

A technique variant for the use of the vacuum extractor with episiotomy to reduce maternal injuries

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Summary

Vulvovaginal tears during childbirth are a relevant factor of morbidity and are often more extensive in case of forceps or vacuum application. Although it is not routinely recommended, episiotomy is the primary mean to reduce the maternal lesion and is commonly used in case of operative delivery, also if sometimes is not able to avoid lacerations. Episiotomy technique as any procedure can be improved. This study suggests a new procedure that has been applied and can significantly reduce maternal vaginal tears during operative childbirth with vacuum extraction.

Key words: Operative vaginal delivery; Vacuum; Vacuum-assisted vaginal delivery; Vacuum extractor; Episiotomy; Vulvovaginal tears; Vaginal birth; Perineal tear.

Introduction

Vulvovaginal tears are an important maternal morbidity factor. Often moderate tears can anyway produce a blood loss and may complicate with dehiscence, infections, persistent pain and excessive scarring. Sometimes they can be severe with heavy blood loss that requires extensive suture and transfusion therapy and even injury to organs such as bladder or rectum.

The first-degree lacerations are not painful and do not require treatment. A second-degree laceration is a laceration that includes perineal skin, subcutaneous tissue, vaginal mucosa, perineal muscle and fascia but not the anal sphincter. These lacerations are painful and require suturing. The third-degree lacerations are tears that include the skin, vaginal muscle, perineal muscles and anal sphincter. A fourth-degree laceration is similar to a third-degree laceration but extends further to involve the rectal mucosa [1]. The main prevention of such damage is one-time episiotomy, usually mid-lateral right or central. The guidelines recommend the restrictive use of episiotomy, using the operator's individual judgment [2, 3]. Unfortunately, indications for the selective performance of this procedure are not clearly defined, and episiotomy is still sparingly used during vacuum deliveries in many institutions, up to 100% in certain medical centres (including the first author's department), whereas the avoidance of this procedure has resulted in malpractice litigation [4]. Episiotomy was performed in 64.3 18.8% of the deliveries, ranging from 28.7 to 86.0%. In separate analysis by parity, significantly higher rates of episiotomy were noted in nulliparous compared with

parous women (58.7 17.8% versus 34.2 14.6%, respectively, $P = 0.035$) [4]

With the use of mediolateral incision there is a avoidance of damage to the Bartholin's gland and duct, lower risk of third-degree lacerations, and it has been found to be more suitable for birthing situations where the child is disproportionately large, the occiput is posterior, breech deliveries and with midforceps deliveries [5]

In case of expeditions second stage of labour, even in a large foetus, complications of episiotomy are not rare. The most frequent complication of episiotomy are upward involuntary extension or secondary tears.

Materials and Methods

The vacuum extractor: traditional technique

The vacuum extractor VO is indicated when it is necessary to shorten the second stage of labour for maternal or fetal indication and caesarean is not preferable. The most common motivation for the use of VO is the presence of unsafe fetal conditions derived from the cardiotocography and when it is believed that caesarean would take longer times or in maternal fatigue conditions that causes a prolonged second stage of labour [6].

One in every 10–20 women arriving at a delivery room can be expected to complete her labour by vacuum-assisted extraction [7]. In literature there is a frequency of 10–30% of vulvo-vaginal tears of II, III, and IV degree with the use of vacuum extractor. Although this procedure is essential and potentially lifesaving in certain circumstances, it is as-

sociated with increased short- and long-term maternal and neonatal morbidity, such as third- and fourth-degree perineal tears, postpartum haemorrhage, and urinary retention, transfusion, retinal haemorrhage, and intracranial haemorrhage [8, 9]. The use is contraindicated for fetal age below 34 weeks, doubtful between 34 and 36 weeks, and considered safe after 36 weeks [2].

The most commonly used model is the Omnicup Mod VAC-6000M and VAC-6000MT "Kiwi Omnicup" model, which maintaining the characteristics of the other suction cups, is characterized by a disposable plastic cup of low profile and constituted of rigid plastic material and small volume for an easy insertion into the vagina. The dispositive includes a handle and a traction force indicator. The cup contains a groove that allows to place the traction tube. With this channel, it is possible to exert a tangential force to the cup itself. The "Kiwi" is characterized by a more efficient traction, less traumatic, and simple to use, but the technique is basically similar [10-12].

The vacuum extractors are used when a quick extraction of the fetus is necessary and they work by means of the vacuum traction effect on the fetal scalp [13, 14]. The main indications are: prolonged second stage of labour, non-reassuring fetal testing, elective shortening of the second stage of labour, and maternal exhaustion [13, 14]. Once the cephalic extremity of the infant is brought to the perineal plane, it is often necessary to proceed with the extension of the vulva with mediolateral episiotomy to avoid major vaginal tears.

No uniform agreement exists in the literature regarding the necessity of episiotomy during vacuum delivery. Nevertheless, according to the present analysis, episiotomy is performed in about two-thirds of vacuum-assisted extractions. This rate varied widely in different studies, from less than one-third, to the majority of the deliveries (up to 86%) [4]. Similar results demonstrated that mediolateral episiotomy was linked with increased rates of postpartum haemorrhage and pain, with findings supported by previous studies [4, 15, 16]. The results of one meta-analysis suggests that midline and mediolateral episiotomy in parous women may increase the rate of advanced perineal tears at vacuum delivery, and that lateral episiotomy in nulliparous women could be associated with a decreased risk of obstetric anal sphincter injuries (OASIS). In addition, mediolateral episiotomy could increase the risk of postpartum haemorrhage and pain [4].

The usual technique consists in an episiotomy with scissors practiced by a midwife, while the obstetric surgeon uses the suction cup and for traction. In this way, extraction from the external genitalia occurs rapidly and episiotomy normally remains modest, but in 10-30% of cases, it extends excessively upwards by affecting the vagina at higher levels than normal and sometimes produces vaginal tearing in undetermined locations, more frequently in a contralateral site of the episiotomy.

Several other factors contribute to increase the rate of lacerations. These factors have been observed by multiple studies and include gravidity, breech presentation, tissue turgor, use of forceps, duration of the second stage of delivery, type of anaesthesia used, and skill of the physician [5]. The same studies have suggested that the angle in which an episiotomy is performed is of importance in determining risks of laceration, specifically at the anal sphincter [1, 17].

With the use of episiotomies to reduce the chance of developing a third- or fourth-degree laceration, these lacerations can still occur in the form of extensions of the incision. Studies published in the past have made it difficult to calculate the risk of extension due to ambiguity of the degree of lacerations that were reported with and without episiotomies, and the difference in the type of episiotomy used. From the reports, the rate of extension in a midline episiotomy ranging from 0.5% to 23.9% and 0% to 9.0% with mediolateral episiotomies. These rates were compared to the rate of third-degree lacerations without episiotomies which ranged from 0% to 6.4% [5]. Shiono *et al.* studied the association between the use of episiotomy and the rate of third- and fourth-degree lacerations in 24,114 women. The results of their studies showed that the overall rates of laceration were 8.3% and 1.5% for primigravida and multigravida patients, respectively [18]. The occurrence of severe laceration increased in deliveries that used forceps, in occiput transverse and posterior presentations, women with smaller pelvic measurements and lower weights, and macrosomia of the foetus.

Beynon compared 100 consecutive patients and concluded that the group that was not urged to push had an episiotomy rate of 39 %, whereas the group that was urged to push had a rate of 63%. Beynon further concluded that the slower distension of the pelvis by the head allowed time for the tissues to stretch and decrease the occurrence of lacerations and the need for episiotomies [19]. This observation in itself carries major clinical and legal implications for obstetricians, as based on current evidence, the avoidance of episiotomy for vacuum delivery cannot be considered to be a medical malpractice [4].

The modified technique - description

In this study the author evaluated a variant of the episiotomy execution mode and of the final expulsion phase by using the vacuum extractor, which allows to reduce the vulvo-vaginal tears. In the variant of the proposed obstetric technique, the extraction of the cephalic extremity, from the application of the VO to the descending to the perineal plane does not differ in any way from the standard technique used in current use.

The technical change is in the final expulsion phase, when the head reaches the perineal plane and pushes and dilates the vulva. In the method currently used in clinical practice, the obstetrician surgeon uses the suction cup by

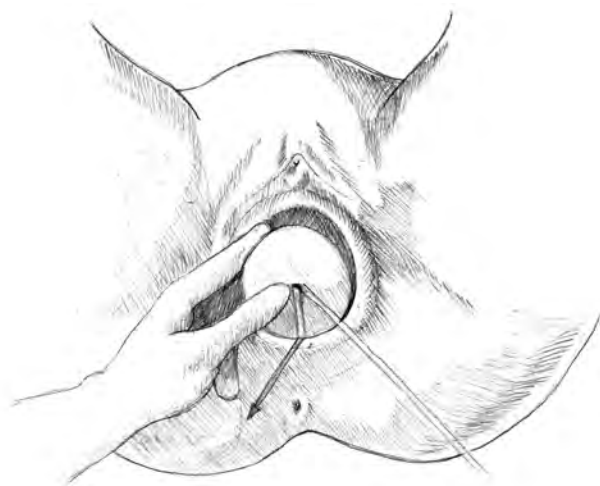


Figure 1. — The crowning head.

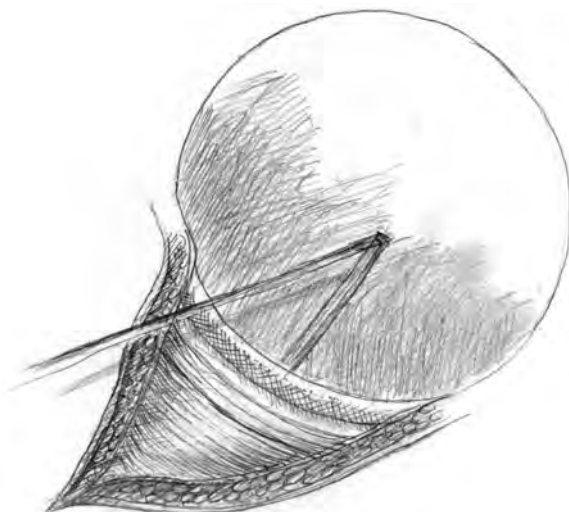


Figure 2. — Skin section.

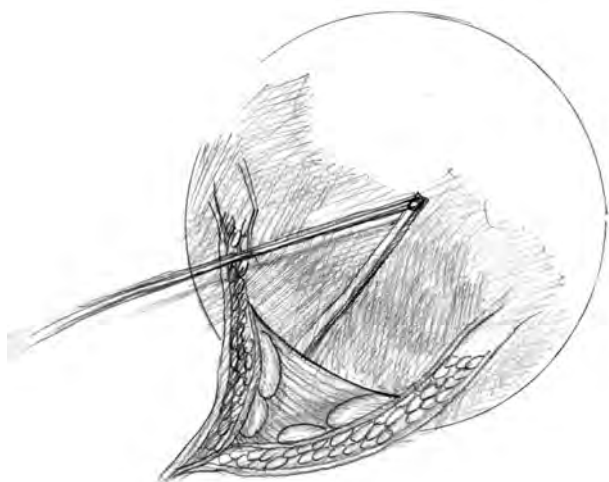


Figure 3. — Section of the perineal muscle.

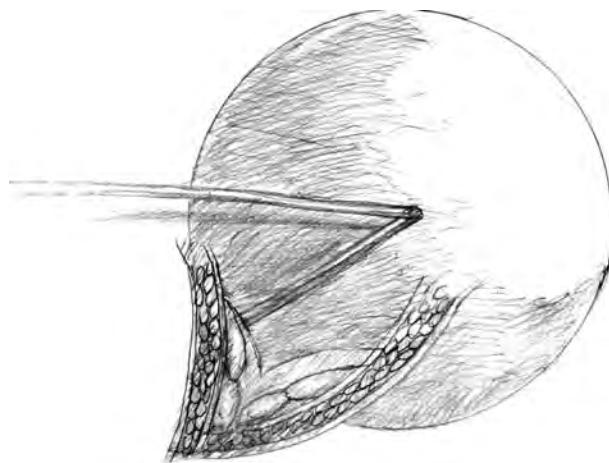


Figure 4. — Section of the vaginal wall.

pulling with the handle in the dominant hand while the other hand controls the ejection of the head. At the same stage, the midwife with the scissor performs episiotomy while the operator pulls with the suction cup. In the proposed personal variant, the aforementioned modified obstetric manoeuvre can be described as follows: The operator at first practices a local anaesthesia for infiltration into the vulva area where episiotomy will be done, after disinfecting the external genitals and before inserting the suction cup into the vagina, and make it adhere with the vacuum to the fetal head. When applying the suction cup and after the efficient tractions have allowed the descent of the fetal head and this reaches the vulva and dilates it, before it is torn and when the operator feels it is the correct moment on the basis of the elasticity of the genitals, he or she leaves the handle of the suction cup to the midwife that keeps it tension, without operating traction, therefore avoiding accu-

rately causing the expulsion of the fetal cephalic extreme. The operator maintains the other hand (the non-dominant) on the cephalic extreme and controls the advancement contrasting it, in the presence of maternal thrust and the minimum traction of the suction cup held by the midwife. In practice, in such a short time, the operator allows the head to remain almost firm in the initial phase of crowning (Figure 1). At this point, the operator with the free hand (usually the right one), carries an incision with the scalpel with a first cut of the skin (Figure 2) and with a second the perineal surface muscle without affecting the vagina (Figure 3). Completed in the following instant, the incision with a third passage of the only part of the vagina that covers the cup of the suction cup attached to the fetal head is performed (Figure 4). In this way, it only affects where the fetal scalp is covered by the plastic cup and it will not affect the fetal skin as well. All this time the fetal head is held

Table 1. — *Comparison of newborn and hospitality data.*

case	Tot.	m	f	weight mean	Apgar 1' mean	Apgar 5' mean	Ph mean	-Be mean	Hospit al stay days (media)
Traditio nal	40	29	11	3336	8,48	9,64	7,29	-6,97	3,7
new	21	11	9	3378	8,67	9,7	7,28	-6,56	4

Table 2. — *Employee variable RBC before childbirth confidence range 95RBC.*

	average	Standard error	Lower limit	Upper limit	Statistical significance
Traditional	3,9	0,157	3,582	4,212	0,983
new	3,91	0,317	3,271	4,554	

Table 3. — *Employee variable Hb before childbirth confidence range 95%.*

Hb	average	Standard error	Lower limit	Limite suUpper limit	Statistical significance
Traditional	11,690	0,460	10,767	12,613	0,942
new	11,590	0,930	9,752	13,455	

Table 4. — *Dependent variable extensive lacerations and need for transfusion.*

cases		Serious degree (2nd - 3 rd grade)	%	Emotra nsfusion from lacerati ons	%	Fecal inconti nence	%	Average fetal weight
Traditio nal	40	7	17,5	1	2,5	0	0	3,244 g
new	21	0	0	0	0	0	0	3,316 g

firm by the left hand of the operator who controls it by braking the spill. In this phase of balancing forces, on one instance the modest traction of the suction cup held by the midwife and the maternal thrusts, on the other instance the operator's hand balances these forces. After vulva engraving, the operator and the midwife facilitate the overcoming of the vulva by the fetal head, rejecting the vulval edges on the side with the fingers and completing the so-called "crowning". Once crowning of the cephalic extremity is completed, the operator, maintaining his or her left hand on the fetal head, resumes with the right hand the handle of the suction cup that was formerly entrusted to the midwife, and completes disengagement of the fetal head. By doing so, the phase of disengagement of the fetal head and overcoming of the vulva rhymes, results for the mother more gradual and less traumatic, properly controlled by the operator's hand. The episiotomy with this method is carried on the skin and muscles only for the necessary length. The vagina is engraved with the scalpel to a lesser extent but always in the same direction as the incision. The vagina should be engraved only in the part overlapping the cup of the vacuum extractor. In this way the fetal scalp is not injured. During fetal expulsion with dilation of the vulva, the vaginal incision will naturally extend in the same direction and orientation of the muscolocutaneous incision, but only for the length required to escape the fetal circumference. It is due to the gradualness of the head expulsion which may be performed avoiding the effects of tearing. Thanks to the braking action of the left hand of the operator, it will hardly have prolongations at the top of the opening of the vaginal wall or cause other injuries in other areas.

The author would like to highlight how the real technical significance of such manoeuvre is not, as may appear, in the incision with the scalpel or in three-layered incision, depending on the tissues involved or in the handgrip passage. These are necessary steps but aimed at the true meaning of the manoeuvre. The proper significance of the aforementioned obstetric manoeuvre is in the procedure that allows the hands of the same operator (with usually the left) to control and regulate fetal head descent while the other hand (usually the right) performs the incision of the vulva. Once an episiotomy is performed, an immediate reduction in the fetal head's emission is achieved, which, if not controlled, often causes a teething maternal lesion. Only if the hands belong to the same individual is it possible to balance correctly and gradually the forces leading to the expulsion of the fetal head, dilation of the vulva as necessary, but not further and avoiding the so-called "tearing emission" of the fetal head that can produce severe vulvar and vaginal injuries. These severe injuries are an important factor in maternal morbidity and require often long and complex repairing sutures. They result very painful and lead to significant blood loss, which may also require transfusion therapy. This causes

evident healthcare costs for increased operative time, suture material, blood transfusions, antibiotic therapy, and iron therapy. In addition to this, remote results may occur as extensive and sometimes painful scarring and the inevitable psychological trauma resulting from the vaginal tears and its repair.

Results

The present author has analysed a group of deliveries where extraction with vacuum extractor was conducted comparing the two methods. In every case examined, the Omnicup Omnip Whiplash Model "Kiwi" was used. The comparative group consisted in those considered as deliveries at the Santo Spirito Hospital in Rome with the use of VO with the traditional method considering a series of 40 cases from January 2016 to May 2017, corresponding to all the cases that occurred during this period. The modified method included a series of 21 cases from 2014 to 2017, corresponding to all the cases treated over this timeframe.

The following parameters were taken into account in the comparison of cases: newborn sex, birth weight, Apgar score at one and five minutes, umbilical cord Ph, difference in haemoglobin and blood count between pre-delivery, and post-delivery.

In the case of more than one a blood test during postpartum, for the purpose of assessing the amount of blood loss, the lowest value of the series of controls performed during hospitalization was taken. Whether the mothers received or not blood transfusion after childbirth during hospitalization were evaluated

Exclusion criteria included cases in which blood loss occurred following postpartum complications, such as failure of detachment of placenta with manual afterbirth, a significantly late placental detachment, or infections to the uterus etc. (Tables 1-4).

Patients were monitored with follow-up with clinical evaluation of perineal status, vulvar scarring, vaginal suture, perineal sensitivity, and sphincter continence. To test the specificity of differences in complications of "serious lacerations" between the two groups of patients (new intervention compared to traditional treatment), the Chi² test with Yates correction were applied. The results of the test have shown that the differences between the propositions of complications in the two treatment groups were statistically significant. The calculated Chi² value was 5.79 with $p = 0.0413$.

The results of the study allowed to evaluate the opportunity to conduct a more in-depth analysis with an assessment with a larger sample and possibly representative of the user basin.

Discussion

Comparison of data of cases treated with the traditional technique and with the variant under consideration did not reveal any significant differences for the neonatal birth conditions, as assessed by Apgar and as Ph-meters of umbilical cord blood. The period of maternal care in postpartum was similar in the two groups. This highlights the substantial security of the modified method that does not appear to affect the condition of the infant.

The evaluation of maternal blood loss, estimated with the decrease in haemoglobin and RBC, did not appear to be different in the two groups in question. However, it should be added that the causes of blood loss the delivery are multiple and only partially dependent on episiotomy. Therefore a larger sample should be considered for a proper evaluation of the comparison.

The difference between the two groups is highlighted in the percentage of cases of extending vaginal tears. In the control group, treated with the traditional method, the incidence of tears was 17.5% of cases, in line with the literature (10-30% of cases). However, with the use of the modified method, there have been no extensive tears and, although the assessment requires more cases and the use by different operators for comparison, in this study it appeared to be effective for the purpose which was proposed.

According to other studies, avoiding a sharp extraction of the cephalic extremity and helping the maternal perineum to relax, it is possible to reduce vulvo-vaginal lesions. This phenomenon is more apparent during the operative delivery where the traction of the operator on the head of the fetus may easily cause a sudden and traumatic emission. With the technique proposed, the use of engraving, when necessary, and under the opinion of the operator, separate for anatomical planes and short on the vaginal wall, allows to minimize the length of episiotomy compared to a full-thickness engraving performed as tradition with the scissors. At the same time, controlling the spill from the vulva of the fetal head with the left hand, and helping crowning with the right, avoids sudden and uncontrolled expulsion. Regarding the applicability of the method in question, it is believed that it can be applied to any kind of delivery room and that the time required for training to learn the technique is quite simple, in a very short time, and is within reach of any obstetrician.

Conclusions

Vaginal delivery injuries are an important issue of maternal health, although little is highlighted in the literature. Episiotomy is frequently performed in childbirth and, with much more frequency with a vacuum extractor. The present author has only considered the use of the vacuum extractor as an operational technique, while not using the forceps in this clinic. During operative delivery episiotomy

is often aggravated, mainly due to a too rapid extraction which does not allow the perineum to adapt. The new method used, from the authors' first study, appears to allow a gradual and controlled release of the cephalic extremity, which is capable of significantly reducing the vaginal lesion. The statistical assessment of the incidence of complications in the two groups of patients treated with the two techniques showed a statistically significant difference in the reduction of complications in favour of the new proposed method. Further control studies will certainly be required. The proposed method is simple to learn for any operator and free of risks for the mother and for the newborn.

Acknowledgement

The author thanks to V. Scotto Di Palumbo, M.D. for important assistance in reviewing the text and the bibliography in this manuscript.

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