Allen VM, O'Connell CM, Baskett TF. Maternal and perinatal morbidity of caesarean delivery at full cervical dilatation compared with caesarean delivery in the first stage of labour. Br J Obstet Gynaecol 2005;112(7):986–90.
13. Fasubaa OB, Ezechi EO, Orji SO, Ogunniya SO, Akindele ST, Loto OM. Delivery of the impacted head of the fetus at caesarean section after prolonged obstructed labour: a randomised comparative study of two methods. J Obstet Gynaecol 2002;22:375–78.
14. Singh M, Varma R. Reducing complications associated with a deeply engaged head at caesarean section: a simple instrument. The Obstetrician Gynaecologist 2008;10(1):38–41.
15. Simpson KR, James DC. Effects of immediate versus delayed pushing during second stage labour on fetal well-being: a randomised clinical trial. Nurs Res 2005;54(3):149–57.
16. Schiessl B, Janni W, Jundt K, Rammel G, Peschers U, Kainer F. Obstetrical parameters influencing the duration of the second stage of labour. Eur J Obstet Gynecol Reprod Biol 2005;118(1):17–20.
17. MacKenzie IZ, Cooke I. What is a reasonable time from decision-to-delivery by caesarean section? Evidence from 415 deliveries. Br J Obstet Gynaecol 2002;109(5):498–504.