Use of the vacuum extractor in the community hospital

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As obstetrical technique continues to develop, newer forms of instrumental delivery have developed. This article reviews 255 deliveries over a six-year period. These cases were taken from private and clinic practice in a general hospital setting. Both Kobayashi and Mityvac extractors were used with and without anesthesia. The use of the malleable extractor has proven a safe and versatile addition to the armamentarium of the obstetrician.

By the mid 1960s, the development of both operative obstetrics and obstetrical anesthesia established the combination of low-forceps deliveries under conduction anesthesia in a great number of community hospitals. While such methods were not routine, they represented a standard to be met. The use of conduction anesthesia is dependent upon the availability of personnel with specific skills; this criterion usually is outside the control of the accoucheur. The operative forceps are totally under the obstetrician's control, however.

Four elements of risk are inherent in the use of obstetric forceps: First, the introduction of the blade into a vaginal vault already occupied by an infant's head risks laceration of the lateral walls. Intravaginal manipulation, such as rotation of the head, increases this risk. Second, the application of the forceps against the infant's parietal and facial areas produces compression of the head to the point of bruising or abrasion, fracture, or even intracranial hemorrhage. While rare, these events are catastrophic.

Third, even proper application of the forceps increases the mass passing through the introitus. Despite an adequate episiotomy, this increase can produce forces exceeding the inherent tone of the perineal musculature, which results in lacerations. Such events are more common with local infiltration or when anesthesia is not used. Fourth, the forceps used in low techniques are designed to overcome resistance of the soft tissue. Injudicious or overenthusiastic traction on the forceps may cause injuries to mother or infant. While the state of the instruments remained static, the traditional means

of reducing these risks lay solely in the maximization of the obstetrician's skills.

An alternative approach was offered in the early 1950s in the form of the Malmström vacuum extractor, which was based on a concept introduced in 1706 by Yonge.¹ A shaped metal cup was applied to the infant's head, negative pressure was applied inside the cup, and a caput succedaneum was created, which allowed traction and rotational forces to be used to augment the mother's expulsive efforts. This instrument was smaller in diameter than the infant's head and produced minimal lateral compression. Thus, it reduced the risk of lateral wall laceration, episiotomy extension, and intracerebral injury. In the hands of such skilled obstetricians as Eisenberg,¹ these benefits were, indeed, obtained.

Deficiencies inherent in the Malmström unit did cause problems. The rigidity and the shape of the cup resulted in excessive caput succedaneum formation. The negative pressure on the rigid edge of the cup produced scratches, skin dehiscence, and subcutaneous hemorrhage.^{2,3} Fortunately, once the basic technique proved effective, improvements in equipment followed.

In the 1970s, semimaleable materials and changes in the shape of the cephalic portion of the cup were introduced in the form of the Kobayashi and Mityvac instruments.⁴ Considerable benefits are seen when comparing these new units to both obstetric forceps and the Malmström extractor. The softer material of the cup allows easier transvaginal application. Also, the gentle cone shape decreases the severity of the caput succedaneum⁵; the Kobayashi unit is more effective in this aspect. In addition, excessive perineal resistance causes suction to be lost, so the instrument pops off before damage to the infant occurs. And, finally, the newer instruments can be used with conduction or local anesthesia, or without any anesthesia.

However, there are problems in using the newer vacuum extractors. First, rotation of the presenting head is possible but more difficult than it is when using forceps. Second, the instrument primarily is used to augment forces of the mother and is limited in its ability to overcome resistance by a thick, firm perineum. Third, inadvertent trapping of the cervix or vaginal mucosa between the

suction cup edge and the infant's head can produce hematomas or skin dehiscence.

I have found the Mityvac unit to be less advantageous because of the less comfortable grip and the more pronounced caput succedaneum. It is, however, a smaller unit, which affords greater ease of insertion and less risk of trapping of the mucosa.

Materials and methods

The 253 patients included in this report were taken from my private and clinic practices from Dec 1981 through Nov 1987. Of these, 98% were delivered by myself or under my direct supervision. Conduction anesthesia was provided through the hospital department of anesthesia, while local anesthesia was administered by myself or an assistant. Apgar ratings were estimated by anesthesiologists, delivery room nurses, or myself.

During the period of the report, both interns and medical students were instructed successfully in the use of the vacuum extractor.

Criteria for application of the extractor were complete dilation, descent of the biparietal diameter to +1/+2 station, rupture of the membranes; and optional episiotomy.

As expertise increased, it was found that this instrument could be applied with or without anesthesia, that rotations could be performed from the posterior or transverse positions, that both the first and second of twins could be delivered in this way, and that premature infants did not tolerate the procedure well, even at reduced negative pressures. While multiparous women tolerated the technique very well, primiparous patients experienced more problems from the inherently firm perineal tone. Extension of the episiotomy did occur in some cases, but less frequently than with forceps use.

The 253 patients ranged in age from 14 to 41 years (average, 25.1 years). There were 90 primiparas (35.6%) and 163 multiparas (64.4%). Gestational ages ranged from 24 to 43 weeks (average, 39.7 weeks). Birth weights ranged from 2lb 14oz (1,304 g) to 14lb 12 oz (5,854 g).

Anesthesia was administered in 246 cases (97.2%); 188 patients had epidural block and 58 patients had local anesthesia.

Complications of delivery included extension of the episiotomy, depression of the infant, and failure of the technique.

Episiotomy was performed for 232 patients (92%). There was fourth-degree extension of the midline episiotomy in 29 patients (12.5%); 22 of these patients were primiparous and 7 were multiparous.

Condition of the 255 neonates was evaluated by

the one-minute and five-minute Apgar scores. Apgar scores of 7 or less were used to denote depression. There were 17 infants (6.7%) with one-minute Apgar scores below 7 (Table 1). Only three showed depression that possibly was associated with technique. Five infants (2.0) had Apgar scores of 7 or less at five minutes. Only one infant might have been depressed because of the procedure. Table 2 lists the various causes of infant depression. One infant death occurred in utero from unknown causes.

Failure of the vacuum extractor technique occurred in 12 patients (4.7%) (Table 3). Eight of these failures were in primipara and four in multipara. Laufe-Piper forceps were used to deliver 11 of these infants; cesarean section was necessary in one case. Rotation with Barton forceps was necessary for two neonates, whose birth weights each exceeded previous siblings by approximately 2 lb. Four infants presented in a persistent occiput posterior position, while four exceeded 3,800 g in birth weight.

Summary

For the uncomplicated vaginal delivery, the ease

TABLE 1. APGAR SCORES OF 255 INFANTS.*

One-minute score	Numbers of infants (%)	Five-minute score	Numbers of infants (%)
<7	17 (6.7)	<7	5 (2.0)
7, 8	125 (49.0)	7, 8	15 (5.9)
9, 10	113 (44.3)	9, 10	235 (92.1)

*There were two cases of twin delivery.

TABLE 2. CAUSES OF INFANT DEPRESSION.

One-minute depression		Five-minute depression	
No.	Cause	No.	Cause
6	Circumnuchal cord with compression	1	Circumnuchal cord with compression
1	Multiple congenital anomalies	1	Maternal drug addiction, with intrapartum fetal heart tone depression; newborn stillborn failing to respond to treatment
1	Persistent occiput posterior position, with rotational and delivery difficulties	1	Persistent occiput posterior position, with rotational and delivery difficulties
4	Predelivery fetal heart tone depression	1	Unknown, possibly technique related
1	Occult cord prolapse		
1	Maternal drug addiction with intrapartum fetal heart tone depression; newborn died		
3	Cause unknown, possibly technique related		

TABLE 3. FAILED VACUUM EXTRACTOR PROCEDURE DATA.

Parity	Maternal age	Gestational age	Anesthesia	Apgar		Birth weight (g)	Comment
				1 min	5 min		
00102	17	39	Epidural	8	10	3,529	Large baby
00001	26	42	Epidural	8	10	3,636	POPP*; rotation required
00001	25	38	Epidural	6	8	4,171	Huge infant
00001	19	40	Local	1	2	3,414	POPP; rotation required
10012	26	40	Epidural	9	10	3,829	POPP and failure to descend; weight 2 lbs more than sibling
10113	25	42	Epidural	8	10	3,371	Premature rupture of membranes; fetal distress
10012	24	42	Epidural	7	9	3,857	POPP; weight 2 lbs more than sibling
00001	18	42	Epidural	7	9	4,529	Tight musculature
00001	20	40	Epidural	7	9	3,536	Huge infant; tight musculature
00001	20	40	Epidural	9	10	3,086	Marked perineal and soft-tissue resistance
00001	33	40	Epidural	7	10	4,043	POPP
20124	36	40	Epidural	7	10	3,957	No reason
							Deep transverse arrest

*POPP = persistent occiput posterior position.

and safety of application of the new Kobayashi and Mityvac vacuum extractor reduces the risks to well below those associated with low forceps use. Proper use of these instruments can be taught readily to graduate physicians and medical students.

The modern vacuum extractor is a safe, versatile, and effective instrument. It is suitable for use in the general hospital and by general practitioners with obstetric privileges.

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5. Maryniak GM, Frank JB: Clinical assessment of the Kobayashi vacuum extractor. *Obstet Gynecol* 1984;64:431-435.

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