

Vaginal Cuff Dehiscence after Minimal Invasive Hysterectomy: Laparoscopic Surgical Techniques

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ABSTRACT

Vaginal cuff dehiscence (VCD) after hysterectomy is an adverse event with potential severe morbidity. Although the data are limited, minimally invasive approaches to hysterectomy, such as total laparoscopic hysterectomy (TLH), may be associated with a higher risk of vaginal cuff dehiscence. The cause for these dehiscences is unknown, and multiple factors may be involved. Internationally, the etiology of VCD is still a matter of concern. Either in its technique (TLH) as in the used technology (electrosurgical colpotomy and/or suturing method), an explanation could be found for the higher incidence of VCD.

This study aims to review laparoscopic surgical techniques in the minimal invasive hysterectomy and its association with VCD.

Keywords: Vaginal cuff dehiscence, Total laparoscopic hysterectomy, Vaginal cuff laparoscopic suture methods, Electrosurgical colpotomy.

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INTRODUCTION

Vaginal cuff dehiscence (VCD) after hysterectomy is an adverse event with potential severe morbidity.

VCD had complicated gynecologic surgery long before the advent of laparoscopic approach to hysterectomy. In older reviews of vaginal evisceration, most cases that were reported in the literature had occurred after vaginal hysterectomy (63%).¹ However, the distribution of reported cases has changed significantly over the past 5 years.²

The reported incidence of VCD following hysterectomy is, nowadays, approximately 0.24%.³⁻⁵ In a large case series, there were 28 cases of VCD among 11,606 patients (0.24%) who underwent total hysterectomy.⁵ The incidence of VCD after any type of pelvic surgery is 0.03% and varies by surgical approach.⁶

However, the true incidence of VCD after hysterectomy is unknown since:

1. The complication is likely under-reported.
2. Patients with cuff dehiscences may present to a different physician or hospital than for the initial hysterectomy, making data collection difficult and
3. Case reports of VCD generally do not include for comparison in the number of hysterectomies that were not associated with this complication.⁷

Despite the difficulty just described, it is reported that the incidence of VCD after total laparoscopic hysterectomy (TLH) varies between 0.3 and 3.1%.³⁻¹⁰ This is higher compared with the abdominal (AH) and vaginal (VH) approach (0.1–0.3%).^{1,3} Currently, 50% of the cases of VCD that have been reported in the literature occurred after TLH or robotic hysterectomy.

After abdominal total hysterectomy, the vaginal cuff can be sutured closed or left open. In the open technique, the edges of the vaginal cuff seal gradually via granulation. It does not appear that either technique is superior for preventing cuff dehiscence.^{5,12}

In several studies, the vaginal route suturing of vault approach, in the total laparoscopic hysterectomy, is described to reduce the incidence of VCD (0.18%).¹⁰ However, other parameters must be considered are as follows:

1. In TLH, vaginal vault closure by laparoscopic route requires statistically significant less time for completion as compared to vaginal route.
2. Postoperative complications, like vault infection and pain, are suggested to be significantly lower in the laparoscopic route as compared to vaginal route suturing for vault closure.
3. The mean postoperative vaginal length was significantly more in the laparoscopic closure than in the vaginal route suturing of vault approach.¹² Given the fact that transvaginal closure can not always be accomplished in all women, alternatives to this suturing method should be studied.

Since, the continuous increment in the number of hysterectomies performed laparoscopically, the etiology of VCD and explanations for its association with TLH have been subjected to research. Patient characteristics, such as smoking, diabetes, advanced age, radiation therapy and chronic steroid administration, next to precipitating factors, such as sexual intercourse, postoperative cuff infection and/or hematoma and increased abdominal pressure (e.g. coughing, vomiting and straining at toilet) have been addressed with regard to their association with VCD.^{4-6,13} Nevertheless, none of these factors are unique for TLH.

Because studies have pointed to the possibility of increased risk of dehiscence with minimally invasive techniques, some potential differences in surgical technique that could contribute to this problem have been studied.^{3,7}

Different from total vaginal hysterectomy and total abdominal hysterectomy for TLHs:

1. Use of energy sources to make the vaginal colpotomy may result in tissue destruction beyond the incision, potentially increasing tissue necrosis and leading to poor healing of the vaginal cuff compared with a sharp colpotomy that is made using a scalpel or scissors. Different electro-surgical instruments (e.g. bipolar and monopolar devices) or ultrasonic devices produce varying amounts of tissue destruction.
2. Laparoscopic magnification of the surgical field may distort the view and cause the surgeon to place sutures too close to the vaginal cuff edge (<1 cm) or not achieve full thickness closure.
3. Laparoscopic suturing to close the vaginal cuff requires advanced training to achieve secure knots via extracorporeal or intracorporeal techniques. Inappropriate use of the laparoscopic knot pusher or poor intracorporeal knot tying technique may compromise suture integrity.

Recently, several studies compared the influence of various vaginal vault closure techniques on the incidence of VCD after TLH. Internationally, the etiology of VCD is still a matter of concern. Either in its technique (TLH) as in the used technology (electrosurgical colpotomy and/or suturing method), an explanation could be found for the higher incidence of VCD.¹³ Preventive measures to minimize the risk of VCD after hysterectomy are uncertain since the causes are not well-established.⁷

This study aims to review laparoscopic surgical techniques in the minimal invasive hysterectomy and its association with VCD.

A literature review was performed using PubMed, Medscape reference, HighWire Press and Up-to-date. The search was conducted using the keywords 'laparoscopic vaginal vault dehiscence', 'laparoscopic vaginal cuff closure techniques', 'vaginal cuff laparoscopic suture methods' and 'electrosurgery laparoscopic hysterectomy'.

Fifty-eight citations were found. Among these studies, a second selection of articles was performed according the purpose of this review. The selected papers were also screened for further references. At the end of the process, 29 articles were reviewed.

LAPAROSCOPIC SUTURING METHODS

Interrupted vs Running Sutures with Knot

Although techniques for suturing of the vaginal cuff have changed rapidly over the past years, only one prospective study on this subject has been published.¹⁴ This study compared laparoscopic closure with interrupted and running sutures, however, with a double-layer suturing method and with an extracorporeal knotting technique. The study

revealed no statistically significant difference between the two suture methods (incidence of VCD: 1.2%).

Several methods are described for laparoscopic intra-abdominal cuff closure. Interrupted or continuous sutures may be tied intracorporeally with a needle driver and grasper or extracorporeally with a knot pusher.¹⁵

TEM Clips

Another method already adopted, off label, in the vaginal cuff closure, is a suturing technique commonly used in transanal endoscopic microsurgery (TEM).

In this technique, a regular Vicryl no. 0 with a suture staple placed at the distal end of the wire is sutured from the right to the left angle of the vaginal cuff, after which another suture staple is placed at the proximal end to secure the suture (suture clip forceps for TEM, Richard Wolf GmbH, Knittlingen, Germany). In all suturing methods, both uterosacral ligaments are incorporated in the repair, and the peritoneum is unclosed.

This way, cuff closure using a running vicryl suture with TEM clips, is a newly appointed alternative to other suturing techniques currently in use. Although it is an easy method to adopt, based on data, no statistical superiority of this suturing procedure could be proven.¹³

Barbed Suture

Barbed suture is a relatively recent concept in gynecologic surgery. The Quill SRS bidirectional barbed suture (Angiotech Pharmaceuticals, Inc Vancouver BC, Canada) was FDA approved for soft tissue approximation in 2004¹⁶ and has been commercially available in the United States since 2007.

Bidirectional barbed sutures are created by cutting barbs into the suture with the barbs facing in an opposite direction to the needle. The barbs change direction at the midpoint of the suture¹⁷ (Fig. 1) and needles are swaged onto both ends of the suture. Due to its decreased effective diameter, the straight-pull tensile strength of barbed suture is rated one suture size greater than smooth suture (e.g. A 0 barbed suture equals a 2-0 smooth suture).

The anchoring of bidirectional barbed suture resists migration and can be conceptualized as a 'continuous interrupted' suture without knots and has been shown to have at least equal tissue holding performance as comparable knot anchored suture has.^{18,19} This offers several advantages. Since, bidirectional barbed sutures self anchor and are balanced by the countervailing barbs, no knots are required. Furthermore, barbed suture self anchors at every 1 mm of tissue, yielding more consistent wound opposition. Finally, knotless barbed suture can securely reapproximate tissues with less time, cost and aggravation.^{20,21}

The safety and effectiveness of barded sutures, in closure of the vaginal cuff, has already been demonstrated in two studies.^{16,22} However, one was noncomparative and, in the other, a more time-consuming double-layer suturing method was used. In both, the use of this suture reduced the incidence of the VCD. Furthermore, the barbed suture proved to be relatively easy to learn dehiscence while not increasing the rate of postoperative bleeding, cuff cellulitis or granulation tissue. Some concern is expressed regarding adhesion formation of the intestine to the tail of the barbed suture, which in turn potentially could cause bowel obstruction.²³

Suture Material

Several studies did address the type and class of suture material as a possible cause for VCD.^{3,24,25} Up-to-date review suggests the use of a delayed absorbable monofilament suture [e.g. polydioxanone (PDS IITM)]: Preferred for the theoretical advantage of lower infectious risks.⁷

However, there is neither data demonstrating evidence nor consensus on the preferred suture material, concerning monofilament vs multifilament and delayed absorbability of the thread.

According to the data, there is no superiority of one of the suturing method over the others.

ELECTROSURGERY

Some authors state that electrosurgical colpotomy, often used in TLH, is responsible for suboptimal vaginal cuff healing, due to tissue necrosis and prolonged devascularization.^{14,25-27}

Colpotomy technique may account for the observed increased risk of VCD associated with TLH as compared with TVH and TAH. In the latter procedures, the colpotomy is often made sharply using heavy scissors or a knife. However, during TLH, the colpotomy is often made using

electrosurgery, which may yield thermal damage at the cuff site, weakening the tissue and increasing the risk of dehiscence.⁸

It is known that monopolar energy in the coagulation mode, is frequently used, for the colpotomy in THL. Coagulation mode is an interrupted, high-voltage current dispersed over a large surface area, while cutting mode is a continuous, low-voltage current concentrating the energy in a small area, resulting in more rapid tissue heating and less thermal spread. Coagulation mode may result in more tissue damage, although is better at sealing vessels in vascular areas like the vaginal cuff.⁸

A recent study, conducted in swines, analyzed energy-induced damage (ultrasonic, monopolar and bipolar), to the vagina during laparoscopic hysterectomy, using the distal scalpel-cut margin was used as reference. All energy sources demonstrated tissue damage, with ultrasonic showing the least and bipolar the greatest.²⁷

Further study of tissue damage relative to cuff closure at laparoscopic hysterectomy is warranted, as also its possible association with vaginal dehiscence.

CONCLUSION

VCD is a potentially severe adverse event and is still a matter of concern to those who perform minimal invasive hysterectomy. Its exact etiology remains unclear.

Data on additional risk factors for cuff dehiscence are limited and conflicting.² Although one study reported no difference in age, tobacco use or diabetes mellitus between women with and without cuff dehiscence, it likely was underpowered to detect a clinically meaningful difference.²⁸ Although it seems biologically plausible that any condition that could compromise wound healing would increase the risk of VCD, the data on such risk factors are sparse. The inconsistency of the reporting of risk factors in studies and case reports, the rarity of the VCD, and the lack of comparison of risk factors between women with and without dehiscence in most retrospective studies makes it impossible to assess the significance of each of these potential risk factors.

Some questions remain are as follows:

1. If in the abdominal hysterectomy, VCD is not increased in patients who had an unclosed cuff closure technique, why would be the suture method, the cause of this complication in the laparoscopic procedure?
2. If electrosurgical colpotomy, overused in laparoscopic hysterectomy, is the cause of damage and wound healing complications, why these exist a superiority of transvaginal closure compared with laparoscopic closure (concerning VCD), in the same electrosurgical damaged tissues?



Fig. 1: Bidirectional barbed suture with barbs that change direction in the middle¹⁷

3. Why would be the preoperative morbidity factors the cause for the superior incidence of VCD, in TLH? Are not the patients the same?
4. What about postoperative conditions in TLH? Lower indices of pain, earlier work return, better predisposition to restart sexual intercourse. Won't be these advantages of the laparoscopic procedures the mainly risk factors of VCD?

Vaginal vault dehiscence is a rare complication after hysterectomy, but more common after a laparoscopic approach. The relationship between cuff dehiscence and mode of hysterectomy would be assessed best by a very large randomized controlled trial (RCT) study design. In fact, much of what is known about VCD comes from case reports and case series, which makes it difficult to truly assess possible risk factors and whether these risk factors differ by type of surgical procedure, mode of hysterectomy, etc. It is unknown whether variations in the surgical management of the vaginal cuff influence the risk of dehiscence.

Despite of this, techniques specific to TLH are pointed to be the main factor of the increased risk of vaginal vault dehiscence seen after laparoscopic hysterectomy.

More research is necessary to identify modifiable risk factors for VCD and methods for its prevention.

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REFERENCES

1. Ramirez PT, Klemer DP. Vaginal evisceration after hysterectomy: A literature review. *Obstet Gynecol Surv* 2002 July;57(7):462-467.
2. Cronin B, Sung V, Matteson A. Vaginal cuff dehiscence: Risk factors and management. *Am J Obstet Gynecol* 2012 Apr;206(4):284-288.
3. Hur HC, Guido RS, Mansuria SM, Hacker MR, Sanfilippo JS, Lee TT. Incidence and patient characteristics of vaginal cuff dehiscence after different modes of hysterectomies. *J Minim Invasive Gynecol* 2007 May-Jun;14(3):311-317.
4. Iaco PD, Ceccaroni M, Alboni C, Roset B, Sansovini M, D'Alessandro L, Pignotti E, Aloysio DD. Transvaginal evisceration after hysterectomy: is vaginal cuff closure associated with a reduced risk? *Eur J Obstet Gynecol Reprod Biol* 2006 Mar;125:134-138.
5. Hur HC, Donellan, NM, Mansuria, NM, Barber RE, Guido R, Lee T. Vaginal cuff dehiscence after different modes of hysterectomy. *Obstet Gynecol* 2011 Oct;118(4):794-801.
6. Croak AJ, Gebhart JB, Klingele CJ, Schroeder G, Lee RA, Podratz KC. Characteristics of patients with vaginal rupture and evisceration. *Obstet Gynecol* 2004 Mar;103(3):572-576.
7. Hur HC. Vaginal cuff dehiscence after hysterectomy. UpToDate 2012 Oct. Available at: <http://www.uptodate.com>. Accessed November, 2012.
8. Robinson BL, Liao JB, Adams SF, Randall TC. Vaginal cuff dehiscence after robotic total laparoscopic hysterectomy. *Obstet Gynecol* 2009 Aug;114:369-371.
9. Agdi M, Al-Ghafri W, Antolin R, Arrington J, O'Kelley K, Thomson AJ, Tulandi T. Vaginal vault dehiscence after hysterectomy. *J Minim Invasive Gynecol* 2009 May-June; 16(3): 313-317.
10. Uccella S, Ghezzi F, Mariani A, Cromi A, Bogani G, Serati M, Bolis P. Vaginal cuff closure after minimally invasive hysterectomy: our experience and systematic review of the literature. *Am J Obstet Gynecol* 2011;205(2):119.e1-12.
11. Shen CC. Comparison of one- and two-layer vaginal cuff closure and open vaginal cuff during laparoscopic-assisted vaginal hysterectomy. *J Am Assoc Gynecol Laparosc* 2002 Nov; 9(4):474-480.
12. Singh K, Shah B, Patel V, Goswami M, Shah MB. Vaginal vault closure techniques in total laparoscopic hysterectomy: a comparison between laparoscopic route vault suturing and vaginal route suturing. *Nati J Commun Med* 2011;2(2):289-292.
13. Blikkendaal MD, Twijnstra A, Pacquee S, Rhemrev JP, Smeets MJ, De Kroor CD, Jansen FW. Vaginal cuff dehiscence in laparoscopic hysterectomy: influence of various suturing methods of the vaginal vault. *Gynecol Surg* 2012 Nov; 9(4):393-400.
14. Jeung IC, Baek JM, Park EK, Lee HN, Kin CJ, Park TC, Lee YS. A prospective comparison of vaginal stump suturing techniques during total laparoscopic hysterectomy. *Arch Gynecol Obstet* 2010 Dec;282(6):631-638.
15. Lange S, Higgins R. Laparoscopic hysterectomy. *Medscape Reference* 2011 July. Available at: <http://emedicine.medscape.com/article/1839957-overview>. Accessed November 2012.
16. Einarsson J, Vellinga T, Twijnstra A, Chavan NR, Suzuki Y, Greenberg JA. Bidirectional barbed suture: an evaluation of safety and clinical outcomes. *JLS* 2010 Jul-Sep;14(3):381-385.
17. Leung JC. Barbed suture technology: recent advances. *Med Textiles* 2004 Oct;26-27:62-80.
18. Rashid RM, Sartori M, White LE, et al. Breaking strength of barbed polypropylene sutures: rater-blinded, controlled comparison with nonbarbed sutures of various calibers. *Arch Dermatol* 2007 Jul;143(7):869-872.
19. Rodeheaver GT, Pineros-Fernandez A, Salopek LS, Rodeheaver PA, Leung JC, Ruff GL, Batchelor SD. Barbed sutures for wound closure: in vivo wound security, tissue compatibility and cosmesis measurements. *Society for Biomaterials 30th Annual Meeting Transactions* 2004; 229:232.
20. Greenberg JA, Einarsson JI. The use of bidirectional barbed suture in laparoscopic myomectomy and total laparoscopic hysterectomy. *J Minim Invasive Gynecol* 2008 Sep-Oct; 15(5):621-623.
21. Moran ME, Marsh C, Perrotti M. Bidirectional-barbed sutured knotless running anastomosis vs classic van velthoven suturing in a model system. *J Endourol* 2007 Oct;21(10):1175-1178.
22. Siedhoff MT, Yunker AC, Steege JF. Decreased incidence of vaginal cuff dehiscence after laparoscopic closure with bidirectional barbed suture. *J Minim Invasive Gynecol* 2011 Mar-Apr;18(2):218-223.

23. Donnellan NM, Mansuria SM. Small bowel obstruction resulting from laparoscopic vaginal cuff closure with a barbed suture. *J Minim Invasive Gynecol* 2011 Jul-Aug;18(4):528-530.
24. Yuce K, Dursun P, Gultekin M. Posthysterectomy intestinal prolapse after coitus and vaginal repair. *Arch Gynecol Obstet* 2005 Jun;272(1):80-81.
25. Walsh CA, Sherwin JR, Slack M. Vaginal evisceration following total laparoscopic hysterectomy: case report and review of the literature. *Aust N Z J Obstet Gynaecol* 2007 Dec;47(6):516-519.
26. Nezhat CH, Nezhat F, Seidman DS, Nezhatc. Vaginal vault evisceration after total laparoscopic hysterectomy. *Obstet Gynecol* 1996 May;87:868-870.
27. Gruber DD, Warner WB, Lombardini ED, Zahn CM, Bullor JL. Laparoscopic hysterectomy using various energy sources in swine: A histopathologic assessment. *Am J Obstet Gynecol* 2011;205(5):494-496.
28. Nick AM, Lange J, Frumovitz M, Soliman PT, Schmeler KM, Schlumbrecht MP, dos Reis R, Ranirez PT. Rate of vaginal cuff separation following laparoscopic or robotic hysterectomy. *Gynecol Oncol* 2011 Jan;120(1):47-51.

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