

## Comparison of two methods of delivery of the deeply engaged fetal head at Cesarean delivery

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### Introduction

Although Cesarean delivery (CD) is the most common surgical procedure employed by the Obstetrician, vaginal delivery is the generally preferred mode of delivery by most women. But, sometimes while awaiting vaginal delivery, due to various factors mentioned below, the fetal head gets impacted during the second stage of labour. The impacted fetal head is then delivered by one of several described methods which could give rise to increased maternal and neonatal morbidity. This could lead to failed instrumental delivery with its attendant morbidity as well. The fetal head is said to be impacted when the station of the fetal head is below the Ischial spines on vaginal examination and the head cannot be easily delivered.<sup>(1)</sup>

The exact incidence of impacted fetal head is unknown. It usually occurs as a consequence of a prolonged second stage of labor, use of epidural anesthesia in labor and mal-position of the fetal head could contribute to impaction as well.<sup>(2)</sup> Impacted fetal head results in difficult and potentially traumatic disengagement of the deeply wedged head during CD. The maneuvers commonly used to disengage the wedged head include, pushing (bimanual or by an assistant) the head through the vagina or alternatively, pulling the infant's feet through the uterine incision.<sup>(1)</sup> Extracting a deeply impacted head at CD is a real challenge and associated with several maternal and neonatal complications like trauma to the fetus, increased risk of infection, uterine incision extension, and excess blood loss.

Some of the maneuvers that have been tried are the following:

1. Pushing the wedged fetal head from below by an assistant<sup>(1)</sup> (push method).
2. Making a low vertical uterine incision and extracting the infant by the feet and legs<sup>(3)</sup>
3. Pushing the head from below with a device called Fetal Disimpacting System<sup>(4)</sup>
4. Extracting the head first with a Murless head extractor (a method that has been practiced since 1948)<sup>(5)</sup>

5. Bimanual version of the push method with one hand of the surgeon in the vagina and the other hand in the uterus<sup>(6)</sup>
6. Patwardhan method (disimpaction of the fetal shoulders first followed by delivery of the baby)<sup>(7)</sup>
7. Reverse breech extraction<sup>(8,9)</sup> (Pull method). This (pull method) technically means grasping the fetal feet through an incision made high in the overstretched lower uterine segment and performing a semi-version to deliver.

Pushing the fetal head from below through the vagina by an assistant is the most used technique. The most recently favored method is the reverse breech extraction (pull method). These two techniques are the most used methods in our institution for the delivery of the impacted fetal head. Three known major complications associated with the push technique are extensions of the uterine incision and post operative endometritis and surgical site infections (SSI). The objective of this study was to compare neonatal and maternal outcomes associated with "push" versus "pull" methods for delivery of the impacted fetal head at CD.

### Methods

**Ethical Approval:** The study was approved by the Institutional Review Board of Christian Medical College, Vellore [IRB Min. No. 9657[Retro] dated 23.09.2015]. Informed consent was waived as it was a retrospective study.

**Study site and population:** Data was gathered from the electronic data base of this tertiary care hospital in South India. This data base is meticulously maintained by the senior staff nurse in Labour Room and checked by the Consultant in charge of the Perinatal Audit. All delivery data from January 1, 2014 to June 31, 2015 were searched using search criteria: arrest of dilatation, arrest of descent, cephalopelvic disproportion (CPD), obstructed labor, push, pull, reverse breech, second stage CD.

The total number of impacted fetal heads at CD requiring either of the 2 commonly used methods was noted.

**Inclusion criteria:** Women who delivered at term (>37 weeks gestation), who were fully dilated on per vaginal

examination, cephalic presentation, with very low station of the fetal head (+1, +2 station) and or signs of obstructed labor.

**Exclusion criteria:** Women with previous CD, twin gestation, preterm delivery, anomalies of the fetus and uterus.

**Maternal and Neonatal Outcomes:** Maternal demographic risk factors like parity, body mass index (BMI) and birth weight at delivery were noted. The indication for CD, blood loss and blood transfusion at CD were recorded as well. Maternal complications of the surgical procedure like unexpected extension of the uterine incision, presence of postoperative pyrexia, surgical site infection (SSI), presence of urinary tract infections, intra operative bowel or bladder injury, the use of inverted T or J shaped uterine incision to facilitate delivery of the fetal head without extension of the uterine incision and re-laparotomy were looked into. Neonatal complications like fracture of the humerus or other long bones as a result of difficult delivery and asphyxia for the neonate were noted.

**Statistical methods:** The association between risk variables and outcome were tested using Chi-square test with Yates correction. The variables which were significant at  $p < 0.25$ , were considered for multivariable logistic regression analysis. The multiple  $R^2$  and Hosmer and Lemeshow goodness of fit statistics were computed. Results were presented with OR and 95% CI. SPSS 18.0 software was used to analyze data.

## Results

During the period of the study, there were a total of 343 CDs performed in the second stage of labor. Of these 343 second stage CDs, there were 63 CDs where the fetal head was impacted and required either the push 44(69.8%) or pull 19 (30.2%) method for fetal head extraction.

**Demographic characteristics:** Most of the sampled women were primiparous 46 (73%) and the rest were multiparous women 17 (27%). There were 15 (26.3%) women in the normal BMI category and a similar number in the overweight category. More number of women who had fetal head impaction belonged to the obese category of BMI 27 (47.4%). Among these obese women, 78% of them had push type of delivery, when compared to the non obese women by bivariate analysis, the statistical significance was 0.09.

**Obstetric considerations:** The indications for CD, as expected, were constituted by arrest of dilatation in 30(47.6%), arrest of descent in 23(36.5%), cephalopelvic disproportion (CPD) in 8 (12.7%) and deep transverse arrest (DTA) in 2(3.2%). Most (72%) of the women who required assistance for delivery of the impacted fetal head, had either one of two dysfunctional labor patterns i.e. arrest of dilatation or arrest of descent.

**Obstetric intraoperative and post operative complications:** The adjusted and unadjusted analyses are presented in Table 1.

**Table 1: Risk factors for maternal and neonatal outcomes in impacted fetal head at cesarean delivery**

Risk Variables	Unadjusted Analysis						Adjusted Analysis			
	Type of delivery (N = 63)						p-value	OR	95% CI	p-value
	Pull		Push		Total					
	n	%	n	%	n	% (column)				
<b>Parity:</b>										
Primi	14	30.4	32	69.6	46	73	0.94			
Multi	5	29.4	12	70.6	17	27				
<b>BMI:</b>										
<30	13	43.3	17	56.7	30	52.6	0.09			
>30	6	22.2	21	77.8	27	47.4				
<b>Birth weight (Kg):</b>										
<2.5	2	50	2	50	4	6.3	0.30			
2.5 – 3.49	35	74.5	12	25.5	47	74.6				
3.5 - 4	7	70	3	30	10	15.9				
>4	0	0	2	100	2	3.2				
<b>Indication LSCS:</b>										
Arrest of descent	9	39.1	14	60.9	23	36.5	0.40			
Arrest of dilatation	6	20	24	80	30	47.6				
CPD	3	37.5	5	62.5	8	12.7				
DTA	1	50	1	50	2	3.2				
<b>Blood loss:</b>										
<1000 ml	19	30.6	43	69.4	62	98.4	0.51			
>1000 ml	0	0	1	100	1	1.6				
<b>Extension:</b>										
Yes	3	11.1	24	88.9	27	42.9	0.004	1.00	2.67- 64.67	0.002
No	16	44.4	20	55.6	36	57.1				
<b>Blood transfusion:</b>										
Yes	3	33.3	6	66.7	9	14.3	0.82			
No	16	29.6	38	70.4	54	85.7				
<b>Fever:</b>										
Yes	3	15	17	85.0	20	31.7	0.07	1.00	1.28 - 27.00	0.02
No	16	37.2	27	62.8	43	68.3				
<b>UTI:</b>										
Yes	1	12.5	7	87.5	8	12.7	0.26			
No	18	32.7	37	67.3	55	87.3				

<b>Wound Infection:</b>										
Yes	1	25.0	3	75.0	4	6.3	0.25	1.00		
No	18	30.5	41	69.5	59	93.7		3.64	0.22 - 58.95	0.36
<b>APGAR:</b>										
<5/7	3	37.5	5	62.5	8	12.7	0.24	1.00		
>5/7	16	29.1	39	70.9	55	87.3		0.31	0.05 - 2.08	0.23
<b>PPH:</b>										
Yes	2	100	0	0.0	2	3.2	0.03			
No	17	27.9	44	72.1	61	96.8				
<b>Bowel Injury:</b>										
Yes	0	0.0	1	100	1	1.6	0.51			
No	19	30.6	43	69	62	98.4				
<b>Bladder Injury:</b>										
Yes	1	50.0	1	50.0	2	3.2	0.53			
No	18	29.5	43	70.5	61	96.8				
<b>Humerus Fracture:</b>										
Yes	1	100	0	0.0	1	1.6	0.12			
No	18	29.0	44	71.0	62	98.4				
<b>TJ Injection:</b>										
Yes	4	100	0	0.0	4	6.3	0.002			
No	15	25.4	44	74.6	59	93.7				
<b>Relaparotomy:</b>										
Yes	0	0	1	100	1	1.6	0.51			
No	19	30.6	43	69.4	62	98.4				

**Unadjusted analysis:** Post operative fever was reported in 20(31.7%) women. Only 15% of the mothers had postoperative fever with pull method, as compared to 85% who had fever when push method was used. Only 8 (12.7%) of the women had a urinary tract infection of which 7 (87.5%) were in push group and 1(12.5%) in pull group. Surgical site infection (SSI) was present only in 4 (6.3%) of the women, 3(75%) in push and 1 (25%) in the pull group.

Second stage CD is commonly associated with bowel and bladder injuries. In this series, only 2 (1 in each method) bladder injuries were reported.

The uterine incision was surgically converted to a J shaped or an inverted T incision in 4 (6.3%) women, in order to avoid an unnatural extension, all of them in the pull method. Relaparotomy was required in one (1.6%) woman, who had push type of delivery of the head. When taking into account, the neonatal outcomes with regard to the 2 types of delivery, there was one neonate with fracture of the humerus in the pull method of delivery. APGAR score was low in 8 neonates of which 5 of them belonged to the push group and 3 to the pull group. When considering birth weight, 47 (75%) of them fell in the 2.5 to 3.49 kg birth weight group. There were only 2 babies each in the small for gestational age (SGA) and large for gestational age (LGA) groups.

Even though the deliveries were complicated, actual postpartum hemorrhage (PPH) occurred only in 2 women in the pull method. Blood was transfused in 9 (14.3%) women, 6 (66.7%) in push group and 3(33.3%) in pull group. It was found that all extensions of the uterine incision added up to 27 (42.9%) of women. When the push method was used 89% had extensions, when compared to 11% in the pull method.

**Adjusted analysis:** Women who had push method of delivery of impacted fetal head, had 13.13(2.67-64.67) higher odds of extension of the uterine incision than when compared with women who had pull method ( $p=0.002$ ). Women who had push method of delivery of the impacted fetal head had 5.88 (1.28–27.00) higher odds of post operative pyrexia when compared with women who had "pull" method ( $p=0.02$ ).

## Discussion

Although both methods could cause serious maternal and neonatal complications, available data seem to favor the "pull" method.<sup>(8,9)</sup> A better maternal outcome seems to depend on adequate uterine relaxation, the patient's position during operation and special attention to the uterine incision.

Most importantly, one of the dreaded complications of a delayed second stage CD is extension of the uterine incision, more so, downward extension to involve the bladder and the cervix and vagina. In the study by Greenberg *et al.*,<sup>(5)</sup> a lower rate of postpartum fever (5% vs. 46%) and lesser extensions of the uterine incision (15% vs. 50%) were found with

the pull method of delivery. Similar results were present in the present study. In an earlier study done by

Khosla *et al.*<sup>(7)</sup> in India, the push method of fetal head extraction was compared with Patwardans method. The push method was associated with extensive uterine extensions resulting in significant hemorrhage. In the present study, the push method has shown to result in significant extensions as well. In the review by Bastani *et al.*,<sup>(9)</sup> of a randomized controlled trial (RCT) of 108 Nigerian women, the push method had significantly longer operating time, postpartum endometritis, longer hospital stay and higher hospital bills. When compared with the present study, there was a similar higher incidence of infectious morbidity (SSI, postoperative fever).

The uterine incision was surgically converted to a J shaped or an inverted T incision in 4(6.3%) of women, in order to avoid an unnatural extension, all of them in the pull method. This could have contributed to the decrease in uterine incision extension that was significantly less in the pull method.

In the present study, there was one incidence of fracture of the fetal humerus with the pull method, though not statistically significant, on account of the small numbers. These could turn out to be important if there were larger numbers. More data are needed to establish the frequency and extent of intra operative disengagement dystocia and to determine the management protocol that carries the lowest risk in such circumstances.

## Conclusion

Considering important complications, namely, extension of uterine incision and post operative pyrexia, the newer "pull" method or reverse breech, appears to be a safer alternative to the "push" method.

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## Consent

The study was approved by the Institutional Review Board of Christian Medical College, Vellore [IRB Min. No. 9657[Retro] dated 23.09.2015]. Informed consent was waived as it was a retrospective study.

## Competing interest

The authors declare that they have no competing interests.

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