

## Disengagement of the Deeply Engaged Fetal Head during Cesarean Section- Conventional Method versus Reverse Breech Extraction- Review of Literature

Seema Chopra\*

Department of Obstetrics and Gynecology, Postgraduate Institute of Medical Education and Research, India

\*Corresponding author: Seema Chopra, Department of Obstetrics and Gynecology, Postgraduate Institute of Medical Education and Research, India, E-mail: [drseemachopra@yahoo.com](mailto:drseemachopra@yahoo.com)

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### Abstract

Obstructed labor with the fetal head impacted in pelvis is an obstetric complication that requires cesarean delivery with skilful handling. Extraction and delivery of the fetal head in this situation can be achieved utilizing either an 'abdomino-vaginal' approach or 'reverse breech extraction'. Other techniques include use of a 'Dis impaction system' or 'Patwardhan technique'. However, caesarean delivery cannot provide assurance against maternal and neonatal morbidity.

Evidence is needed to guide clinicians as to which technique; reverse breech extraction or push method best facilitates delivery with the least complications for mother and baby. The superiority of one technique over another is yet to be proven.

The present review indicates that the pull technique has relative advantages over the push method in cases of impacted fetal head at cesarean delivery with regard to fetal and maternal complications.

### Introduction

The majority of pregnant women as well as obstetricians aim for normal vaginal birth. Dystocia, which complicates up to 20% of all vaginal deliveries [1] is often diagnosed in the second stage of labor, when the fetal head is engaged in the pelvis, and vaginal delivery is replaced by cesarean. However, caesarean delivery cannot provide assurance against maternal and neonatal morbidity when there is difficulty in disengaging a deeply impacted fetal head, a situation that may result in serious maternal and neonatal morbidity [2,3]. Difficult caesarean birth may result in injury for the infant or complications for the mother.

In 2012, about 23 million caesarean sections were done globally [4]. The international healthcare community has considered the rate of 10% and 15% to be ideal for caesarean sections [5]. Some evidence supports a higher rate of 19% may result in better outcomes [4].

The contributing factors for increasing rate of second stage caesareans, first of all may be because of concurrent increase in caesarean births and a corresponding decrease in rates of instrumental deliveries as many fetuses with head deeply engaged in pelvis could have been managed in the past by either vacuum or forceps extraction are nowadays delivered by cesarean section [6]. A second potential contributing factor is the less stringent criteria for the duration of the second stage, mainly in patients under epidural anesthesia, who have reassuring fetal heart rates, which allows for wedging of fetal head deep in pelvis with each uterine contraction [7].

Also, further impaction of the fetal head may occur during attempt at operative vaginal delivery. A vacuum extractor allows larger head diameters to be pulled into the pelvis compared with forceps. Thus a deeply impacted head follows a failed instrumental delivery [3]. Multiple factors can contribute to impaction of the fetal head,

including reluctance to intervene during a prolonged second stage, use of epidural anesthesia, trial of instrumental delivery, and fetal head malposition [3,8-10]. Whatever be the cause, extracting a deeply impacted head is a real challenge and associated with several complications (trauma to the fetus, increased risk of infection, uterine incision extension, and excess blood loss) [8,9,11,12].

Although classical teaching suggests that the 'inferior pole of the fetus must be delivered first through any lower segment incision, and the superior pole should come first through a classical incision [13]. However, this generalized statement may not always hold true especially in cases of intraoperative disengagement dystocia.

Management of impacted fetal head during second stage cesarean requires careful and gentle attention to various surgical steps for delivery of a fetus without adverse maternal and neonatal outcomes, mostly by an experienced surgeon.

According to WHO, it is estimated that worldwide, more than 500,000 women die of complications of pregnancy and childbirth every year. Approximately, another 7 million who survive childbirth suffer serious health problems and a further 50 million suffer adverse health consequences and an overwhelming majority occurs in developing countries. Adverse outcomes in low risk pregnancies occur in 8.6% of vaginal deliveries and 9.2% of caesarean section deliveries [14].

In those who are low risk, the risk of death for caesarean sections is 13 per 100,000 and for vaginal birth 3.5 per 100,000 in the developed world. The UK National Health Service gives the risk of death for the mother as three times that of a vaginal birth [15].

In Canada, the difference in serious morbidity or mortality for the mother such as cardiac arrest, wound hematoma, or hysterectomy was 1.8 additional cases per 100 or three times the risk [16].

Obstructed labor affects more than 6 million women worldwide; it accounts for 8% of the approximately 500,000 annual maternal deaths, which occur mostly in low-resource countries [17]. The exact incidence of deeply impacted head encountered during cesarean delivery is not known but it is estimated to be a quarter of all emergency cesarean deliveries.[18] Impaction of the fetal head is considered when the station is below the ischial spines and it is usually a consequence of a prolonged second stage of labor [3,19].

Impaction of the fetal head is usually not associated with cephalo-pelvic disproportion, where the fetal head fails to descend in the maternal pelvis. It is a manifestation of an unduly prolonged second stage, when the obstetrician has to decide upon mode of delivery-whether instrumental delivery or a cesarean section [20].

There is an accompanying rise in the overall cesarean section rate at full dilatation [21]. Cesarean sections at full dilation are associated with higher rates of maternal and neonatal complications [22]. Delivery of the impacted fetal head in the second stage is technically challenging, and is a major factor contributing to the associated increased complications [3,23]. Delivery of the impacted head after prolonged obstructed labour can be associated with significant maternal and neonatal complication

Caesarean section at full dilatation with obstructed labour can be difficult, with potential complications for mother and baby. Evidence is needed to guide clinicians as to which technique; reverse breech extraction or head push best facilitates delivery with the least complications for mother and baby [24].

Obstructed labor with the fetal head impacted in the pelvis is an obstetric complication that requires cesarean delivery with skilful handling in an organized manner to avoid serious maternal and neonatal sequel [25]. Extraction and delivery of the fetal head in this situation can be achieved utilizing either an abdomino-vaginal approach with head pushing from the vagina [26] or reverse breech extraction, where the baby is delivered by grasping the feet or buttocks and delivering them through the incision, with the head delivered last [27]. Other techniques described include use of a Dis impaction system [28] or Patwardhan technique, where the infants' shoulders are delivered first, then the trunk, breech, limbs then finally the head [23].

Although different techniques are described in the literature [25, 29, 30] The superiority of one technique over another is yet to be proven [29,31,32] (Table 1).

Studies	Extension of incision		Average Blood loss (ml)		Infectious morbidity		NICU Admission		Fetal Injury		
	n(%)		P value		n(%)		n(%)		n(%)		
	P value				P value	p value					
	Push Method	Pull Method	Push Method	Pull Method	Push Method	Pull Method	Push Method	Pull Method	Push Method	Pull Method	
Fasubaa et al. [2]	25(46.3)	89(4.8)	1257	898	46(85.2)	37(68.5)	39(59.3)	14(25.9)	3(5.6)	4 (7.4)	
			<0.001					<0.01			
Levy et al. [29]	14/28(50)	3/20(15)	3	0	13(46.4)	1(5)	-	-	0	0	
		<0.05		NS		<0.05					
Chopra et al. [30]	31/136	Jan-46	5/136 women	Jan-46	18(13.24)	3(6.5)	0	0	0	1	
	-22.8	-2.2									
Veisi et al. [25]	24/35	Mar-37	571+/-68	457+/-68	3(8.1)	3(8.7)	0	0	0	1	
	-68.6	-3.7		<0.005		NS					
		<0.005									
Bastani et al. [40]	15/30(50)	5/29(17.2)	3(30)	1(3.5)	wound [1]				0	0	
					fever 16	1(NS)					
					UTI 10	1(<0.001)	-	-			
						3 (<0.001)					

**Table 1:** Studies on different techniques on disengagement of the fetal head.

### The Conventional Method

The fetal head is delivered as routine cephalic extraction but with the difficulty encountered in reaching below the impacted head deep in pelvis and thinned out and stretched lower uterine segment. This may

result in extension of incision laterally or downwards and may involve uterine vessels, the ureter or trauma to fetal head [30].

## The 'Push Technique'

Similar to the traditional cephalic delivery in a routine caesarean section, but with the difference that the fetal head is extracted following pushing through the vagina, assisted from below by another person and is hence referred to as the push method [29].

The oldest procedure of abdomino-vaginal delivery in the presence of an impacted fetal head was described during the early 1980s as a modified caesarean section [26], the wedged fetal head was pushed by an assistant's hand introduced through the vagina. On the other hand Lippert [33,34] suggested that the surgeon avoids further deflexion of head with one hand in the uterus and the other hand in the vagina pushes the head up. It was seen in studies by Kafali [35] and Lippert [33,34] that the fetal head gets compressed between the surgeon's hand and the pelvic bones during manipulations combined with the thinning of the lower uterine segment because of prolonged labour results in lateral extension of a transverse lower uterine segment incision, and involves laceration of uterine vessels [35]. A deeply impacted fetal head leads to a lack of space between the bony pelvis, pelvic muscles, and the fetal head, making it difficult for the surgeon to insert a hand in order to dislodge it from the pelvis.

Another modification of the push technique was described by Landesman et al. [26]. He carried out the abdomino-vaginal delivery in modified lithotomy position, the legs abducted in either the 'Whitmore' or the 'frog' position, and with a cupped hand in the vagina, the wedged vertex gently lifted through the uterine incision.

## 'Reverse Breech Extraction' or the 'Pull Technique'

In the reverse breech extraction the fetus in cephalic presentation is extracted through the uterine incision by the podalic pole [29,30]. In this method, after opening the uterus, the surgeon introduces a hand through the uterine incision towards the upper segment, grasps both feet, and gently pulls the fetus up to extract it through the uterine incision [25].

In simple terms, this maneuver entails grasping the fetal feet, performing a semi-version, and delivering the fetus by total breech extraction [27]. Kafali [35] described a low vertical uterine incision for fetal extraction compared to routine low transverse incision as it provided more space for manipulations as well as its safety as it did not lead to lateral extensions of uterine incision.

In most of the circumstances, the fetal feet can be easily reached through a transverse uterine incision; therefore, an inverted T or J shaped incision is not a prerequisite of this method [3], which is usually used in situation of extreme difficulties in fetal extraction.

An upward extension of the lower segment incision at one of the lateral ends leads to the J-shaped incision whereas an inverted-T is an extension in the center of the lower segment flap of uterine incision [36,37].

While dis-impacting fetal head, fetal trauma can be prevented by avoiding hyper-extension of fetal cervical spine and forceful pull on neck.

## The Patwardhan Method (Shoulders First Method)

This technique was first described by Dr. Patwardhan [38]. In cases of occipito-transverse or occipito-anterior positions with the head deeply impacted in the pelvis, an incision is made in the lower uterine

segment, at the level of the anterior shoulder, which is then delivered out. The posterior shoulder is also delivered with gentle traction on this shoulder. Now the fingers are hooked through both the axillae and with gentle traction, aided by fundal pressure by an assistant, the body of the fetus is brought out of the incision, the fetal head is then gently lifted out of the pelvis. when the fetus is in occipito-posterior position, after delivering the anterior shoulder as described earlier, the hand is introduced into the uterus upto fundus and a foot is grasped. Gentle traction on this foot along with fundal pressure, the body of the fetus is extracted out followed by the head.

## The 'Fetal Disimpacting System' and 'Fetal Pillow'

The Fetal Disimpacting System is manufactured by Safe Obstetric Systems UK Ltd (Essex, UK). It has a foldable base plate that is 11 cm long and 4.5 cm wide, with a balloon attached to it which is inserted below the fetal head vaginally, at the time of inserting a foley catheter before the caesarean. Just before making the uterine incision an assistant inflates the balloon with 180 ml of saline solution. This straightens the base plate which opens to become flat against the pelvic floor. The inflated balloon gently elevates the fetal head 3-4 cm from its original position, making it easier to deliver. This balloon is deflated once delivery is achieved, and the device is gently pulled out using the attached tubing or by hooking a finger into the base plate [39].

The objective of the present review is to compare selected intraoperative and postoperative maternal and fetal outcome indicators for impacted fetal head extraction by either the pull or the push method during caesarean delivery.

## Comparison among Various Management Options

Results from retrospective [29,30] and some prospective [2] studies show that maternal and fetal outcomes in cases involving the pull method are better than those in cases involving the push method. All operations were performed by the same obstetric chief resident under the direct supervision of one of the co-authors. Longer operation times were required in the push group (45.29 vs 33.38 minutes; P =0.001). The operation time was longer with the push method than with the pull method (overall standard mean differences (SMD)) 2.7; 95% CI, 0.57-4.82) [2,25-41]. The duration of the hospital stay was also significantly longer in the push group [2]; however, the overall SMD showed no association with either technique [2,29,41].

## Incision Extension

The risk of lateral or downward extension of the uterine incision was approximately 8 times higher with the push method (OR 7.8; 95% CI, 5.01-12.25) than with the pull method [19,25,42,43] and was consistent in all studies, and heterogeneity testing did not show any significant variation between the studies ( $I^2=17.1\%$ ). Some authors [2,40] investigated lateral and downward incisions separately and found that lateral extensions were more common than vaginal extensions if the push method was used. Extension of the uterine incision occurred in 24 (68.6%) patients in the push group and 3 (8.1%) patients in the pull group.

Maternal complications in the push and pull groups were extension of the uterine incision (15 [50.0%] vs 5 [17.2%]); T or J incision (3 [10.0%] vs 4 [13.8%]); (P=0.008) [40].

## Infectious Morbidity

Febrile morbidity [25,40] urinary tract infection [40], and endometritis [2,41] were more prevalent among women in the push group than among those in the pull group. None of the included studies demonstrated a statistically significant association of wound infection with either method [2,19,25,29,30,40-42], and there was no heterogeneity between the studies ( $I^2=0.0\%$ ). However, wound infection was more common in the push group [29,30,40,41]. The incidence of post-partum fever was 8.6% and 8.1% in the push and pull groups, respectively ( $P>0.05$ ).

## Blood Transfusion

Need for blood transfusion in the push group was consistently higher than that in the pull group (overall OR 3.8; 95% CI, 2.44–5.81) [2]. Similarly, the estimated blood loss during cesarean delivery was significantly higher in the push group than in the pull group (SMD 2.3; 95% CI, 0.23–4.38) [12,14,16,19]. The mean blood loss in the push group was particularly high (SMD 7.7; 95% CI, 6.65–8.89) [14]. However, heterogeneity testing revealed the presence of significant variation ( $I^2=98\%$ ) between the studies included in this analysis [2,25,41].

## Neonatal Outcome

The mean 5-minute Apgar score of the newborns did not differ significantly depending on the extraction technique used [25,40]. In 2 studies [2,36], the Apgar score in the push group was high and that in the pull group was low. However, the overall SMD showed no association with either technique, and there was significant heterogeneity between the studies ( $I^2=98\%$ ) [2,25,40].

Dislodging the fetal head vaginally in the push method could explain the significantly more common occurrence of genital tract injuries and extension of the uterine incision to the broad ligaments and the vagina. Furthermore, higher rates of urinary tract infection and endometritis, as demonstrated by fever after delivery, may have been caused by the spread of vaginal microorganisms to the operating field.

Although there were no significant differences in perinatal complications between the groups in the present study, some investigators have reported that the pull method of delivery is associated with significantly lower perinatal morbidity and mortality than the push method, perhaps as a result of less fetal trauma with the former method [2].

A randomized prospective study of 108 Nigerian patients, in which morbidity and mortality rates associated with the two methods were compared. Patients with a live fetus in obstructed labor at term were randomized to either the intraoperative “push” or the “pull” procedure. Patients in the “push” group had significantly longer operation time, more blood loss, extension of the uterine incision, postpartum endometritis, longer hospital stay and, consequently, higher hospital bills. In addition, the fetal morbidity was worse in the “push” group. The authors concluded that the “pull” method is safer and faster than the “push” method [2].

## Conclusion

In conclusion, the present results indicate that the pull technique has relative advantages over the push method in cases of impacted fetal

head at cesarean delivery with regard to fetal and maternal complications.

Another open question is whether the procedures should be performed in sequence (i.e., first pushing from below and then pulling from above [35] simultaneously (i.e., pushing and pulling at the same time [26,33,34], or never in combination. In simple terms, it is unknown if the proposed manoeuvres have an additive beneficial or an additive detrimental effect.

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