

Vacuum-Assisted Delivery of the Fetal Head at Cesarean Section

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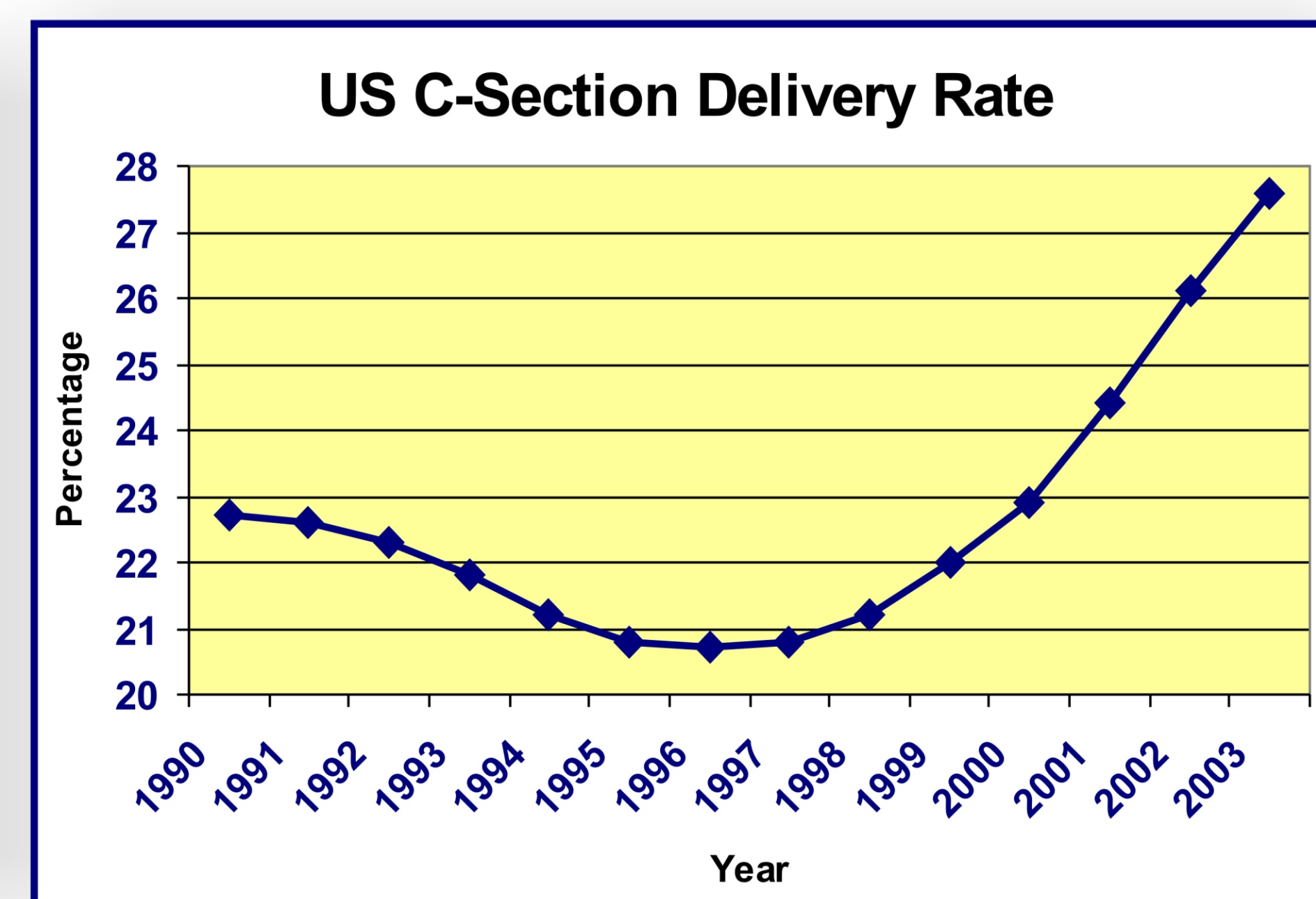
Introduction

The cesarean section rate continues to climb worldwide. In the United States in 2003, 27.6 percent of all births were by cesarean section, a marked rise of 1.5 percent over the all-time high rate of 2002. However, this surgical procedure is not without risk; one such risk is the traumatic or deliberate extension of the uterine incision while attempting to deliver the fetal head. Techniques to effect delivery under these circumstances have included pressure on the uterus, the use of forceps blade/s, or additional incisions in the uterus - all of which can be traumatic to both mother and fetus. The use of the vacuum extractor to assist in delivery of the fetal head at cesarean section has been increasing in recent years.

We sought to compare the safety and efficacy of delivery of the fetal head at cesarean section using the vacuum extractor (Kiwi®OmniCup®, Clinical Innovations, Inc.) and the traditional method of manual extraction.

Total Cesarean Delivery Rates United States, 1990-2003	
Year	Percentage
2003	27.6
2002	26.1
2001	24.4
2000	22.9
1999	22.0
1998	21.2
1997	20.8
1996	20.7
1995	20.8
1994	21.2
1993	21.8
1992	22.3
1991	22.6
1990	22.7

Source: National Vital Statistics Reports, Vol. 54, No. 4, September 22, 2005

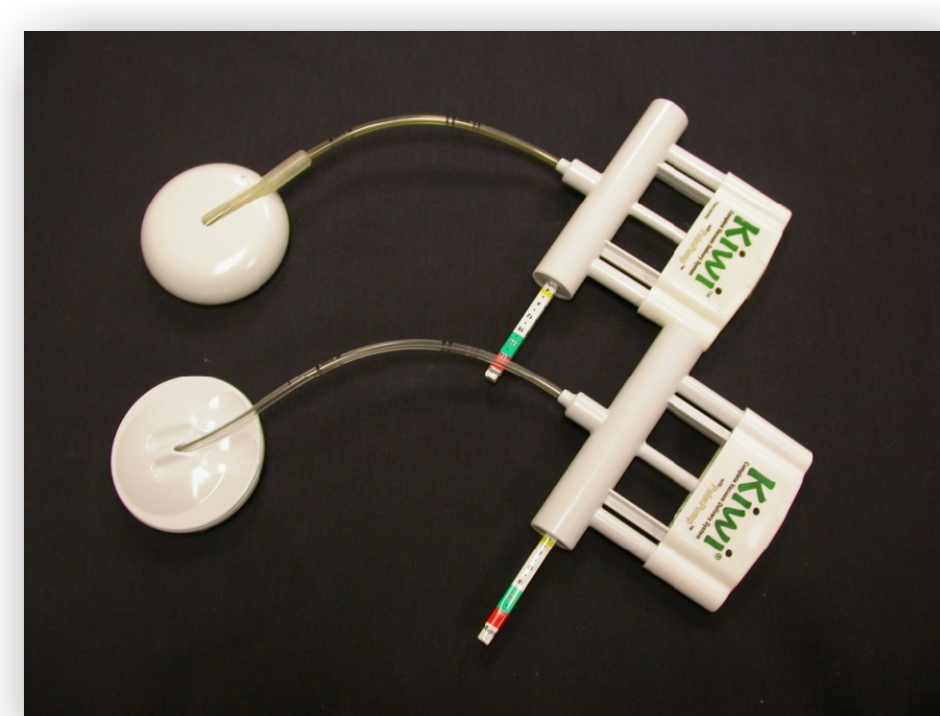


Methods

A cohort design was used in this study. Women at term, with singleton gestations and requiring a cesarean section for delivery, were recruited to participate in this study. All women approached agreed to participate in the study and allow the use of the Kiwi®OmniCup® to assist delivery of the fetal head. The comparison group, all having undergone a “traditional” cesarean section (manual extraction of the fetal head), was retrospectively selected from medical records by matching maternal demographics.

The primary outcome measures included estimated blood loss for the procedure, evidence of uterine/cervical lacerations, neonatal APGAR scores, and neonatal trauma (including evidence of scalp abrasions, bruising, cephalohematoma, subgaleal or intracranial hemorrhage). In addition, the time (*in minutes*) from hysterotomy incision to delivery of the neonate, fetal station and position at the time of cup application and the number of cup detachments were recorded in the study group.

Statistical analysis included Student *t* test for continuous variables and χ^2 test for categorical variables. The Fisher exact test was used when the expected cell frequencies were equal to or less than 5. $P < 0.05$ was considered statistically significant. Statistical analyses were performed by using SPSS.



Kiwi®OmniCup®
Kiwi®Omni-C Cup



Kiwi®Omni-C Cup (left) has a lower profile cup than Kiwi®OmniCup®

Vacuum-Assisted Delivery at C-Section



1. Locating flexion point



2. Inserting vacuum extractor



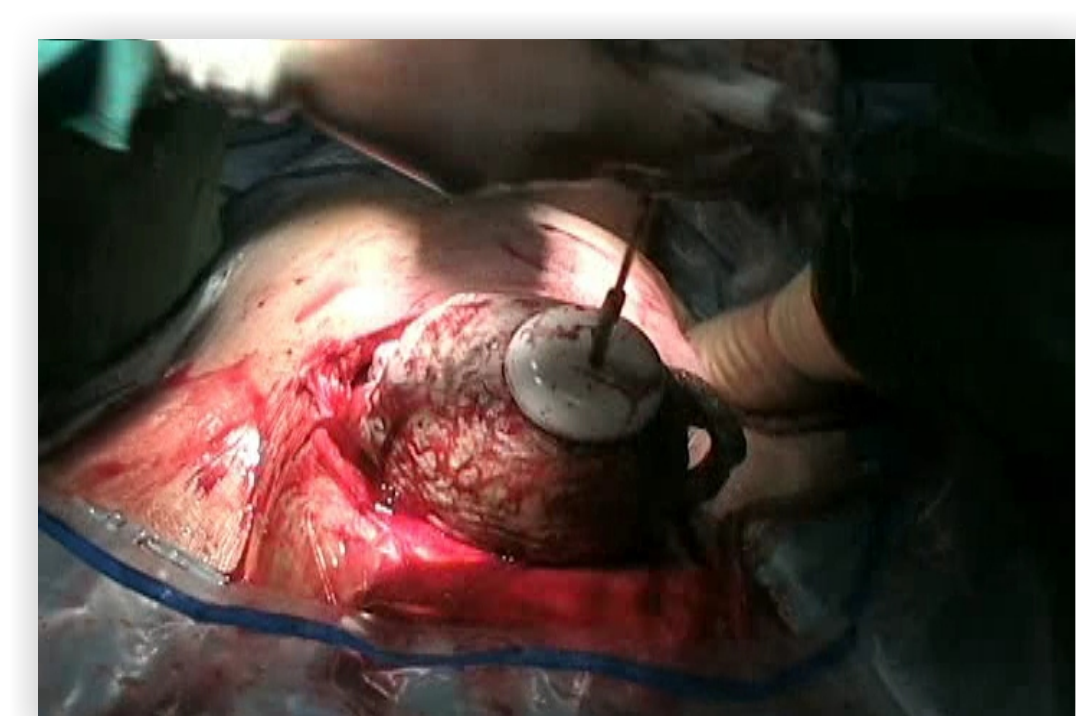
3. Placing device on flexion point



4. Obtaining vacuum of 500-600 mmHg



5. Exerting gentle traction



6. Delivering the fetal head

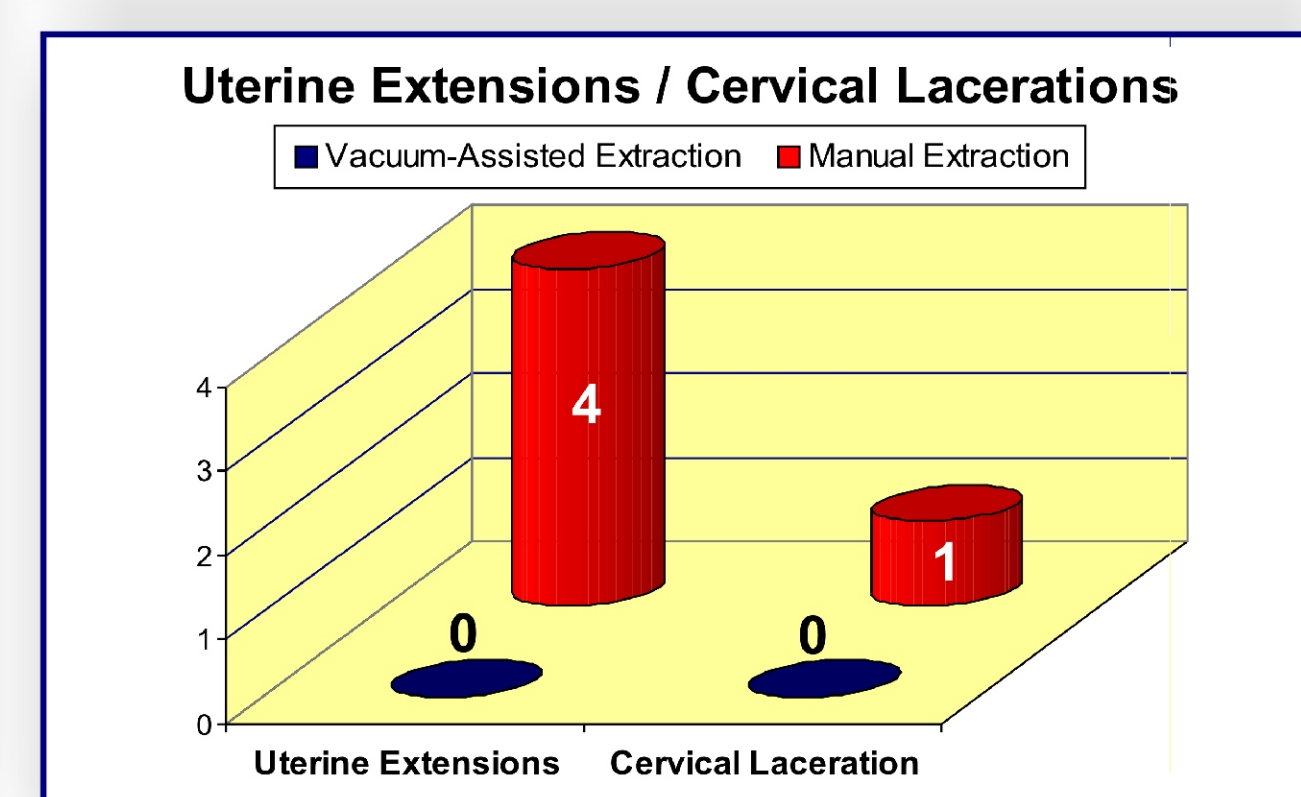
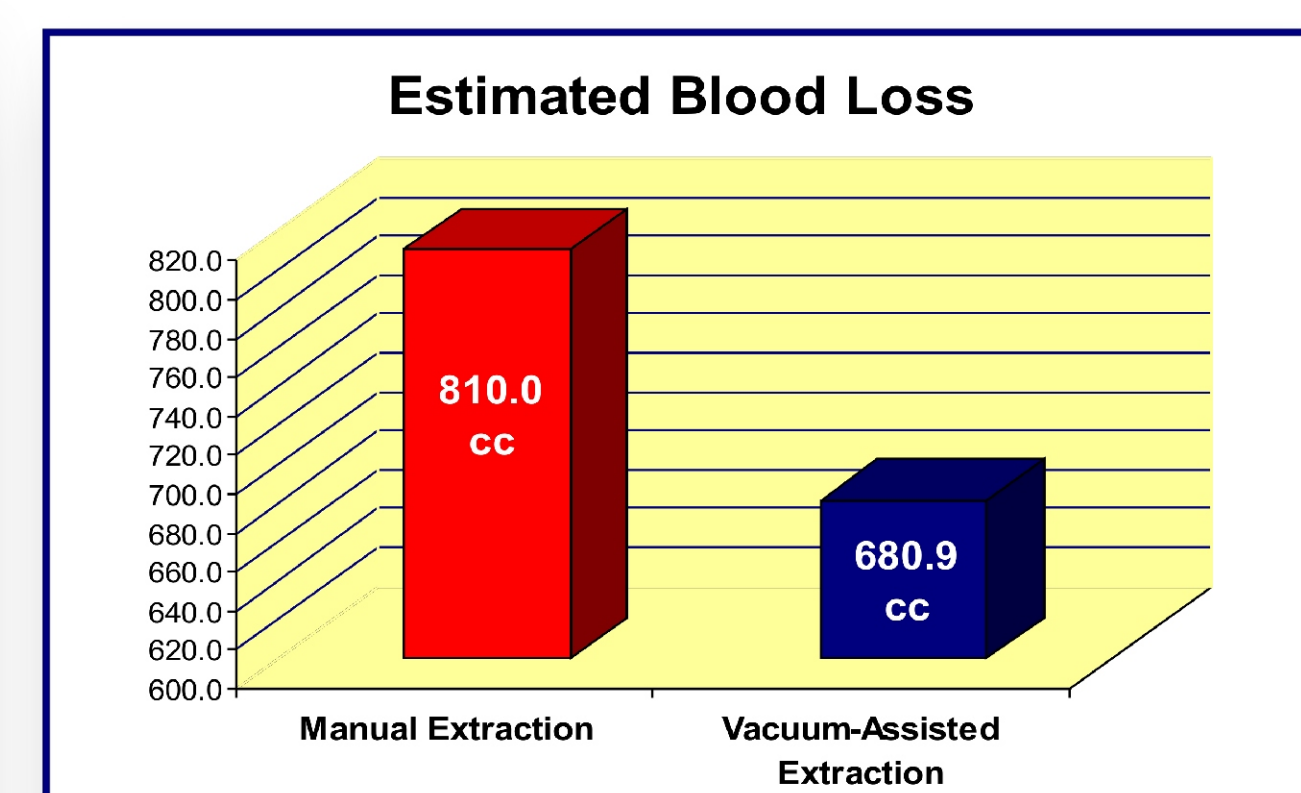
Results

A total of 25 women underwent a cesarean section where the Kiwi®OmniCup® was used to assist delivery of the fetal head. An additional 25 women who had undergone cesarean sections (with manual extraction of the fetal head) were retrospectively selected by matching maternal demographics. The estimated blood loss was less in the study group (680.9cc vs. 810.0cc; $P < 0.04$).

In the manual extraction group, 4 of the 25 women had uterine extensions, and 1 of the 25 had a cervical laceration documented at the time of surgery. Whereas, there were no uterine extensions or cervical lacerations evident in the study group (use of the Kiwi®OmniCup®). Neonatal outcomes revealed no difference between the two groups in APGAR scores or birth weight (7.67 lbs. vs 7.85 lbs.; $P < 0.62$), but there were slightly more scalp effects (bruising, abrasion and chignon) in the study group.

The 3 reported scalp effects in the study group were all minor and spontaneously resolved within 1 week without treatment. The scalp effects (2 abrasions and 1 bruise) were due to malplacement of the cup and subsequent pop-offs during the delivery. Those cups that were appropriately placed over the flexion point (three centimeters anterior to the posterior fontanelle along the sagittal suture) had no pop-offs and revealed no evidence of scalp effects. Thus, like vacuum-assisted vaginal deliveries, proper placement of the cup is vital to the safety and success of the procedure.

Study Results						
Age	G	P	Time (min.)	Station	Position	Pop-Offs
18	1	0	2	Low	OP	1
22	2	1	2	Unengaged	OT	0
24	2	1	1	Mid	OA	0
28	3	2		Mid	OT	0
38	3	1	2	Mid	OT	0
23	1	0	1	Mid	OA	0
25	2	1	2	Unengaged	OA	0
19	1	0	1	Mid	OT	0
20	2	1	1	Unengaged	OT	0
22	2	1	2	Unengaged	OP	0
19	1	0	2	Low	OP	0
22	2	1	2	Unengaged	OT	1
24	2	1	1	Mid	OA	0
28	3	2		Mid	OT	0
38	3	1	2	Mid	OT	0
23	1	0	1	Mid	OA	0
21	2	1	2	Unengaged	OT	0
24	3	2	1	Mid	OP	0
22	1	0	2	Low	OP	1
29	3	2	2	Mid	OT	0
30	2	1	2	Mid	OA	0
21	2	1	2	Unengaged	OT	0
19	1	0	1	Low	OP	0
25	2	1	2	Mid	OT	0
21	2	1	2	Mid	OA	0



Conclusions

Over the past decade, the cesarean section rate has increased tremendously. However, the technique for this procedure has undergone very little change. Delivery of the infant at time of cesarean section can be difficult, depending on the size and the station of the fetal head. Even unengaged and mid-pelvic stationed infants can present difficulties when attempting to deliver the head through the hysterotomy. Lateral extensions in the uterine incision and even lacerations down to the cervix may occur. Thus, using a vacuum device to minimize the space requirements of the hysterotomy can reduce the incidence of these unwanted extensions and lacerations. The minor scalp effects caused by the vacuum appear to be largely avoidable if the cup is appropriately placed over the flexion point. The new hand held vacuums, such as the Kiwi®OmniCup®, decrease the chance of contamination of the surgical field due to their all-in-one design.

This study showed that the use of the vacuum extractor at time of cesarean section is a safe and effective method to affect delivery of the fetal head. It limits the traumatic extensions of the hysterotomy and provides a less invasive alternative for the surgeon. Given the increasing rate of cesarean sections worldwide, it is important to evaluate alternative techniques for this antiquated method of delivery.