

# Vacuum extraction: Tips for achieving an optimal outcome

↘ This method of delivery can avert cesarean section and its associated morbidity but carries its own risks, determined in part by maternal and fetal characteristics. Appropriate patient selection and choice of instrumentation are keys to success with vacuum extraction.

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### **CASE** Is vacuum extraction right for this delivery?

A 41-year-old woman (G2P2002) is at term in her third pregnancy, and the fetus exhibits prolonged deceleration that does not resolve while the mother pushes from a +3 station. The fetus, estimated to weigh 8 lb, is in the occiput anterior (OA) position. The mother is willing to consider vaginal extraction, and you must weigh the factors that may influence successful delivery.

Vacuum extraction (VE) is an effective method to facilitate delivery. From 2007 to 2013, VE was used to facilitate about 3% of vaginal deliveries in the United States.<sup>1</sup> By contrast, cesarean delivery rates over the same period averaged about 30%.<sup>2</sup>

Controversy exists on the pros and cons of operative vaginal deliveries versus cesarean delivery, as well as on the instruments and operational approaches used. While

opinion tends to be resolute and influential, evidence remains inconclusive.

Multiple factors influence a decision on whether to choose VE. The clinician's own bias regarding delivery routes and comfort level with performing VE are important. The patient, too, may have preconceived opinions about VE. Knowing the indications for VE and its benefits and risks (TABLE 1) can help the patient make an informed choice and the counseling on which will be needed in obtaining the patient's informed consent. The expectations and desires of the patient in concert with the experience and skill of the clinician will serve to achieve the optimal decision.

### Indications for VE

Maternal indications for the use of VE include prolongation or arrest of the second stage of labor. Another indication is the need to shorten the second stage due to a maternal cardiac or cardiovascular disorder or due to maternal exhaustion.

Fetal indications include nonreassuring fetal status or a need to correct for minor degrees of malposition (asynclitism, deflexion) that historically have been addressed with the use of obstetric forceps. VE delivery in these circumstances requires a very experienced and skilled operator.



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**TABLE 1 Benefits and risks of vacuum extraction**

	Benefits	Risks
Mother	Avoids cesarean delivery, usually preferred by mother; is cost effective; lessens morbidity	Genital tract trauma; possible injury to pelvic floor
Fetus	Decreases incidence of respiratory difficulties at birth	Cranial hemorrhage; shoulder dystocia

**Further selection criteria**

Birthweight influences the consideration of VE. Low birthweight or prematurity are contraindications to the use of VE due to concerns about fetal/neonatal bleeding. Large fetuses will have issues with cephalopelvic disproportion, thus increasing the risk for 2 disorders: shoulder dystocia and fetal cranial bleeding.

Cranial bleeding, both intracranial and extracranial, can result in serious neonatal morbidity and mortality. Bleeding may occur spontaneously or with the use of VE. In using VE, force is transmitted to the fetal scalp. The scalp then has the tendency to pull on its contents and attachments—skull bones, brain, fluids, etc. The scalp attachments include vessels at right angles to the scalp, which may be traumatized or torn by the pulling force. This may lead to subgaleal hemorrhage, a collection of blood in the large potential space below the scalp and above the aponeurosis. Enough force may be generated to deform the intracranial contents and cause intracranial bleeding.

The likelihood of success with VE varies depending on maternal anatomy, the position of the fetal head, gestational age, and the presence or absence of gestational diabetes (TABLE 2).

**Delivery by VE: Main considerations**

After determining that a candidate is suitable for VE and obtaining informed consent, consider key operative factors:

- choice of extraction cup
- adequate anesthesia
- careful maternal positioning
- maternal bladder emptying
- review of fetal status.

Two major cup types are available: rigid and flexible.

**Rigid plastic cup.** This design is similar to the metal cup used by Malmström and attaches to the scalp via chignon formation. A variation of the rigid cup is the mityvac “M” that mimics the Malmström design but incorporates a semiflexible handle to facilitate proper cup placement and aid in the direction of pulling force.

**Flexible cup.** This type of cup flattens against the scalp with vacuum and may result in less minor scalp trauma than the rigid cup.

Greater force can be employed with rigid cup designs than with flexible cups, which can increase the chances of a successful delivery when the fetus is in the occiput posterior (OP) position. Flexible designs tend to cause less damage to the scalp than the rigid cup but are reported to have a higher failure rate.



**Ensuring proper patient selection when attempting vacuum extraction can minimize risks to the mother and fetus**

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**TABLE 2. Patient selection criteria for vacuum extraction**

Good candidates	Marginal candidates	Poor candidates
Multiparous	Prim parous	Protraction disorders 2nd stage
Pregnancy at term	Pregnancy is post term	LGA fetus
Wide subpubic arch	Average subpubic arch	Narrow subpubic arch
Good maternal compliance	Gestational diabetes	Poor maternal compliance
Fetus in OA position	Fetus in OP position	Uncertain position of fetal head
	Arrest disorders	Deflexion, asynclitism

Abbreviations: LGA, large for gestational age; OA, occiput anterior; OP, occiput posterior.

## Delivery is facilitated by use of both hands



Left hand allows operator to safely ascertain the descent of the fetal head as well as the attachment of the cup.

**Cardinal rule of any procedure.** Prior to cup placement, remember this rule: abandon the procedure if it proves too difficult. Most deliveries will occur with 3 or 4 pulls.<sup>3</sup> Difficulties include:

- failure to gain station with the initial pull
- repetitive cup pop-offs (3 or more)
- an excessive duration of the procedure (>10 minutes).

Less than optimal placement of the vacuum extractor will increase the risk of scalp trauma, particularly in nulliparous women.<sup>3</sup>

If the procedure is unsuccessful, the resulting options include cesarean delivery and expectant management.

**Tip.** Use both hands during the pull to more reliably detect a problem with cup attachment, thereby minimizing the possibility of detachment and subsequent scalp trauma (FIGURE).

### Key points of technique

Perform a careful and thorough pelvic examination to determine fetal station, position, attitude, and synclitism.

The optimal cup placement is 2- to 3-cm proximal to the posterior fontanel or, alternatively, 5- to 6-cm distal to the anterior fontanel, assuming the fetal head is properly flexed.<sup>4</sup> The correct point of flexion will result in the smallest diameter of the fetal head presenting to the birth canal and should minimize the force necessary to achieve delivery.

Use minimal vacuum to attach the cup to the fetal head. As the subsequent contraction develops, apply full vacuum with the hand device. Encourage maternal expulsive effort and use traction only in concert with pushing efforts. Three pushes facilitated with pulling may be achieved during a single contraction. Failure to bring about descent with the initial pull indicates potential failure with this approach and, in the absence of technical reasons for the failure, merits serious consideration of abandoning the procedure (TABLE 3, page 24).

In the event of failed delivery with VE, it is important to recognize that you should not make a second attempt with another instrument; the chance of success is low and the risk of injury is significantly increased.<sup>5</sup>

### Carefully document the decision for VE and its implementation

The medical record is the most important witness to the event. Clearly record the following items, preferably as close in time to the decision/event as possible:

1. the indication for the procedure
2. the antecedent labor course
3. maternal anesthesia
4. personnel present
5. instruments employed
6. position and station of the fetal head
7. force and duration of traction
8. nature of the attempt
9. immediate condition of the neonate, and any resuscitative efforts.

### Closing reminders and advice

In preparing to discuss the patient's preferences for delivery, understand clearly the risks and benefits of VE and develop a comfortable approach to sharing this information with your patient and her family. Also, if VE is selected, consider performing the procedure in the cesarean delivery room. This will serve to remind you to be mindful to abandon the procedure, if need be, at an appropriate point.



**Abandon vacuum extraction if there is failure to gain station with one pull, the cup pops off repeatedly, or the procedure is taking longer than 10 minutes**

**TABLE 3. Reasons for failed vacuum extraction<sup>4</sup>**

Instrument	Technique	Clinical circumstances
Pump failure	Failed maternal valsalva	Congenital anomaly
Vacuum leak	Inappropriate intensity or axis of traction	Macrosomia or unappreciated cephalopelvic disproportion
	Maternal tissue entrapment	Incomplete cervical dilation
	Poor cup position	Minor degrees of malposition

**CASE Resolved**

You apply the vacuum extractor, and a small amount of vacuum demonstrates satisfactory attachment. On the second pull, the fetus easily delivers, and the Apgar scores

are 8 and 8. The birthweight is 3,725 g. The vacuum-assisted delivery has resulted in the shortest delay in delivery and without adverse consequences for neonate or mother. 🟢

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