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GUIDELINES FOR OPERATIVE VAGINAL BIRTH

This guideline has been prepared and reviewed by the Clinical Practice Obstetrics Committee and approved by Executive and Council of the Society of Obstetricians and Gynaecologists of Canada.

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Abstract:

Objective: To provide guidelines for operative vaginal birth in the management of the second stage of labour.

Options: Non-operative techniques, episiotomy, and Caesarean section are compared to operative vaginal birth.

Outcome: Reduced fetal and maternal morbidity and mortality.

Evidence: MEDLINE and Cochrane databases were searched using the key words "vacuum" and "birth" as well as "forceps" and "birth" for literature published in English from January 1970 to June 2004. The level of evidence and quality of recommendations made are described using the Evaluation of Evidence from the Canadian Task Force on the Periodic Health Examination.

Recommendations:

1. Non-operative interventions such as one-to-one support, partogram use, oxytocin use, and delayed pushing in women using epidurals will decrease need for operative birth. (I-A)
2. Manual rotation may be used alone or in conjunction with instrumental birth with little or no increased risk to the pregnant woman or to the fetus. (III-B)
3. Routine episiotomy is not necessary for an assisted vaginal birth. (II-1E)
4. When operative intervention in the second stage of labour is required, the options, risks, and benefits of vacuum, forceps, and Caesarean section must be considered. The choice of intervention needs to be individualized, as one is not clearly safer or more effective than the other. (II-B)
5. Failure of the chosen method, vacuum and/or forceps, to achieve delivery of the fetus in a reasonable time should be considered an indication for abandonment of the method. (III-C)
6. Adequate clinical experience and appropriate training of the operator are essential to the safe performance of operative deliveries. Hospital credentialing boards should grant privileges for performing these techniques only to an appropriately trained individual who demonstrates adequate skills. (III-C)

Validation: The Clinical Practice Obstetrics Committee and Executive and Council of the Society of Obstetricians and Gynaecologists of Canada approved these guidelines.

Key Words

Vacuum extraction delivery, obstetrical forceps delivery, operative birth, Caesarean section, second stage of labour

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FOR INFORMATION ON THE SELF-DIRECTED LEARNING EXERCISE, SEE PAGE 762.

OPERATIVE VAGINAL BIRTH

Obstetrical-care providers frequently face dilemmas in the management of the second stage of labour. The decision as to whether or not a particular birth requires assistance and the choice and timing of any intervention must involve consideration of the risks of the potential techniques and the skills of the operator, as well as the urgency of the need to expedite the birth process.

Operative vaginal birth refers to forceps- or vacuum-assisted delivery. Manual rotation, episiotomy, and, rarely, symphysiotomy can also be used to effect a vaginal birth. Caesarean section is the surgical alternative to operative vaginal birth. Experts often provide conflicting evidence for and against the use of these procedures.[1,2]

The literature discussing the use of vacuum and forceps includes prospective randomized trials comparing the outcomes after forceps- and vacuum-assisted birth.[3-6] These trials do not use the same inclusion criteria, the same instruments, or look at the same outcomes, making comparison of these 2 techniques difficult. Neonatal mortality and serious morbidity related to spontaneous vaginal birth, vacuum or forceps, or Caesarean section have been reviewed in a large retrospective study.[7] None of these prospective[3-6] or retrospective[7] studies discuss specifics of the technique used for vacuum or forceps procedures, the time required, or the criteria for abandonment of the procedure.

The quality of evidence and classification of recommendations reported in this guideline have been described using the Evaluation of Evidence criteria outlined in the Report of the Canadian Task Force on the Periodic Health Exam (Table 1).[8]

INDICATIONS FOR OPERATIVE VAGINAL BIRTH

Operative intervention in the second stage of labour may be indicated by conditions of the fetus or of the mother (Table 2). In cases of non-reassuring fetal status, operative delivery may prevent hypoxic brain damage[9] or fetal death.[9] Maternal indications include congestive heart failure[9] or cerebral vascular malformations.[9] Operative procedures may also be indicated for inadequate progress in labour[9]; in these cases, it is extremely important to ensure there is in fact adequate uterine activity.[10]

NON-OPERATIVE PRACTICES THAT DECREASE THE NEED FOR OPERATIVE BIRTH

Several non-operative interventions have been shown to decrease the need for operative birth. One such intervention is the involvement of one-to-one birth attendants, who provide care during labour and birth.[11] Such attendants were described as experienced, continuously present, and able to provide physical and emotional support.[11] Hodnett[11] assessed the role of the special support person in labour by reviewing 14 controlled trials, summarized in the Cochrane database, the results of which were all consistent despite a variety of obstetrical settings, hospital conditions, high- or low-risk pregnancies, and the differences in the professional training of the persons who provided the support. Using one-to-one birth attendants is a simple way to reduce the need for operative delivery.[11]

Monitoring the progress of labour and using oxytocin where progress is not adequate decreases the need for operative birth.

Table 2. Indications for Operative Vaginal Birth

Fetal
• non-reassuring fetal status
Maternal
• medical indications to avoid valsalva (e.g., cerebral vascular disease, cardiac conditions)
Inadequate progress
• adequate uterine activity documented
• no evidence of cephalopelvic disproportion
• lack of effective maternal effort

Table 1

Quality of Evidence Assessment[8]	Classification of Recommendations[8]
The quality of evidence reported in these guidelines has been described using the Evaluation of Evidence criteria outlined in the Report of the Canadian Task Force on the Periodic Health Exam.	Recommendations included in these guidelines have been adapted from the ranking method described in the Classification of Recommendations found in the Report of the Canadian Task Force on the Periodic Health Exam.
I: Evidence obtained from at least one properly randomized controlled trial.	A. There is good evidence to support the recommendation that the condition be specifically considered in a periodic health examination.
II-1: Evidence from well-designed controlled trials without randomization.	B. There is fair evidence to support the recommendation that the condition be specifically considered in a periodic health examination.
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one center or research group.	C. There is poor evidence regarding the inclusion or exclusion of the condition in a periodic health examination, but recommendations may be made on other grounds.
II-3: Evidence obtained from comparisons between times or places with or without intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category.	D. There is fair evidence to support the recommendation that the condition not be considered in a periodic health examination.
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.	E. There is good evidence to support the recommendation that the condition be excluded from consideration in a periodic health examination.

In studies where a partogram is used, there is less oxytocin used and fewer operative births.[12] Oxytocin should be used before operative vaginal birth if labour is not progressing appropriately, and partograms should be used routinely.[10]

Flexibility in the management of the second stage of labour, including upright position, adequate analgesia, and delayed pushing if the woman does not have the urge to push, can also reduce the need for operative vaginal birth. A Canadian multicentred randomized study[13] demonstrated that women with epidurals were likely to have fewer operative interventions if they did not push in the second stage of labour until they had a strong urge to push or until 2 hours had passed. Flexibility with regard to time limits for the second stage of labour is also important. The rate of operative vaginal birth is reduced if the arbitrary time limit of 2 hours in the second stage of labour is abandoned when progress is being made.[13]

RECOMMENDATION

1. **Non-operative interventions such as one-to-one support, partogram use, oxytocin use, and delayed pushing in women using epidurals will decrease need for operative birth. (I-A)**

MANUAL ROTATION

Manual rotation is part of the art of obstetrics. The purpose of manual rotation is the same as for forceps rotation: to turn the fetal head to an occiput anterior position, thus making the presenting diameter of the fetal head smaller. If rotation to an occiput anterior position is not occurring spontaneously, then manual rotation alone or in conjunction with an instrumental birth may facilitate vaginal delivery. Manual rotation can be used alone or it can be followed by forceps or vacuum. Table 3 outlines techniques for manual rotation. Although no studies exist on its effectiveness and potential complications, anecdotal evidence suggests that effectiveness is high, complications are low, and the pain experienced is about the same as for cervical examination.

Table 3. Techniques for Manual Rotation

Technique No. 1

1. The entire hand is placed in the woman's vagina with the palm up.
2. The fetal head is flexed and slightly dislodged.
3. The occiput is rotated anteriorly by pronation or supination of the forearm.
4. The fetal head may need to be held in place for a few contractions or until the application of a vacuum or forceps is completed.

Technique No. 2

1. The fingers may be placed along the lambdoid sutures.
2. Using mild pressure and a dialling motion, the fetal head can be rotated to an occiput anterior position.
3. The fetal head may need to be held in place for a few contractions or until the application of a vacuum or forceps is completed.

RECOMMENDATION

2. **Manual rotation may be used alone or in conjunction with instrumental birth with little or no increased risk to the pregnant woman or to the fetus. (III-B)**

EPISIOTOMY

Routine episiotomy has not been demonstrated to be an effective way to shorten the second stage of labour.[14] In the uncommon case where the perineum is preventing delivery, an episiotomy may expedite a vaginal birth. This has not been examined in any prospective studies.

Episiotomy has also not been proven an essential part of an assisted vaginal birth, as it does not reduce and may increase the incidence of maternal trauma.[15] Midline episiotomies have been found to increase the risk of third- and fourth-degree tears in spontaneous deliveries[14] as well as operative deliveries.[15]

RECOMMENDATION

3. **Routine episiotomy is not necessary for an assisted vaginal birth. (II-1E)**

INSTRUMENTAL VAGINAL BIRTH

Instrumental vaginal birth involves use of the vacuum extractor or obstetric forceps to allow the operator to increase the forces along the pelvic curve. The vacuum applies suction and traction to an area on the scalp covered by the suction cup.[9,16] Forceps cradle the parietal and malar bones of the fetal skull and apply traction to these areas, as well as laterally displacing maternal tissue.[9] The use of both instruments simultaneously causes compression of the fetal head. Table 4 outlines the prerequisites and contraindications to instrumental vaginal birth. Vacuum and forceps deliveries are classified by the station of the leading bony point of the fetal head and the degree of rotation of the sagittal suture from the midline. Table 5 outlines the criteria for different types of instrumental deliveries.

Forceps and vacuum use have been compared in many studies.[3,5-7,19,20] Johanson and Menon[3] included 10 such studies from the Cochrane database in a meta-analysis. Johanson and Menon found that vacuum is more likely to fail as the instrument of delivery than forceps. Women randomized to the vacuum delivery groups, however, were less likely to require a Caesarean section.[3] The risk of maternal injury was greater in the forceps groups.[3] Women who had a vacuum delivery had less severe lacerations than those who had a forceps delivery as well as less perineal pain at 24 hours post-delivery.[3] Other studies demonstrated no difference in urinary incontinence or anal sphincter dysfunction after 5 years whether vacuum or

forceps were used for operative vaginal birth.[3,5]

Complication rates to the neonate were similar in both the forceps- and vacuum-delivered groups.[3] Cephalohematomas and retinal hemorrhages are more common in vacuum deliveries.[3] External ocular injuries and facial nerve palsies are more common with forceps deliveries.[3] Serious complications are rare for both forceps and vacuum deliveries but can lead to neonatal death.[1,7,21,22] A large retrospective study of primigravid women in California[7] found infants were no more likely to die before discharge when delivered by vacuum or forceps than by spontaneous vaginal birth. They were less likely to die if delivered vaginally than by Caesarean section. A neonate delivered by 2 operative interventions (i.e., Caesarean section following a failed vacuum attempt or forceps attempt, or vacuum and forceps birth) is more likely to have a serious injury than one delivered by any one of these interventions alone.[7] Indeed, a positive correlation exists between the number of operative interventions in the second stage of labour and the likelihood of death or intracranial injury.[7] Other research has demonstrated similar results.[17,23,24]

Fetal injuries have been attributed to delay between a failed operative vaginal delivery and a Caesarean section.[22] Most operative deliveries, including the application of a vacuum, should be considered a trial. Unless the practitioner is certain that an operative vaginal delivery is going to be successful, the possibility of failure needs to be anticipated. In these circumstances, an alternative plan that will result in a safe and expeditious birth must be in place and implemented promptly if the planned operative birth is unsuccessful.

Clear documentation is important throughout labour and birth. Table 6 lists the elements to include when documenting instrumental birth.

Table 6. Elements Required for Documentation of Instrumental Birth

- indication for intervention
- record of discussion with the woman of the risks, benefits, and options
- position and station of the fetal head, as well as how it was assessed (i.e., vaginally and/or abdominally)
- amount of moulding and caput present
- assessment of maternal pelvis
- assessment of fetal heart rate and contractions
- number of attempts and ease of application of vacuum or forceps
- duration of traction and force used
- description of maternal and neonatal injuries

Table 4. Instrumental Birth

Prerequisites	Contraindications
• vertex presentation • cervix is fully dilated and the membranes ruptured • head is fully engaged • exact position of the head can be determined so proper placement of the instrument can be achieved • pelvis is deemed adequate • informed consent must be obtained • appropriate analgesia is in place • maternal bladder has been emptied • adequate facilities and backup personnel are available • operator must have the knowledge, experience, and skill necessary to use the instruments and manage complications that may arise • backup plan	Relative • unfavourable attitude of fetal head • rotation >45° from occiput anterior or occiput posterior (vacuum) • mid-pelvic station • fetal prematurity. There is a small retrospective study reviewing the outcome of deliveries of infants 1500 g to 2500 g. No difference was found in Apgar scores, umbilical pH, or intraventricular hemorrhage when comparing vacuum extraction with controls who delivered spontaneously.[17] Absolute • non-vertex or brow • unengaged head • incomplete cervix dilation • clinical evidence of cephalopelvic disproportion • fetal coagulopathy

Table 5. Criteria for Types of Instrument-Assisted Births[18]

Outlet	• fetal scalp visible without separating the labia • fetal skull has reached the pelvic floor • sagittal suture is in the anteroposterior diameter or right or left occiput anterior or posterior position (rotation does not exceed 45°) • fetal head is at or on the perineum
Low	• leading point of the skull is at station plus 2 cm or more and not on the pelvic floor Two subdivisions: (*a*) rotation of 45° or less, (*b*) rotation more than 45°
Mid	• fetal head is engaged • leading point of the skull is above station plus 2 cm

VACUUM

While the rate of operative vaginal birth has remained stable over the last decade (1991–2001), the rate of vacuum use has increased from 6.8 to 10.6%.[25] When used properly, the vacuum technique (Table 7) may facilitate a vaginal delivery from an outlet or very low station with an application of brief duration and minimal traction forces.[25]

Vacuum cups can be metal or plastic, rigid or soft. Randomized studies[4] report rigid cups to be more likely to result in vaginal birth than soft cups, but they are more likely to cause scalp trauma. Before vacuum can be recommended as a rotational instrument, evidence of its safety for this purpose must be established. Rotation may occur with descent of the vertex, but when actively used to rotate the fetus, torsion can result in severe injury to the scalp.[22]

It has been repeatedly shown that maternal injury is less frequent and less extensive with the use of vacuum compared to forceps.[3,6,19,20] Maternal complications of vacuum delivery include cervical lacerations, severe vaginal lacerations, vaginal hematomas, and third- and fourth-degree tears.[3,9]A maternal third- and fourth-degree laceration rate of 17% was reported with vacuum use in Quebec from 1991/1992 through 1995/1996.[20] This rate is significantly higher than at an unassisted delivery (odds ratio [OR], 3.9; confidence interval [CI], 3.8–4.1) but lower than with forceps use (OR, 0.5; CI, 0.5–0.5).[20] An inspection for lacerations should be conducted after every vacuum delivery.

Fetal and neonatal complications of vacuum use vary in severity from mild scalp lacerations[4,9] to severe subaponeurotic hemorrhage[4,9,21,22] or intracranial hemorrhage and death.[4,9,21,22] A Cochrane review of randomized trials found an odds ratio of 2.38 (CI, 1.6–3.37) for a cephalohematoma occurring following vacuum use compared to that following forceps use.[4] Subaponeurotic hemorrhages, skull fractures, and intracranial hemorrhages were not reviewed in these studies.[4] A historical cohort[20] from 1991/1992 and 1995/1996 found the incidence of cephalohematoma with vacuum delivery to be 12.8%. The incidence of intracranial hemorrhage was 0.1%, which is higher than that for spontaneous deliveries but not higher than that for forceps. The rate of subaponeurotic hemorrhage was not recorded.[20] The American College of Obstetricians and Gynecologists estimates the incidence of neonatal death or serious injury related to vacuum birth to be 1 in 45 455 vacuum extractions.[1]

It is the experience of members of the Clinical Practice Obstetrics Committee that vacuum deliveries have been performed when the cervix is not fully dilated and the head is not engaged. This may be considered only when the benefits significantly outweigh the risks and when there is no viable alternative.

FORCEPS

Forceps use in Canada has decreased over the last decade from 11.2% in 1991 to 6.8% in 2001.[25] Techniques for applying forceps vary with the type of forcep being used. Detailed descriptions can be found in obstetrical textbooks[9] and the ALARM (Advances in Labour and Risk Management) course.[27] Practice may take place on inanimate models, and clinical experience should be gained under the supervision of an experienced operator before one applies them independently. Table 8 outlines important application principles and procedures as well as possible complications.

Maternal and fetal complications can occur with forceps use. A retrospective study[20] in Quebec reported third- or fourth-degree perineal lacerations to occur at a rate of 31% with forceps birth.[20] This rate is similar to that found in other research.[28]

Table 7. Vacuum-Assisted Birth

Application Procedure	Potential Complications
• Prior to application, check that the vacuum is working and the pressure dial is not delivering >500–600 mm Hg. Pressure greater than this does not improve outcome and may result in an increased risk of complications.[24,26] • With the vacuum suction off, apply the center of the cup to the occiput, 2 cm anterior to the posterior fontanelle. The sagittal suture should be centered under the vacuum. The vacuum cup should be checked to ensure it includes no maternal tissue. • Apply suction to the scalp. Check that there are no maternal tissues within the vacuum cup. • Traction is applied with a contraction and the axis of traction follows the pelvic curve. • The safe parameters for maximum number of pulls and the maximum time of use are not well established. Most (76%–96%) deliveries are effected within four contractions.[16] If delivery has not occurred after four contractions, the intended method of delivery should be reassessed. • Descent should be evaluated after each contraction. Lack of descent with appropriate technique is evidence of cephalopelvic disproportion. • Pop-offs should be avoided. Pop-offs lead to rapid compression/decompression forces. No studies have examined injuries related to repeated pop-offs.	• maternal lacerations • fetal scalp lacerations and bruising • facial nerve palsy • cephalohematoma • subaponeurotic hemorrhage • skull fractures • intracranial hemorrhage • retinal hemorrhage • hyperbilirubinemia

Table 8. Forceps-Assisted Birth

Application Principles and Procedure	Potential Complications
• Be familiar with the instrument being used. • Use finger-strength pressure when applying forceps. • Rotation within one plane can only be done with forceps without a pelvic curve. • When checking the application: (*a*) the posterior fontanelle should be located midway between the sides of the blades, with the lambdoid sutures equidistant from the forceps blades and one finger-breadth above the plane of the shanks. (*b*) the sagittal suture must be perpendicular to the plane of the shanks throughout its length. (*c*) the fenestration of the blades should be barely felt and the amount of fenestration felt on each side should be equal. With a solid blade, no more than a fingertip should be able to be inserted between the blade and the fetal head.	• maternal lacerations • minor external ocular trauma • retinal hemorrhage • fetal skull fractures • facial nerve palsies • cephalohematomas • subaponeurotic hemorrhages • intracranial hemorrhages • scalp lacerations

In the neonate, facial lacerations occurred at a rate of 1%.[6,19] Neurologic sequelae in the form of facial nerve palsy in the Quebec study[20] occurred at a rate of 0.5%, 5 times higher than with a vacuum birth (relative risk [RR], 5; CI, 2.5–5). The incidence of cephalohematoma was 1% and intracranial hemorrhage 0.1%.[20] The use of protective covers over forceps has been found to decrease superficial skin lacerations.[29]

CAESAREAN SECTION

There is a recent trend to go to Caesarean section in the second stage without due consideration of operative vaginal delivery. However, when operative vaginal birth is unsuccessful, felt to be unsafe, or is unacceptable to the woman, Caesarean section is the appropriate choice. Caesarean sections also have a risk of serious complications. Babies delivered by Caesarean section have more respiratory difficulty, including that requiring ventilation.[30] Caesarean section increases the risk in subsequent pregnancies of uterine rupture,[31] which can lead to fetal death or serious fetal hypoxic injury.[22,31] Caesarean section also increases the risk of placenta previa,[32] placental abruption,[32] and invasive placental disease.[32]

Maternal risk from Caesarean section includes increased maternal mortality. In women who deliver by Caesarean section, maternal mortality is 4-fold that of the maternal population that delivers vaginally.[33] The woman is at increased anaesthetic risk, particularly due to aspiration,[31] and risk of increased blood loss,[32] infection,[32] venous thromboembolus,[32] and surgical injury to bladder and bowel.[32]

Use of vacuum or forceps may be necessary at the time of Caesarean section.

RECOMMENDATIONS

4. **When operative intervention in the second stage of labour is required, the options, risks, and benefits of vacuum, forceps, and Caesarean section must be considered. The choice of intervention needs to be individualized, as one is not clearly safer or more effective than the other. (II-B)**
5. **Failure of the chosen method, vacuum and/or forceps, to achieve delivery of the fetus in a reasonable time should be considered an indication for abandonment of the method. (III-C)**
6. **Adequate clinical experience and appropriate training of the operator are essential to the safe performance of operative deliveries. Hospital credentialing boards should grant privileges for performing these techniques only to an appropriately trained individual who demonstrates adequate skills. (III-C)**

SUMMARY

When second stage of labour problems are going to affect maternal or fetal well-being, first consideration should be given to non-operative intervention. When non-operative interventions have been maximized, the options and risks of operative vaginal birth compared to Caesarean section must be considered. Whether or not operative vaginal birth is appropriate for women in the second stage of labour is a complex decision with many risks to balance, including maternal well-being, fetal well-being, and the availability of facilities and personnel. The most appropriate intervention needs to be chosen on an individual basis, within the context of each woman's unique circumstances.

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