

# Laparoscopic hysterectomy: really so risky to a vaginal cuff dehiscence?

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## Summary

**Purpose of investigation:** The authors report their experience with vaginal vault suturing procedure in patients that underwent total laparoscopic hysterectomy (TLH) for benign diseases. Vaginal vault colpotomy and closure were only laparoscopically carried out. **Materials and Methods:** Longitudinal retrospective study was conducted in 550 patients, affected by gynaecological benign pathologies, that underwent TLH were enrolled. Information about age, body mass index, parity, corticosteroid therapy, previous pelvic surgery, smoking, diabetes, menopausal status, and procedure characteristics (operating time, blood loss, uterus weight, postoperative recovery time, and adverse outcomes) were collected. Postoperative complications and adverse outcomes were recorded. **Results:** Only one case (0.2%) of vaginal cuff dehiscence (VCD) occurred four weeks after surgery, which was quickly laparoscopically repaired with interrupted intracorporeal knots. The trigger event was sexual intercourse in a patient affected by systemic lupus erythematosus (SLE). No cases of VCD presented in patients with other considered comorbidities. **Conclusion:** A careful technique could further decrease the incidence of postoperative vaginal cuff dehiscence, regardless of laparoscopic or vaginal suture approach.

**Key words:** Vaginal cuff dehiscence, Total laparoscopic hysterectomy, Surgical complications, Endoscopic Surgery.

## Introduction

Hysterectomy is the most common non-pregnancy-related major surgery performed on women in the world: about 600,000 hysterectomies are annually performed in the United States [1].

The choice of surgical approach (abdominal, vaginal, and laparoscopic) depends on skills of the surgeon, uterine or vaginal size, and availability of an adequate surgical equipment.

Total laparoscopic hysterectomy (TLH) has been described as a beneficial technique as well as vaginal hysterectomy (VH) and more advantageous for patients, if it is conducted with a safe technique [2, 3]. Nevertheless, in literature, a higher incidence of postoperative complications is reported in TLH compared to VH: among these, vaginal cuff dehiscence (VCD) is described to be a rare but severe complication. Its incidence after TLH varies between 0.3% and 3.1% [4, 5]. It can lead to serious life-threatening developments and be complicated by vaginal evisceration, intestinal ischemia, and intra-abdominal infection [6]. Recently, some authors suggested that a transvaginal suture is safer than laparoscopic one [4, 7].

In the present study the authors report their surgical outcomes in women that underwent reverse hysterectomy (RH) [8] for benign diseases, in which vaginal closure was laparoscopically carried out.

## Materials and Methods

A longitudinal retrospective study was conducted in Minimally Invasive Surgery and Operative Obstetrics Unit, (Woman and Child Health Departments) of Obstetrics and Gynaecology Clinic at the University of Padua.

Patients eligible for inclusion in the study were women who underwent RH for benign uterine disease, during the three-year period from January 2010 to January 2013. In total, 550 women affected by benign uterine pathologies were included: in all women had been subjected to a preoperative PAP test, clinical examination, ultrasound exam to assess the absence of malignant ovarian pathologies, and hysteroscopy to assess the absence of malignant uterine pathologies were performed [9].

Exclusion criteria included malignancy, antithrombotic therapy and cardiopulmonary diseases (defined as a history of cardiac failure, myocardial infarction, unstable angina, acute or recent vascular thrombosis, asthma or pulmonary obstructive disease poorly controlled, or contraindicating prolonged Trendelenburg position).

Clinical and surgical records such as age, menopausal status, parity, body mass index (BMI), smoking, diabetes, corticosteroid therapy, previous pelvic surgery, and procedure characteristics (operating time, blood loss, uterus weight, recovery time) were collected.

Postoperative complications and adverse outcomes were classified using the morbidity scale proposed by Dindo *et al.* [10]. Patients were postoperatively evaluated by anamnesis and physical examination two months after surgery. Sexually active patients were instructed not to restart sexual intercourse until this evaluation. A descriptive statistical analyses was performed on these data.

## Surgical technique

The surgery was performed under general anesthesia with nasogastric tube insertion and a bladder catheter placed immediately before the operation. All patients underwent antibiotic prophylaxis with two g cefazolin 30 minutes before surgery.

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Two gynaecologists, experienced in advanced laparoscopic surgery, performed all procedures with similar techniques and instruments over time [8].

During a RH, after exposure of the anterior vaginal fornix, circular colpotomy was performed with a clear cut incision by a Harmonic Ace. Closure began from the distal angle of the vaginal cuff and proceeded to the opposite side, making sure to include the pubocervical fascia, part of the cardinal ligament, and even the vaginal mucosa and the rectovaginal fascia with interrupted sutures of 0 polydioxanone intracorporeal knots on a 36-mm half-circle taper point needle. The vaginal vault was therefore suspended to the pubocervical fascia, part of cardinal ligament, and to the residual uterosacral ligaments.

## Results

A total of 550 laparoscopic hysterectomies were included in the study. Mean age was  $52 \pm 8.565$  years. BMI was  $24.85 \pm 3.759$  g. Two hundred and one women (28.7%) women were smokers, 196 (35.4%) patients were in premenopause, while 354 (64.6%) were in menopause. One-hundred-sixteen (21.3%) women were nulliparous, while 132 (24.3%) had one child, 225 (41%) had two children, 40 (7.4%) had three children, 21 (1.9%) had four children, and 16 (1.4%) had five children. One hundred fifty-two patients (27.6%) had a caesarean section. Twenty-two (4%) patients were affected by diabetes. One patient was affected by systemic lupus erythematosus (SLE), but in a clinical remissive phase and was not assuming any drugs.

The surgical prescription was: fibromatosis in 431 patients (78.4%), chronic pelvic pain in 64 (11.6%), endometriosis in 15 (2.7%), and endometrial hyperplasia in 40 (7.3%). The operating time was  $112 \pm 53.3$  min, median blood loss was  $85.64 \pm 161.47$  ml, and mean recovery time was  $2.4 \pm 1.35$  days. The mean uterus weight was  $280.59 \pm 251.35$  g. Postoperative complications are reported in Table 1, according to Dindo *et al.* classification [10].

Only one case (0.2%,) of vaginal cuff dehiscence occurred with intestinal loops of small bowel protrusion. The patient was readmitted four weeks after surgery because of pelvic pain and poor vaginal bleeding. The trigger event was sexual intercourse and she was affected by SLE. Vaginal cuff dehiscence was quickly laparoscopically repaired with interrupted intracorporeal knots.

## Discussion

VCD is described to be one of the major complication after TLH. Its incidence after total laparoscopic hysterectomy varies between 0.3% and 3.1%. According to literature, VCD is defined as a full thickness separation, partial or total, of the anterior and posterior edges of the vaginal cuff with or without bowel evisceration. [7].

It usually occurs in the first month after surgery, but it has been described also after several years: median time to de-

Table 1. — Postoperative complications (classification by Dindo *et al.*) [12].

Postoperative complications	Frequency	Percentage	Cumulative percentage
None	510	92,7%	92,7
Grade I	30	5,5%	98,2
Grade II	3	0,5%	98,7
Grade III a	2	0,4%	99,1
Grade III b	3	0,5%	99,6
Grade IV	2	0,45	100,0

hiscence has been reported from 1.5 to 3.5 months. It should be suspected in patients with vaginal bleeding and profuse purulent discharge [11]. In postmenopausal women, it usually follows surgery for genital prolapse or complicated pelvic operations: high-grade enterocele, vaginal vault prolapse, and severe cuff atrophy contribute to the weakening of the vaginal apex [12]. In premenopausal women, it is commonly associated by intercourse or unusual sexual practices after vaginal surgery. The most frequent surgical prescription to a hysterectomy is fibromatosis, afflicting mostly woman during reproductive age and impacting their quality of life with unpleasant symptoms.

Several factors are involved in the pathogenesis of fibromatosis: leiomyoma growth and development seems to depend on steroid, genetic background, cytogenetic anomalies, and inflammatory environment [13].

Less frequent surgical prescriptions are chronic pelvic endometriosis and endometrial hyperplasia [14].

Nowadays, the reason for the increased incidence of VCD after TLH is still a matter of concern: the suturing method is mentioned as an etiological intraoperative factor.

In a recent systematic review [4], analyzing data from more than 13,000 total endoscopic hysterectomies (both laparoscopic and robotic) included in series published between 1989 and 2010, Uccella *et al.* suggested that the modality of cuff closure may play a key role in the genesis of VCD, with transvaginal suture being associated with threefold and ninefold reductions in the incidence of cuff separations respectively compared with laparoscopic and robotic sutures. They concluded that vaginal dehiscence and other complications (such transvaginal bleeding, reintervention, infections) are significantly reduced when the vaginal vault is closed transvaginally. They reported a risk of vaginal dehiscence of 0.64%, vaginal bleeding 0.46%, reintervention 0.66%, infections 0.28% after TLH compared to 0.18%, 0.18%, 0.24% and 0.12% after LAVH or VH, respectively. They hypothesized that this important disparity was related to the use of electrocautery (at the time of colpotomy) and to thermal tissue damages, to the insufficient tissue involved in the suture (due to the magnification of pelvic anatomy by laparoscope), and to the worst reliability of the knots made with laparoscopic instruments.

In 2007, Hur *et al.* [5, 15] observed a decreasing incidence (1.35%) of VCD in TLH (958) performed from January 2006 to December 2009 in comparison to those (662) performed from January 2000 to March 2005 (4.83%). They attributed the reason of this decrease to the improved surgeon experience.

The incidence of VCD in the present series of cases was 0.2%: this lower value is simply obtained by means of skill-full technique, which is the essential condition to perform a TLH.

During a TLH, energy is generally used in dividing the cuff for cutting and performing hemostasis. The degree of tissue injury has relevance on outcome of vaginal cuff closure: the suture must not incorporate injured tissue.

In a recent study [16], assessing the histopathological degree of energy-related injury after a robotic TLH performance in the swine vagina, Gruber *et al.* observed that tissue injury related to ultrasonic was significant lower than bipolar energy, while monopolar was slightly less than that associated with bipolar energy. In other studies, monopolar energy has been associated with the greatest degree of tissue damage.

Even if ultrasonic energy causes the least tissue damage because of its less thermal spread, tissue necrosis and devascularisation, it may produce histologic effects in adjacent tissues by transferring mechanical energy to tissues resulting in protein denaturation and vaporization of fluids in cells, but post-surgical effects of various energy type were not analysed.

The present authors routinely use Harmonic ACE which allows a good haemostasis and clear cut incision. Through its continuous and homogeneous tension, it ensures tissue quality optimization and concurs to favourable outcome of the suture. [17]

Recent studies [18] reported a significant decrease of VCD employing barbed suture instead of traditional suture: Siedhoff *et al.* demonstrated the absence of complications after laparoscopic barbed suture (compared to braided suture comprised of polyglycolic acid and Endostitch and to monofilament suture). The authors adjusted the results with patient characteristics and concluded for barbed suture superiority, because of the tension distribution across the length of the suture and less tissue ischemic damage with a significant shortening in procedure time.

Other studies [19] compared laparoscopic suturing of the vaginal cuff with a single-layer unknotted running suture and both laparoscopic and transvaginal closure with knotted interrupted sutures. The authors found a threefold increase (3.3%) of VCD incidence in laparoscopic closure with knotted interrupted sutures (while in transvaginal interrupted suturing was 1.3 % and in laparoscopic running one was 2.4%). There was no statistical difference with regard to VCD between these three groups.

In the present series of laparoscopic vaginal closure with intracorporeal interrupted suture, only one case of VCD out of 550 occurred in a patient with a systemic disease.

According to literature, in the present authors' experience, VCD does not seem attributable to the suture tensile strength but rather to primary healing defects. Routinely, the authors prefer to remove high size uterus through the vagina, after a partial morcellation. For this reason, their preoperative workup includes hysteroscopy with endometrial biopsy in all patients to rule out premalignant and malignant lesions [9].

Several preoperative risk factors have been postulated for VCD: increased age, coitus before healing, trauma or tape, corticosteroid therapy and radiotherapy, use of the Valsalva maneuver, previous vaginoplasty, postoperative infection, hematoma, poor surgical technique, vaginal atrophy, smoking, malnutrition, anaemia, diabetes, menopausal status, and previous pelvic surgery [20].

Even if it seems biologically plausible that any condition compromising wound healing increases the risk of vaginal cuff dehiscence, the data on such risk factors are approximate.

According to literature [21, 22], risk factors (such as considered smoke, higher BMI, diabetes, menopausal status, and previous pelvic surgery) did not seem to predispose patients to VCD after laparoscopic surgery.

The inconsistent recording of risk factors in studies, infrequency of the VCD, and the lack of their comparison between women with and without dehiscence in most retrospective studies make it difficult to assess the significance of each of these potential risk factors.

Immunosuppressive status and systemic connective tissue disease (systemic lupus erythematosus, systemic sclerosis, rheumatoid arthritis, and Raynaud's disease) is common in young women and predispose them to the development of surgical complications, even in the elective setting [23].

In the present series, the only case of VCD occurred in a patient with SLE, probably consequence of altered inflammatory processes, the past use of immune modulating drugs (steroids, methotrexate, hydroxychloroquine, which are associated to higher risk of infection and poor wound healing), and the microvascular vasospasm of Raynaud's phenomenon.

The trigger events are those which increase abdominal pressure (along with vaginal atrophy or enterocele after hysterectomy) because of stretching of vaginal wall and shifting of intra-abdominal pressure towards the vaginal apex, such as sexual intercourse [24]. The surgical joining between pubocervical and rectovaginal fascia allows to restore the anatomical and functional conditions of pelvic organs.

## Conclusion

In the authors' experience only one case of dehiscence in a woman with systemic lupus erythematosus and after a incautious sexual intercourse four weeks after surgery occurred. That clinical condition resulted in a VCD and protrusion of small bowel loop, which was quickly laparoscopically re-sutured

Various methods of suturing of the vaginal vault have been described, with the aim to restore pelvic stability and to avoid the risk of dehiscence of the vaginal vault.

In the early years after the introduction of the laparoscopic technique, many authors have reported an increased incidence of this complication. Today, the experience and the proper equipment has allowed us to perform a suture with excellent results and lower incidence of VCD. The authors believe that laparoscopic surgical procedures may be actually performed involving also cardinal ligaments in the sutures (not only pubocervical and rectovaginal fascia). These landmarks are the main support structures of the apex of the vagina, with an effective pelvic stability. In the authors' experience, combining these measures with careful technique could further decrease the incidence of this severe complication.

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