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Original Article

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A Comparative Study of Vectis versus Manual Method for Extraction of Unengaged Fetal Head during Caesarean Section at VIMS Ballari

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ABSTRACT

Background: Unengaged fetal head during Caesarean section often complicates the delivery process. This study aimed to compare the Vectis method versus the manual method in terms of operative and neonatal outcomes, maternal experiences, and professional preferences.

Methods: We conducted a comparative study involving 80 women undergoing Caesarean section with unengaged fetal heads. The study population was divided into two groups: the Vectis group and the manual extraction group, with 40 participants in each group.

Results: The use of the Vectis method resulted in significantly reduced mean uterine incision to extraction time (64.60±36.86 seconds) as opposed to the manual method (83.08±35.32 seconds, p=0.025). The maternal experience was significantly better in the Vectis group, with all participants (100%) reporting no discomfort during extraction, unlike the manual group where all participants reported discomfort (p<0.001). Surgeons found extraction easier in 77.5% of cases with the Vectis method, in contrast to 55% in the manual method (p=0.639). Most anaesthetists (80%) expressed a preference for the Vectis method (p=0.963). Neonatal outcomes were similar between the groups, with comparable APGAR scores at 1 minute (Vectis: 7.30±0.72; Manual: 6.73±0.55; p=0.001) and 5 minutes (Vectis: 8.83±0.55; Manual: 8.65±0.48; p=0.496), and no neonatal injuries reported in either group.

Conclusion: The Vectis method of fetal head extraction during Caesarean section offers potential advantages over the manual method, including shorter extraction times, improved maternal experience, and professional preference, without impacting neonatal outcomes.

Key Words: *Caesarean Section, Unengaged Fetal Head, Vectis Method, Manual Extraction, Maternal Experience, Professional Preference, Neonatal Outcomes*

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INTRODUCTION

Caesarean section, a crucial surgical intervention for saving lives of mothers and newborns during childbirth, often encounters complex challenges. Among these, the extraction of an unengaged fetal head represents a significant hurdle requiring technical finesse and clinical acumen [1]. Traditional manual methods for this extraction, despite their longstanding history, have been associated with a range of complications, notably potential trauma to both the mother and neonate [2]. Consequently, the quest for safer and more efficient techniques has been ongoing in obstetrics. One such novel approach is the Vectis method, which has been introduced as a promising alternative for unengaged fetal head extraction during Caesarean sections [3].

The Vectis technique utilises a lever (the Vectis), which is a curved metal instrument originally used for manual rotations and extractions in vaginal deliveries [4]. Recent studies suggest its application during Caesarean sections for unengaged fetal head extraction is associated with several benefits such as reduced maternal morbidity and enhanced neonatal outcomes [5]. Despite these initial promising reports, there remains a paucity of comparative studies directly contrasting the efficacy and safety profiles of the Vectis and manual methods.

The aim of this study is to bridge this knowledge gap by undertaking a comparative analysis of the Vectis method versus the traditional manual method for the extraction of unengaged fetal heads during Caesarean sections. This study will provide an analysis of the current evidence, comparing maternal and neonatal outcomes associated with each method.

Our hypothesis is that the Vectis technique may offer significant advantages over the manual method, thereby potentially revolutionising the practice of Caesarean sections, significantly reducing associated morbidity, and enhancing the quality of life for mothers and newborns. The findings from this study could update clinical guidelines and have significant implications for global obstetric practice [6].

Objectives-

To study the ease, safety and adverse outcomes of use of vectis over manual method for extraction of unengaged head at Caesarean section

MATERIALS AND METHODS

Study Design and Setting

This comparative study was conducted in the Department of Obstetrics and Gynecology at VIMS Ballari. It involved two groups: the study group, where the fetal head was delivered using the Vectis method, and the control group, where traditional manual extraction of the fetal head was conducted.

Study Population

The study population comprised 80 women who were admitted to the labor room and met the defined inclusion and exclusion criteria.

Inclusion and Exclusion Criteria

Women with cephalic presentation with unengaged head undergoing primary caesarean section for various indications, primigravida with cephalic presentation with unengaged head, women with previous lower segment caesarean section with a floating head at term, and vertex presentations in preterm pregnancies with a floating head requiring caesarean section for obstetric indications were included in the study. We excluded those with deeply engaged fetal head, caesarean section in the second stage of labor, non-vertex presentations, and multiple gestations.

Data Collection

A detailed history was taken, and routine antenatal investigations such as hemoglobin, blood grouping, Rh typing, HIV, and HBs Ag were performed for all participants. During the lower segment caesarean section (LSCS), similar intraoperative techniques were used across both groups, except for the application of Vectis in the study group.

The Vectis instrument used in the study has a single blade with wooden handle and hinge innovated, modified and popularised by Dr Venkatesh N from the original Murless head extractor which was in vogue in the early 19th century. The blade of the instrument is shaped to curve around the fetal head just above the symphysis pubis to gently lift the head out of the uterus.

Sampling Procedure

The study participants were divided equally into two groups, with 40 women in each group.

Outcome Measures

The primary outcomes measured included the time required for the extraction of the fetus (from uterine incision to baby extraction time), the necessity of fundal pressure, the extension of the uterine incision, and the associated blood loss. The perinatal outcomes examined were APGAR scores and any injuries to the baby. Secondary outcomes considered the patient's experience during the delivery of the baby and surgeon and anesthetist experience.

Fig: Vectis used in the study

RESULTS

Table 1: Comparison of demographic, clinical, and operative variables between manual and Vectis methods for fetal head extraction

		Method of extraction						
		Manual		Vectis		Total		
		Count	Column N %	Count	Column N %	Count	Column N %	p-value
Age	19-23	15	37.50%	16	40.00%	31	38.75%	0.659
	24-28	20	50.00%	21	52.50%	41	51.25%	
	29-33	4	10.00%	3	7.50%	7	8.75%	
	34-38	1	2.50%		0.00%	1	1.25%	
Indication For C Section	Contracted pelvis	0	0.00%	2	5.00%	2	2.50%	0.465
	CPD	1	2.50%	1	2.50%	2	2.50%	
	ERCS	27	67.50%	25	62.50%	52	65.00%	
	Fetal distress	7	17.50%	4	10.00%	11	13.80%	
	Scar tenderness	5	12.50%	8	20.00%	13	16.30%	
Position	LOA	22	55.00%	18	45.00%	40	50.00%	0.175
	LOP	0	0.00%	2	5.00%	2	2.50%	
	LOT	4	10.00%	8	20.00%	12	15.00%	
	ROA	12	30.00%	7	17.50%	19	23.80%	
	ROT	2	5.00%	5	12.50%	7	8.80%	
Uterine Incision to Extraction Time (Seconds)	<60 seconds	8	20.00%	24	60.00%	32	40.00%	0.001
	>120 seconds	2	5.00%	5	12.50%	7	8.75%	
	60-120 seconds	30	75.00%	11	27.50%	41	51.25%	
Fundal Pressure	Not	0	0.00%	40	100.00%	40	50.00%	0.001
	Used	40	100.00%	0	0.00%	40	50.00%	
Significant Intraoperative Complications	Nil	40	100.00%	40	100.00%	80	100.00%	n/a

The table presents a comparative analysis of variables related to the manual and Vectis methods for the extraction of an unengaged fetal head during Caesarean sections.

The age distribution was similar across both groups with the majority of patients falling in the 24-28 age range (50% in the manual group and 52.5% in the Vectis group). The p-value of 0.659 suggests that there was no significant difference in age distribution between the two groups. The mean age of patients was similar for both groups: 24.83 years (SD=3.62) for the manual method and 24.55 years (SD=3.02) for the Vectis method. The combined mean age was 24.69 years (SD=3.32). There was no statistically significant difference between the two groups regarding patient age (p=0.638).

The majority of Caesarean sections in both groups were conducted due to elective repeat Caesarean section (ERCS), accounting for 67.5% of the manual group and 62.5% of the Vectis group. The p-value of 0.465 indicates no significant difference in the indications for Caesarean section between the two groups.

In terms of fetal position, the left occipito-anterior (LOA) position was the most common in both groups. There was no significant difference between the two groups (p=0.175).

Significant differences were observed in the time from uterine incision to fetal extraction, with 60% of the Vectis group achieving extraction in less than 60 seconds compared to 20% in the manual group (p=0.001). The mean time from uterine incision to extraction was significantly shorter for the Vectis method (64.60 seconds, SD=36.86) compared to the manual method (83.08 seconds, SD=35.32). The overall mean extraction time was 73.84 seconds (SD=37.05). This difference was statistically significant (p=0.025).

Fundal pressure was used in all cases in the manual group and not used at all in the Vectis group. This difference was statistically significant (p=0.001).

No significant intraoperative complications were noted in either group. Given that there were no events in this category, a p-value cannot be calculated.

This data suggests that the Vectis method for the extraction of an unengaged fetal head during Caesarean sections may lead to faster extraction times, possibly contributing to improved maternal and neonatal outcomes.

Table 2: Comparison of Neonatal Outcomes between Manual and Vectis Methods for Fetal Head Extraction

		Method of extraction						
		Manual		Vectis		Total		
		Count	Column N %	Count	Column N %	Count	Column N %	
APGAR 1 Min	5	0	0.00%	1	2.50%	1	1.30%	0.001
	6	13	32.50%	3	7.50%	16	20.00%	
	7	25	62.50%	19	47.50%	44	55.00%	
	8	2	5.00%	17	42.50%	19	23.80%	
APGAR 5 Min	6	0	0.00%	1	2.50%	1	1.30%	0.019
	8	14	35.00%	4	10.00%	18	22.50%	
	9	26	65.00%	35	87.50%	61	76.30%	
Neonatal Injuries	nil	40	100.00%	40	100.00%	80	100.00%	n/a
Neonatal Outcome	alive	40	100.00%	40	100.00%	80	100.00%	n/a

The table illustrates the comparison of neonatal outcomes for the manual and Vectis methods of fetal head extraction during Caesarean sections, involving 80 participants, 40 for each method.

For the 1-minute APGAR score, a significantly higher proportion of newborns delivered by the Vectis method had a score of 8 (42.5%), compared to the manual method (5%). Additionally, a lower proportion of newborns in the Vectis group had a score of 6 (7.5%) as compared to the manual group (32.5%). The observed differences were statistically significant (p=0.001).

Considering the 5-minute APGAR score, a larger percentage of newborns from the Vectis group (87.5%) had a score of 9, contrasted to 65% in the manual group. The statistical significance of this difference is indicated by a p-value of 0.019.

In both groups, no neonatal injuries were reported, and all newborns were alive following the procedure. Given no events in these categories, p-values are not applicable.

This table indicates that the Vectis method for extraction of an unengaged fetal head during Caesarean section is associated with better APGAR scores at 1 and 5 minutes post-delivery compared to the traditional manual method.

Table 3: Comparative Evaluation of the Experience by Mother, Surgeon, and Anaesthetist during Manual and Vectis Methods of Fetal Head Extraction

		Method of extraction						
		Manual		Vectis		Total		
		Count	Column N %	Count	Column N %	Count	Column N %	
Experience by mother	Discomfort present	40	100.00%	0	0.00%	40	50.00%	0.001
	No discomfort	0	0.00%	40	100.00%	40	50.00%	
Experience by surgeon	Difficult extraction	18	45.00%	9	22.50%	27	33.75%	0.639
	Easy extraction	22	55.00%	31	77.50%	53	66.25%	
Experience by anaesthetist	Cannot say	2	5.00%		0.00%	2	2.50%	0.001
	Not preferred	32	80.00%	8	20.00%	40	50.00%	
	Preferred	6	15.00%	32	80.00%	38	47.50%	

The table presents a comparison of the experience reported by mothers, surgeons, and anaesthetists during Caesarean sections using the manual and Vectis methods for fetal head extraction.

All mothers in the manual group reported the presence of discomfort during the extraction, whereas no discomfort was reported by mothers in the Vectis group. This difference was statistically significant (p=0.001).

From the surgeon's perspective, extraction was rated as "easy" more often in the Vectis group (77.5%) compared to the manual group (55%). However, the difference between the two groups was not statistically significant (p=0.639).

The anaesthetists' perspective revealed a preference for the Vectis method (80% preferred) over the manual method (15% preferred), although the difference was statistically significant (p=0.001). A higher proportion of anaesthetists in the manual group found the extraction method to be "not preferred" (80%), compared to the Vectis group (20%).

These results suggest that the Vectis method for the extraction of unengaged fetal heads during Caesarean sections is more comfortable for the patient and is generally preferred by the operating team, although further research is needed to substantiate these findings.

Table 5: Comparison of Mean APGAR Scores and Length of Abdominal Incision between Manual and Vectis Methods for Fetal Head Extraction

	method of extraction						
	Manual		Vectis		Total		
	Mean	SD	Mean	SD	Mean	SD	p-value
APGAR 1 min	6.73	0.55	7.30	0.72	7.01	0.70	0.001
APGAR 5 min	8.65	0.48	8.83	0.55	8.74	0.52	0.496
Length of Abdominal Incision (cm)	12.92	0.83	13.45	1.16	13.18	1.03	0.021

This table presents a comparison of the mean APGAR scores at 1 and 5 minutes and the mean length of the abdominal incision for the manual and Vectis methods of fetal head extraction during Caesarean sections.

The 1-minute APGAR score was significantly higher for the Vectis group (Mean=7.30, SD=0.72) than for the manual group (Mean=6.73, SD=0.55). The overall mean 1-minute APGAR score was 7.01 (SD=0.70). The difference was statistically significant (p=0.001).

In contrast, the 5-minute APGAR scores were similar for both groups: 8.65 (SD=0.48) for the manual group and 8.83 (SD=0.55) for the Vectis group. The overall mean 5-minute APGAR score was 8.74 (SD=0.52), with no statistically significant difference between the two groups (p=0.496).

The mean length of the abdominal incision was slightly longer for the Vectis group (Mean=13.45 cm, SD=1.16) than for the manual group (Mean=12.92 cm, SD=0.83). The overall mean length of the abdominal incision was 13.18 cm (SD=1.03). The difference was statistically significant (p=0.021).

These findings suggest that the Vectis method may result in better immediate neonatal outcomes (as indicated by the higher 1-minute APGAR score) and require a slightly longer abdominal incision compared to the manual method.

Table 6: Comparison of fall in Haemoglobin Levels between Manual and Vectis Methods for Fetal Head Extraction

	Method of extraction					
	Manual		Vectis		Total	
	Mean	SD	Mean	SD	Mean	SD
FALL IN HB	0.83	0.90	0.40	0.64	0.87	0.53
p-value (Fall in Hb)	0.007		0.002			

The mean fall in Hb levels was larger in the manual group (Mean=0.83 g%, SD=0.90) compared to the Vectis group (Mean=0.40 g%, SD=0.64), with an overall mean fall of 0.87 g% (SD=0.53). This difference was statistically significant (p<0.01).

These findings suggest that the Vectis method of fetal head extraction during Caesarean sections may be associated with less fall in hemoglobin levels compared to the manual method, possibly indicating a better surgical and recovery experience.

DISCUSSION

The present comparative study demonstrated that the Vectis method of fetal head extraction during Caesarean section may be associated with more favorable maternal and neonatal outcomes compared to the traditional manual method. This aligns with the growing body of research advocating for less invasive and safer approaches to obstetric procedures [7, 8].

Our study found that the left occipito-anterior (LOA) position was the most frequently observed fetal position in both the Vectis and manual groups. Importantly, this positional preference didn't result in a statistically significant difference between the two groups (p=0.175). This finding is in line with those of Priyanka HK et al. [7], where they reported the left occipitotransverse (LOT) position as the most common in both Vectis (32%) and manual extraction groups (62%). Despite the apparent difference in the prevalence of the LOT position, their study found no significant variation between the two groups, as indicated by a P-value of 0.44. These results further suggest that the fetal position at the time of extraction, whether it be LOA or LOT, does not play a significant role in the choice between Vectis and manual extraction methods.

In our study, we observed significant differences in the duration from uterine incision to fetal extraction. Specifically, 60% of the extractions in the Vectis group were completed in less than 60 seconds, while only 20% of extractions in the

manual group fell into this timeframe. This difference was statistically significant, as evidenced by a p-value of 0.001. Additionally, the mean extraction time was significantly shorter for the Vectis method (64.60 seconds, SD=36.86) compared to the manual method (83.08 seconds, SD=35.32), with the overall mean extraction time being 73.84 seconds (SD=37.05). This difference also showed statistical significance (p=0.025).

Contrastingly, Priyanka HK et al. [7] reported a relatively equal distribution of extraction times across the Vectis and manual extraction groups. Their study showed that for a majority of women (86% in the Vectis group and 88% in the manual extraction group), the time from incision on the lower uterine segment to extraction of the head ranged from 15 to 35 seconds. Only about 6% of cases in the Vectis group and 3% in the manual group required more than 45 seconds. However, they found no statistically significant difference between the two groups (p-value=0.390).

Similarly, Swain et al. [8] reported varying extraction times across different methods. The mean extraction time was longest in the manual extraction group (90.56±4.91 seconds), shorter in the forceps extraction group (70.2±5.02 seconds), and shortest in the vacuum extraction group (62.3±2.03 seconds). It is also notable that extension of the uterine incision was required in some cases of the manual and forceps extraction groups but none in the vacuum extraction group.

Taken together, these findings indicate that while our study found significant differences in extraction times between the Vectis and manual methods, other studies have reported a less pronounced difference. However, variations in study design and population might account for these discrepancies.

Our study demonstrated that all cases in the manual group required the application of fundal pressure, while it was not used at all in the Vectis group. This difference was found to be statistically significant (p=0.001).

This observation aligns well with the findings reported by Priyanka HK et al., [7] where they indicated that no cases in the Vectis group required fundal pressure for the extraction of the head. In contrast, all women in the manual extraction group needed fundal pressure, leading to a highly significant difference (p-value: <0.001).

In the study by Ingole SJ, [9] fundal pressure was required in all cases of the manual extraction group as well, but only 13 patients in the forceps group required additional fundal pressure. In line with this, Swain et al. [8] also reported that the application of fundal pressure was needed in all cases of the manual extraction group, 51 cases of the forceps extraction group, but none of the cases in the vacuum extraction group.

These reports collectively reaffirm the results observed in our study, highlighting that the need for fundal pressure application is significantly higher in the manual method compared to the Vectis method.

Our study reports significant differences in the 1-minute APGAR scores between the Vectis and manual groups, demonstrating a mean score of 7.30 for Vectis versus 6.73 for the manual group (p=0.001). The 5-minute APGAR scores, conversely, didn't show a significant disparity, with mean scores of 8.83 and 8.65 in the Vectis and manual groups, respectively (p=0.496).

In comparison, Swain S et al.'s [8] study presented a range of APGAR scores at 1 minute, with scores between 4 to 7 recorded in two cases each in the manual and forceps groups. They reported that in all instances of manual, forceps, and vacuum extraction, the 1-minute APGAR scores were above 7. The mean APGAR score in their manual extraction group was slightly higher than in our manual group at 8.49 (SD 0.50). For the forceps and vacuum extraction groups, the scores were marginally higher still at 8.53 (SD 0.50) and 8.61 (SD 0.53), respectively.

At the 5-minute mark, all APGAR scores in Swain et al.'s [8] study were again above 7, similar to our study findings. Their 5-minute mean APGAR scores for the manual, forceps, and vacuum groups were 8.49 (SD 0.50), 8.53 (SD 0.50), and 8.61 (SD 0.49), respectively.

These findings consolidate the evidence that the Vectis method is comparably safe and effective as other methods for the extraction of unengaged fetal head during Caesarean section. Nevertheless, our study's observation of a higher mean 1-minute APGAR score in the Vectis group suggests a potential benefit for neonatal well-being.

In our study, we found a significant difference in maternal discomfort between the two extraction methods. All mothers in the manual group reported experiencing discomfort during the extraction, while none of the mothers in the Vectis group reported such discomfort. This difference was statistically significant (p=0.001).

This finding is consistent with the study conducted by Priyanka HK et al. [7] According to their study, the use of the Vectis method has shown a significant advantage in reducing maternal discomfort. Hence, our study, together with the findings of Priyanka HK et al., [7] strongly suggests that the Vectis method could be a more comfortable option for mothers during the extraction process.

From the perspective of surgeons and anaesthetists, our study observed intriguing trends. While the extraction was rated as "easy" in 77.5% of the cases with the Vectis method compared to 55% in the manual group, this difference was not statistically significant (p=0.639). Furthermore, the majority of anaesthetists (80%) preferred the Vectis method over the manual method (15% preferred), to reach statistical significance (p=0.001). Conversely, a higher proportion of anaesthetists considered the manual extraction method as "not preferred" (80%) compared to the Vectis method (20%).

It should be noted, however, that these findings could not be compared directly with existing literature due to limited studies on the use of the Vectis method for extraction during cesarean sections. Further research in this area is warranted to corroborate these results.

These results suggest that the Vectis method for the extraction of unengaged fetal heads during Caesarean sections is more comfortable for the patient and is generally preferred by the operating team, although further research is needed to substantiate these findings.

In our study, the mean length of the abdominal incision was slightly longer in the Vectis group (Mean=13.45 cm, SD=1.16) compared to the manual group (Mean=12.92 cm, SD=0.83), with an overall mean length of 13.18 cm (SD=1.03). This difference reached statistical significance (p=0.021). However, this contrasts with the findings of Priyanka HK et al. [7], who reported that a smaller incision of less than 12 cm was required in 96% of cases in the Vectis group, while 27% of the manual extraction group needed an incision greater than 12 cm. Thus, the abdominal incision was significantly smaller in the Vectis group in their study (p value <0.001).

This difference in outcomes may be due to variations in surgical techniques, patient characteristics, or other unmeasured factors. Additional research may be necessary to further elucidate the relationship between the extraction method and the required length of abdominal incision.

In our study, the mean fall in Hemoglobin (Hb) levels was notably larger in the manual group (Mean=0.83 g%, SD=0.90) compared to the Vectis group (Mean=0.40 g%, SD=0.64). The overall mean fall in Hb was 0.87 g% (SD=0.53), with this difference demonstrating statistical significance (p<0.01).

Contrastingly, Priyanka HK et al. [7] found no significant difference in blood loss, estimated by the change in pre-operative and post-operative hemoglobin levels, between the Vectis and manual extraction groups (p=0.153). Ingole et al. [9] reported significantly more blood loss in the manual delivery group compared with forceps-assisted delivery, as reflected in the larger difference in pre and post-operative hemoglobin levels (1.87 g/dL for manual vs 1.03 g/dL for forceps, p=0.011).

Furthermore, Swain et al. [8] reported estimated blood loss in manual, forceps, and vacuum extraction groups, with the manual extraction group experiencing a blood loss of 428±69.38 ml, significantly less than the 579±97.22 ml seen in the forceps extraction group and slightly less than the vacuum extraction group, which had a blood loss of 454±66.92 ml.

The disparities in these findings may be due to differences in the methods used to estimate blood loss, surgical techniques, patient characteristics, or other factors not accounted for in these studies. Future research is required to explore this further.

In summary, this study supports the notion that the Vectis method of fetal head extraction during Caesarean section can be a safe and effective alternative to the manual method, with potential benefits for both the mother and neonate. However, further large-scale randomized controlled trials are needed to corroborate these findings.

CONCLUSION

The comparative analysis of Vectis and manual methods of extraction of unengaged fetal head during Caesarean section, conducted within our study, highlights several significant findings. Firstly, the Vectis method was associated with shorter extraction times and decreased the necessity for fundal pressure, reducing the associated risks. Secondly, both maternal and professional experiences were improved with the Vectis technique. Mothers reported experiencing less discomfort during the extraction, surgeons found the process easier, and anaesthetists expressed a clear preference for this method.

Furthermore, both APGAR scores and neonatal outcomes were comparable between the two groups, suggesting no adverse impact on neonatal health with the use of the Vectis method. Although the Vectis technique was associated with a slightly greater drop in maternal hemoglobin levels post-operatively, this was not clinically significant.

In conclusion, our study suggests that the Vectis method can offer a viable, effective, and potentially preferable alternative to the traditional manual extraction technique during Caesarean section for unengaged fetal head. Future research is recommended to further confirm these findings and to investigate the potential long-term implications of the Vectis technique for both mother and neonate.

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