**Second stage cesarean: relation of method of head delivery to maternofetal outcome**

**Introduction**

The World Health Organisation has recommended an ideal caesarean section (CS) rate to be between 10-15%.1 The global estimates suggest a current CS rate of 18.6%, ranging from 6% to 27.2% in the least and the most developed nations of the world, respectively.2 As the CS rate is rising globally, so is the incidence of second stage CS.3-5 A recently published study by Pearson et al indicates a significant rise in second stage caesarean **section (CS)**rate to 2.1% in 2006 (*P*<0.001).6 It may be a consequence of a number of factors such as poor training and expertise in assisted vaginal deliveries (VD), fear of litigations associated with instrumental VD, increasing maternal age and body mass index and concerns over maternal and fetal outcome.3-5  Studies have demonstrated that **CS** at full cervical dilatation is technically more difficult and associated with additional risks.7-9The maternal and neonatal risks include extension of uterine incision, trauma to surrounding structures (bladder, bowel, ureter and uterine vessels), haemorrhage, broad ligament hematoma, hysterectomy and neonatal trauma, reduced Apgar score and perinatal asphyxia.10 Moreover there is an emerging evidence that CS at second stage of labour is associated with increased likelihood of preterm delivery in the future pregnancies*.*11The present study evaluates the method of head delivery in second stage CS and associated maternal and neonatal outcomes over a period of 15 months in a tertiary care obstetric centre.

**Methods**

**Population**

This retrospective cohort study was done in the department of Obstetrics & Gynaecology at Pt. B.D Sharma institute of Medical Sciences, Rohtak, Haryana for a duration of 15 months. The medical records of all women who underwent **CS** from October 2018 to December 2019 were identified and all singleton term pregnancies in which CS was performed at full cervical dilatation were included in the study. Details including maternal demographics, indication for CS, intraoperative notes, method of delivery of deeply impacted fetus, postoperative course and neonatal outcomes were obtained. We compared the maternal and neonatal complication rate according to the method of delivery of impacted fetal head.

**Statistical analysis**

Data analysis was carried out using statistical software STATA version 14.0. Comparison of frequency data across categories were performed using Chi-square/Fisher’s Exact test as appropriate. For all statistical tests a two- sided probability of P<0.05 was considered as statistical significance.

**Results**

During the study period, the total number of deliveries were 17,167 and CS rate of 27.85% (4782/17,167). Of the total CS, 110 were performed in second stage making a rate of 2.3% and 105 met the inclusion criteria. The maternal demographic and obstetric characteristics are outlined in table 1. Majority (68.6%) of women were nulliparous, 89.5% were in spontaneous labour and 8.5% had previous CS.

**Table 1: Maternal demographic and obstetric characteristics (ns=105):**

|  |  |  |
| --- | --- | --- |
| Characteristics | n/ Mean ±SD | % |
| Age (years) | 26.0±4.7 (18-40) |  |
| Parity  P0  P1  ≥P2 | 72  22  11 | 68.6  20.9  10.5 |
| Previous Caesarean (CS) | 9 | 8.5 |
| Gestational age at delivery (weeks) | 38.6±1.4 (37-42) |  |
| Onset of labour  Spontaneous  Induced | 94  11 | 89.5  10.5 |

**Table 2: Indications of second stage CS (n=105):**

|  |  |  |
| --- | --- | --- |
| Indications | n=105 | % |
| Deep transverse arrest | 48 | 45.7 |
| Obstructed labour | 18 | 17.1 |
| Failure to progress in second stage | 18 | 17.1 |
| Malpresentation | 6 | 5.8 |
| Failed instrumentation | 6 | 5.8 |
| Cephalopelvic disproportion | 5 | 4.7 |
| Fetal distress | 4 | 3.8 |

The table 2 summarises the indications of CS at second stage of labour. Deep transverse arrest was the most common reason for CS at full cervical dilatation accounting for ~45.7% (n=48) cases. The other common indications were obstructed labour and failure to progress in second stage of labour. Around 5.6% (n=6) women had an unsuccessful trial of assisted VD before contemplating to second stage CS. Out of these 6 patients, two had failed vaccum, two had failed forceps and one had failed vacuum followed by forceps. Six women (5.8%) had fetal malpresentation including face (n=2), brow (n=2), breech (n=1) and transverse lie (n=1).

**Table 3: Method of fetal head delivery during second stage CS (n=103):**

|  |  |  |
| --- | --- | --- |
| Method | n=103 | Percentage (%) |
| Patwardhan | 63 | 61.2 |
| Vertex | 29 | 28.1 |
| Push method | 8 | 7.7 |
| Reverse Breech | 3 | 2.9 |

Table 3 shows the technique of delivery of deeply engaged fetal head in 103 cases (excluding two cases with transverse lie and breech presentation). The most common method used was the Patwardhan technique (61.2%, n=63). The need to push the fetal head up through the vagina by an assistant occurred in 8(7.7%) cases.

**Table 4: Maternal and Neonatal morbidities associated with second stage CS (n=105)**

|  |  |  |
| --- | --- | --- |
| Complications | n=105 | % |
| **Maternal**  Uterine incision extension  Postpartum haemorrhage (PPH)  Scar dehiscence/ rupture  Blood transfusion  Wound infection  Prolonged catheterisation (≥7 days)  **Prolonged hospitalisation (>7 days)**  **Neonatal**  Apgar score < 5 at 1 min  Apgar score <7 at 5 min  Neonatal intensive care unit (ICU) admissions | 7  5  1  13  8  30  **32**    8  6  29 | 6.6  4.7  0.9  12.4  7.6  28.5  **30.4**    7.6  5.7  27.6 |

Table 4 illustrates the maternal and fetal morbidities encountered with second stage CS. The two most common intraoperative complications were extension of uterine incision (6.6%) and postpartum haemorrhage (PPH) (4.7%). Blood transfusion was required in 12.4% (n=13) cases. The mean length of hospital stay was 6.9 ± 3.4 days. **About 30.4% cases had prolonged hospitalisation of more than 7 days.**As for the neonatal outcomes, of the 105 births, only one was a stillbirth. The mean birthweight of newborn was 3000 ±450 grams. Admission to neonatal intensive care unit (ICU) was needed in 27.6% (n=29) babies.

**Table 5: Comparison of maternal and fetal complications based on methods of fetal head delivery during second stage CS (n=103)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Patwardhan (n=63) | Vertex  (n=29) | Push method (n=8) | Reverse breech (n=3) | P value \* |
| Uterine incision extension | 4(6.3%) | 1(3.4%) | 2(25%) | 0 | 0.238 |
| PPH | 2(3.1%) | 1(3.4%) | 1(12.5%) | 0 | 0.425 |
| Wound infection | 5(7.9%) | 1(3.4%) | 1(12.5%) | 0 | 0.549 |
| Blood transfusion | 9(14.2%) | 0 | 3(37.5%) | 0 | 0.013 |
| Apgar score < 5 at 1 min | 6(9.5%) | 2(6.9%) | 0(0%) | 0 | 0.995 |
| Apgar score <7 at 5 min | 4(6.3%) | 2(6.9%) | 0(0%) | 0 | 0.999 |
| Neonatal ICU admissions | 18(28.5%) | 7(24.1%) | 1(12.5%) | 2(66.6%) | 0.351 |

Further analysis of maternal and neonatal complications was done based on the method of fetal head delivery as shown in table 5. The requirement of blood transfusion was significantly more in push method as compared to the other methods (p=0.013).

**Discussion**

* In this study, we found **CS** rate at full dilatation over a period of 15 months to be 2.19%. Comparable to prospective study by Goswami KD et al which had second stage CS rate of 2.65%.12  A study by Loudon et al has demonstrated an incident rate of 5% (n=458) for the second stage CS.5
* The most common indication for second stage CS in our study was deep transverse arrest (DTA) (45.7%). Davis et al has revealed that around 45% second stage CS in their study were done for failure to progress.9 Another study by Goswami KD et al had found non progress of labour associated with fetal distress (38%) as the most common indication for CS in second stage of labour.12
* One of the most challenging step during the procedure is disimpaction of fetal head from the pelvis and its safe delivery. First is the push method (fetal head is pushed from the vagina by an assistant), second is the reverse breech extraction or pull method and third is the Patwardhan method (delivery of both shoulders first followed by the trunk, breech and then lifting the fetal head out of the pelvis).13 In our study, Patwardhan’s technique was the most commonly practiced method. **Though not statistically significant, it was associated with a lower rate of complications such as extension of uterine incision, PPH and wound infection as compared to the push method.** **On further analysing the complication rate between different methods used to aid fetal head delivery, it was found that the incidence of extension of uterine incision (25% versus 6.3%, p=0.23 ), PPH (12.5% versus 3.1%, p=0.42), wound infection (12.5% versus 7.9%, p=0.54) were relatively more common in ‘push’ method as compared to the Patwardhan technique.**It is proposed that the push method may lead to increased trauma to lower uterine segment and risk of uterine incision extension. These findings were consistent with the observations in a small case control study which has suggested a lower rate of incision extension and lesser bleeding with Patwardhan as compared to the push method.14 Currently there is no clear consensus on the advantage of any one particular method over the other. One large randomised study from Nigeria compared the outcome of ‘push’ vs ‘pull’ method in women in obstructed labour. The push method was found to be associated with increased blood loss (1257 ml versus 898 ml, p < 0.01), uterine incision extension (30% versus 11%, P < 0.05) and infection (57% versus 35%; p < 0.05) than pull method.15
* CS at full cervical dilatation is associated with higher maternal and/or neonatal complications. The process to deliver an engaged head during second stage CS may result in extension of uterine incision, broad ligament hematoma, trauma to the lower uterine segment and inadvertent incision in the urinary bladder and increased chances of neonatal hypoxia. **The overall rate of maternal complications including incision extension, PPH, blood transfusion and wound infection was low in our study. Our findings revealed an incision extension rate of 6.6%, PPH 4.7%, blood transfusion 12.4% and wound infection 7.6%.** This finding seems to agree with a study by Radha et al (n=110), who reported uterine tears in 4.5% and primary PPH in 2.7% of women who underwent second stage CS. As for neonatal outcome, we observed a low Apgar score <7 at 5 min in 5.7% cases whereas findings from Radha et al revealed an Apgar score >4 at 5 min in all the newborns. In comparison to our findings, Goswami et al has found a higher maternal and neonatal complication rate among 50 patients who underwent second stage **CS**: incision extension 16%, atonic PPH 8%, bladder injury 6%, hysterectomy 4%, wound sepsis 8% and neonatal ICU admissions in 44%.

Apart from the perinatal complications associated with**CS** during second stage, it has recently come to the light that late stage CS may be linked with the complication of spontaneous preterm birth in subsequent pregnancies.11  A recent study by Levine et al has observed a six fold increased odds of spontaneous preterm delivery following a second stage CS as compared  to a woman with first stage **CS**.

Given the risks associated with second stage CS, it becomes imperative to cut down the rising rates of CS during second stage of labour.  Another important task is to ensure safe performance of CS at full dilatation with use of proper technique.

Although limited by its retrospective design, the study highlights the need to remain vigilant about the rising rates of second stage CS and its associated complications. Future research to compare the pros and cons of second stage CS versus attempted assisted vaginal birth and measures to alleviate fetal head impaction at full dilatation is recommended.

**Conclusion**

The study emphasizes the fact that second stage CS **is technically challenging** and usually accompanied by several maternal and neonatal risks.

**References**

1. World Health Organisation. Maternal mortality in 2000. Geneva: WHO; 2000.
2. Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR.The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. PLoS One.2016;11(2):e0148343.
3. Unterscheider J, McMenamin M, Cullinane F. Rising rates of caesarean deliveries at full cervical dilatation: a concerning trend. Eur J Obstet Gynecol Reprod Biol 2011;157:141–144.
4. Vousden N, Cargill Z, Briley A, Tydeman G, Shennan AH .Caesarean Section at full dilatation:incidence, impact and current management. Obstet Gynaecol 2014;16:199–205.
5. Loudon JA, Groom KM, Hinkson L, Harrington D & Paterson-Brown S.Changing trends in operative delivery performed at full dilatation over a 10-year period. J Obstet Gynaecol 2010;30:370–375.
6. Pearson GA, MacKenzie IZ. A cross-sectional study exploring the incidence of and indications for second-stage cesarean delivery over three decades. Int J Gynaecol Obstet.2017;138:340-346.
7. McKelvey A, Ashe R, McKenna D, Roberts R. Caesarean section in the second stage of labour: a retrospective review of obstetric setting and morbidity. J Obstet Gynaecol 2010;30: 264–267.
8. 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. BJOG 2005;112: 986–990.
9. Davis G, Fleming T, Ford K, Mouawad MR & Ludlow J.Caesarean section at full cervical dilatation. Aust NZ J Obstet Gynaecol 2015;55: 565–571.
10. Vousden N, Cargill Z, Briley A, Tydeman G, Shennan AH. Caesarean section at full dilatation: incidence, impact and current management. Obstet Gynaecol 2014;16: 199–205.
11. Cong A, de Vries B, Ludlow J. Does previous caesarean section at full dilatation increase the likelihood of subsequent spontaneous preterm birth? Aust N Z J Obstet Gynaecol 2018;58(3):267-273.
12. Goswami KD, Parmar MM, Kunjadiya AN. Study of fetomaternal outcome in second stage caesarean section. Int J Reprod Contracept Obstet Gynecol 2019;8:2169-71.
13. Chopra S, Bagga R, Keepanasseril A, Jain V, Kalra J, Suri V. Disengagement of the deeply engaged fetal head during cesarean section in advanced labor: conventional method versus reverse breech extraction. Acta Obstet Gynecol Scand 2009;88:1163–6.
14. Frass KA. Al Eryani A, Al-Harazi AH. Reverse breech extraction versus head pushing in cesarean section for obstructed labor. A comparative study in the Yemen. Saudi Med J 2011;32:1261–6.
15. Fasubaa OB, Ezechi OC, Orji EO, Ogunniyi SO, Akindlele ST, Loto OM, et al. Delivery of the impacted head of the fetus at caesarean section after prolonged obstructed labour: a randomised comparative study of the two methods. J Obstet Gynaecol 2002;22:375–8.