

The Kiwi Omnicup Ventouse Versus
the Conventional Ventouse For
Vacuum-Assisted Vaginal Delivery

Thesis

*Submitted for Partial Fulfillment of Master Degree
in Gynecology and Obstetrics*

By

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Acknowledgement

*It is a great pleasure to acknowledge my deepest gratitude to **Prof. Dr. Salah Taha Fayed.**, Professor of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University for his help, advice and guidance.*

*My special indebtedness and appreciation to **Dr. Karim Ahmed Wahba**, Lecturer of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University who helped me in revising this work and for his endless support, great guidance that is quite apparent in this work.*

Lastly, I want to express my appreciation to all my family and colleagues. As, without their support and help this work would have not been fulfilled.

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Introduction

The obstetric vacuum extractor, or ventouse, has been considered and promoted as the instrument of choice for operative vaginal delivery in the U.K because randomized trials and meta-analysis comparing it with forceps demonstrated less maternal trauma with the vacuum, despite increased neonatal morbidity and failure to deliver with the ventouse (*Groom et al., 2007*).

Essentially, all vacuum extraction devices consist of a cup made of soft or rigid material, which can be attached to the fetal scalp, a vacuum pump that provides suction for the cup's attachment and a traction system that allows the operator to assist the mother with the birth. Consistently good results with the vacuum extractor, however, depend upon achieving correct applications of the cup on the fetal scalp (*Vacca, 2001*).

For successful use of the vacuum, determination of the flexion point is vital. This is located, in an average term infant, on the sagittal suture 3cm anterior to the posterior fontanelle, and thus 3cm posterior to the anterior fontanelle. The center of the cup should be placed directly over this, as failure to adequately position the cup can lead to a progressive deflexion of the fetal head during traction and failure to deliver the baby. (*Hayman et al., 2007*).

The standard omnicup vacuum device is a low profile, Malmstorm-design cup with a thin flexible suction tube through

which passes a traction wire that is attached to the center of the dome of the cup. It is made from a rigid plastic material. The device incorporates a lightweight and compact palm-pump vacuum mechanism which provides the suction for cup attachment to the fetal scalp and which also serves as a handle for traction. The palm-pump cylinder houses a colour-coded vacuum indicator gauge that displays the amount of generated suction as well as a valve for releasing the pressure. Measurement indicators on the suction tubing assist the operator to determine that the cup has been inserted a sufficient distance into the birth canal . The omnicup may be used as an "anterior" cup for occipito-anterior and outlet procedures by direct application of the cup to the fetal head. The device functions as a "posterior" cup suitable for use in occipito-transverse and posterior positions when the cup is maneuvered into the birth canal with the suction tube recessed in a groove on the dome of the cup (*Vacca, ୨୦୦୭*).

Aim of the Work

The aim of this study is to evaluate efficacy and safety of the Kiwi Omnicup in comparison with the conventional ventouse in routine clinical practice.

Normal Labor and Delivery

A full-term pregnancy is considered to be २८० days, nine calendar months or ten lunar months calculated from the first day of the last menstrual period. This is a fairly arbitrary number that may, in fact, vary with genetic differences and depends on a normal menstrual cycle, which varies considerably from woman to woman. The average actual length from conception to birth is estimated as २६५ days. Childbirth is a natural process, and it, too, varies among women. Despite what the obstetrical texts say about what to expect, there are many variations that make each woman's experience hers alone. The whole process averages about १॔ hours for first-time mothers and about eight hours for mothers in their subsequent pregnancies (***Linda Bennington et al., २००१***).

Labor is a physiologic process during which the products of conception (i.e., the fetus, membranes, umbilical cord, and placenta) are expelled outside of the uterus. Labor is achieved with changes in the biochemical connective tissue and with gradual effacement and dilatation of the uterine cervix as a result of rhythmic uterine contractions of sufficient frequency, intensity, and duration (***Norwitz et al., २००१***).

Childbirth usually begins spontaneously, but it may be started by artificial means if the pregnancy continues past ॔१ weeks gestation. There are three signs that labor may be starting: rhythmical contractions of the uterus; leaking of the

bag of waters (amniotic sac); and bloody show. The importance of the sign of contractions is in the rhythm and not the contractions. True labor contractions may start once every ten or 15 minutes or even at longer intervals, but gradually the interval decreases until they come every three to four minutes. The bag of waters may leak slowly or may suddenly burst, and there is a gush of fluid. If contractions are not ongoing prior to this, they are likely to start soon after. If they do not, it may be necessary to stimulate labor as the womb is now open to possible infection. The bloody show is a slight discharge of blood and mucus. It usually occurs after the cervix has started to dilate slightly and the mucus plug that keeps the cervix sealed from potential pathogens becomes dislodged. The diagnosis of true labor can only be determined by a vaginal exam to determine if the cervix has changed in dilatation (opening). True labor is determined by whether the contractions are, in fact, changing the cervix. If a woman is experiencing contractions and makes no cervical change, then this is false labor. Although the woman having the contractions may feel like she is really experiencing labor, true labor is determined by cervical change. Many women may experience Braxton-Hicks contractions (practice contractions) in preparation for true labor, and these can become uncomfortable at times, which prevents the woman from resting (*Linda Bennington et al., 2007*).

Position of the fetus:

The position of the baby's head changes during the course of labor. At the onset of labor, the baby is usually facing toward the mother's right hip with the back of the head toward the mother's left hip. This position is called **left occiput transverse**. This position allows the widest part of the baby's head (the front-to-back axis) to correspond with the widest part of the mother's upper pelvis (side-to-side). As labor progresses and the baby descends into the mother's pelvis, the baby's head encounters the lower part of the mother's bony pelvis and pelvic floor. Since the widest part of these structures runs from front-to-back, the baby's head normally rotates so that the back of the head is directly below the mother's bladder and the baby's face is directed toward the mother's tailbone. This position is called occiput anterior. A position halfway between left occiput transverse and **occiput anterior** is called **left occiput anterior**. In this position the back of the baby's head is at a 45 degree angle to the left of the midline (*Douglas Levine, 2007*).

Station of the fetus:

Station refers to how far down the baby's head has descended into the mother's pelvis. The birth canal is shaped like a cone, curving underneath and behind the pubic bone. Its narrowest section lies between two bony landmarks of the pelvis (one on either side), called the **ischial spines**. The geometric plane that extends through these spines and up to the pubic bone is called the midpelvis and is arbitrarily described as zero station. As the baby's head descends below this plane, the

station of the baby is indicated by a number representing how many centimeters the baby has descended. For example, the baby is said to be at a +2 station when the head is two centimeters below the plane defined by the ischial spines and the pubic bone. When the baby's head is at zero station, the largest part of the head has entered the bony pelvis. Until the baby's head is at least at zero station, the baby hasn't completely entered the pelvis. When the baby's head is above zero station it is said to be unengaged. Forceps deliveries should never be attempted when the baby is unengaged. In the past, forceps delivery of an unengaged baby was called a high forceps. Forceps deliveries at less than +2 station are termed midforceps (*Douglas Levine, 2007*).

Stages of labor

Obstetricians have divided labor into 3 stages that delineate milestones in a continuous process.

First stage of labor

The first stage begins with regular uterine contractions and ends with complete cervical dilatation at approximately 10 cm. In his landmark studies of 500 nulliparas, Friedman (1955) subdivided the first stage into an early latent phase and an ensuing active phase. The latent phase describes the period between the onset of labor and when the rate of cervical dilatation changes most rapidly, usually at about 3-4 cm of cervical dilatation. The active phase heralds a period of increased rapidity of cervical dilation and ends with complete cervical dilation of 10 cm. According to Friedman, the active

phase is further divided into an acceleration phase, a phase of maximum slope, and a deceleration phase (*Cheng et al., ۲۰۰۶*).

Second stage of labor

The second stage begins with complete cervical dilatation and ends with the delivery of the fetus. The ACOG has suggested that a prolonged second stage of labor should be considered when the second stage exceeds ۳ hours if regional anesthesia is administered or ۴ hours in the absence of regional anesthesia in nulliparas. In multiparous women, such a diagnosis can be made if the second stage of labor exceeds ۲ hours with regional anesthesia or ۱ hour without it (*American College of Obstetricians and Gynecologists, ۲۰۰۳*).

Third stage of labor

The third stage of labor lasts from the delivery of the fetus until the delivery of the placenta and fetal membranes. Although delivery of the placenta requires less than ۱۰ minutes, the duration of the third stage of labor may last as long as ۳۰ minutes before active intervention is commonly considered. The ability of the fetus to successfully negotiate the pelvis during labor involves changes in position of its head during its passage in labor. The mechanisms of labor, also known as the cardinal movements, are described in relation to a vertex presentation, as is the case in ۹۵% of all pregnancies. Although labor and delivery occurs in a continuous fashion, the cardinal movements are described as ۷ discrete sequences, as discussed below (*Norwitz et al., ۲۰۰۳*).

Engagement

The widest diameter of the presenting part (with a well-flexed head, where the largest transverse diameter of the fetal occiput is the biparietal diameter) enters the maternal pelvis to a level below the plane of the pelvic inlet. On the pelvic examination, the presenting part is at 0 station, or at the level of the maternal ischial spines.

Descent

The downward passage of the presenting part through the pelvis. This occurs intermittently with contractions. The rate is greatest during the second stage of labor.

Flexion

As the fetal vertex descends, it encounters resistance from the bony pelvis or the soft tissues of the pelvic floor, resulting in passive flexion of the fetal occiput. The chin is brought into contact with the fetal thorax, and the presenting diameter changes from occipitofrontal (11.5 cm) to suboccipitobregmatic (9.5 cm) for optimal passage through the pelvis.

Internal rotation

As the head descends, the presenting part, usually in the transverse position, is rotated about 45° to anteroposterior (AP) position under the symphysis. Internal rotation brings the AP diameter of the head in line with the AP diameter of the pelvic outlet.

Extension

With further descent and full flexion of the head, the base of the occiput comes in contact with the inferior margin of the pubic symphysis. Upward resistance from the pelvic floor and the downward forces from the uterine contractions cause the occiput to extend and rotate around the symphysis. This is followed by the delivery of the fetus' head.

Restitution and external rotation

When the fetus' head is free of resistance, it untwists about 45° left or right, returning to its original anatomic position in relation to the body.

Expulsion

After the fetus' head is delivered, further descent brings the anterior shoulder to the level of the pubic symphysis. The anterior shoulder is then rotated under the symphysis, followed by the posterior shoulder and the rest of the fetus.

The initial assessment of labor should include a review of the patient's prenatal care, including confirmation of the estimated date of delivery. Focused history taking should be conducted to include information, such as the frequency and time of onset of contractions, the status of the amniotic membranes (whether spontaneous rupture of the membranes has occurred, and if so, whether the amniotic fluid is clear or meconium stained), the fetus' movements, and the presence or