

## **Laparoscopic Hysterectomy: should the complications re-define the classification**

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**Abstract:** The laparoscopic route for the removal of uteri for benign conditions represents a well established surgical route over the last twenty years, gaining popularity throughout the world. The modifications of the original technique and the variable involvement of the laparoscopic component necessitated the description of this surgical procedure and therefore classification systems were described. An attempt was hence made to standardize laparoscopic hysterectomy so that we all understand the same meaning when we describe a specific type. This standardization, however, has not incorporated factors such as simplicity, different types of energy use and complications that have to be audited to a set standard that probably does not exist yet, due to the variable complication rates in the literature. We look into the different major proposed classification systems and their benefits and drawbacks and try to re-define a system that is simple to use and may improve our audit purposes. In order to achieve this we review the complications of laparoscopic hysterectomy in the literature, using the Cochrane collaboration, the Medline and Embase databases.

**Keywords:** Laparoscopic Hysterectomy, Laparoscopically assisted vaginal hysterectomy, total laparoscopic hysterectomy, complications, classification

Laparoscopic hysterectomy( LH) and laparoscopically assisted vaginal hysterectomy (LAVH) represent an approach to the removal of uteri for benign and malignant gynaecological disease that has been evolving the last twenty years [1]. The slow uptake in this approach to hysterectomy may be due to variable complication rates and training necessary to standardize this procedure and reduce complications [2].

The surgical approach to hysterectomy was also addressed by the Cochrane collaboration and found complication rates in the laparoscopic groups to be variable [3]. Comparisons were made with vaginal (VH) and abdominal hysterectomies (AH) in different groups and complications categorized in primary and secondary. All urinary tract injuries were higher in the LH group when compared to AH and the total LH (TLH) when compared to the VH groups with more intra-operative bleeding and postoperative blood transfusions in the LH versus the VH modalities, the Cochrane review shed some light in the subject of benefits and risks associated with LH. No differences were seen in individual visceral organ injury between LH and TAH, LH and VH or TLH and LAVH.

The e-VALuate study, representing the largest multicenter randomized controlled trial comparing LH to AH and VH in two arms, showed major complication rates as high as 11.1% in the abdominal and 9.8% in the vaginal arm [4]. Ureteric injuries varied in the two arms for LH between 0.3 and 0.9% and bladder lacerations were seen between 0.9 and 2.1%, the first being somewhat comparable to other studies such as the large retrospective review from Donnez [5], with a 0.32% ureteric injury rate quoted and marginally higher than the 0.1% rate occurring in an 11-year period review of urinary tract injuries amongst 7725 LAVH in a single centre [6]. This rate was comparable to 1.2% ureteric injuries observed prospectively in a multicenter survey which included 1165 LH and with a clear drop in the rate during the second and final year of the study [7]. Conversely, the bladder lacerations are quoted below 2%, varying between 0.3-0.4% in retrospective reviews [5], [6], [8] and almost 1.5% in prospective cohorts [7], [9]. A meta-analysis of 3 randomized controlled trials (RCTs) of TLH and total AH (TAH) showed significantly more total complications in the TAH group and no difference concerning the urinary tract injuries [10], similar to the RCT by Marana of LAVH and TAH [11].

The bowel injury rate in LH has been between 0 and 0.2% in the e-VALuate study, indifferent to that in other large studies [5], [7] and not significantly higher when compared to TAH or VH [3]. There does not seem to be considerable variance in this complication.

Hemorrhage and blood transfusion as occurring in 4.6 to 5.1% of the LH in the e-VALuate study, interpreted into more intra-operative bleeding and transfusions, in the laparoscopic as opposed to the vaginal access, but less mean blood loss and drop in Haematocrit compared to AH. This was reiterated in the meta-analysis of TLH and TAH [1]). No difference in haematoma formation was identified. The Finnish national register of LH documented a 3.8% of blood transfusion, with 1.2% vascular complications.

Febrile morbidity was described in many ways and therefore cannot directly be compared. A temperature of more than 38.5 degrees Celsius after the first 48 hours of surgery was used as criteria to include in the minor complications of the review by Donnez [5], seen in 0.76% of the LH performed, but that represented a rate of 4.9 to 5.4% in the e-VALuate RCT [4]), equivalent to the 5.6% of infections in the Finnish national register, half of which represent febrile morbidities of unknown origin [7]. Similar rates are described in TAH and LH [10], with fewer wound infections amongst laparoscopic routes of hysterectomy [3].

Other rare complications varied between studies and ranged from 0.1% for venous thromboembolism [7], to 0.7% for pulmonary embolism and 0.7% for deep vein thrombosis [9], similar to the RCT by Garry [4]. Vaginal vault dehiscence is thought to be higher in hysterectomies performed via the laparoscopic route [12] and quoted as 1.14% using this route. Wound dehiscence shown in the e-VALuate study [4] was 0.2-0.3% in the LH groups, similar to TAH (0.3%) but higher than VH (0%). Mortality rates were 0.12-.034 per 1000. Laparoconversions are not more frequent when LH is performed, as opposed to VH [3], and were prevalent in 2.7 to 3.9% of LH in the e-VALuate RCT study [4], as opposed to 0.76% in a retrospective review from Australia [8] and 7.5% in a prospective study from France [13].

Some of the above morbidities pose small risk to the patients' recovery, but others have serious implications and therefore their prompt diagnosis and management is crucial. Ureteric injuries represent a major complication and despite the belief they mainly occur at the level of the infundibulopelvic ligament, during LH they can occur at any level from the pelvic brim to the ureteric canal [14]. Their occurrence is probably directly related to the experience of the operator [15] and is significantly decreased by as much as 44% as the surgeon becomes more confident with the approach [2]. Vault dehiscence is related to early sexual intercourse resumption after surgery and vaginal blood loss and is associated with vaginal evisceration [1]). There have also been suggested relations of the risks of LH with increased uterine size, BMI, uterine width more than 10cm, previous caesarean deliveries and the mode of haemostasis of the ovarian pedicle [4].

Therefore with increasing experience and patient selection laparoscopic hysterectomy can be safe to perform and replace most of the instances when the laparotomy route is used. The necessity to standardize the procedure and record the level of laparoscopic involvement imply the use of an efficient, simple and reproducible classification.

Laparoscopic hysterectomy has been classified by different authors and in various ways, and a consensus was reached by the American Associations of Gynecological Laparoscopists [16] to adopt the one proposed by Munro and Parker [17]. This systematic method to describe the laparoscopic hysterectomies using anatomical landmarks involved during the operations, has a 5 stage stratification using the type 0 class for preparation purposes. It very thoroughly covers possible alterations to the procedure and provides the surgeon sub-classification methods (A-E) to describe it. Its complexity though led to the abbreviated system which again uses the same 5 types, but only describes the anatomical landmarks involved laparoscopically during the procedure, together, either unilaterally or bilaterally. This classification system does not mention the method of closure of the vaginal vault in a separate type or subtype, making it difficult to audit complication rates of vault dehiscence and hematoma formation. Being more complete than the system proposed by Johns and Diamonds [18], it also includes steps which may be of importance to know if they were performed vaginally or laparoscopically, such as the cardinal and uterosacral ligaments, as complications can be related to excessive fulguration or inappropriate suspension. Garry proposed a descriptive approach, which seems appealing due to simplicity and clear distinction. This was achieved by not using a numerical approach but rather describing the primary and if likely the secondary operations. Being simple to reproduce this system has the drawback of not exactly defining the anatomical landmarks of the operation, which by themselves will promote standardization of the technique and make easier the way we evaluate our operations and audit our results. It seems more reasonable, therefore, that a simple descriptive approach, incorporating the surgical anatomy and defining the method of vault closure, will serve the above purposes. It also appears that a diagnostic laparoscopy, which has been classified as stage 0 [18], or a preparatory procedure (type 0 by Munro) [17], do not contribute to the actual description of the hysterectomy, and can be documented separately in order to explain co-morbidities such as adhesions and endometriosis. Surgery, furthermore, aims to follow bilateral descriptions, and should there be any deviation from the standard, this should be described rather than classified as unilateral procedure (i.e. adnaectomy).

A different pattern was used by Nezhat to classify hysterectomies [19], where seven operative steps were used and these were acknowledged in a descriptive manner. These were the round and broad ligaments (step 1), the infundibulopelvic ligaments (step 2), the uterine vessels (step 3), the bladder flap and pillars (step 4), the uterosacral-cardinal complex (step 5), culdotomy (step 6) and finally the vaginal vault closure (step 7). They used the term total laparoscopic hysterectomy (TLH) for the procedure being completely performed laparoscopically and subtotal laparoscopic hysterectomy (SLH) for the supracervical version. Vaginally assisted laparoscopic hysterectomy

(VALH) involves according to Nezhat's classification at least four steps laparoscopically and laparoscopically assisted vaginal hysterectomy (LAVH) involves three or two. This step-wise, very logical and anatomically correct classification mentions steps like the round ligaments and the bladder dissection that are usually performed in the process, but probably are of minor importance in the classification process. Moreover, VALH and LAVH seem to be separated by the number of steps and whether the culdotomy was done with energy laparoscopically or using cold knife vaginally is not distinguished.

We would suggest 4 types of laparoscopic hysterectomy, using 5 descriptions, where type I LAVH (laparoscopically assisted vaginal hysterectomy) involves laparoscopic dissection of the infundibulopelvic ligaments. Type II LH (laparoscopic hysterectomy) involves transection of the uterine arteries and type III of the uterosacral and cardinal ligaments, laparoscopically. Finally type IV LH involves laparoscopic culdotomy with vaginal suturing and type IV TLH (total laparoscopic hysterectomy) involves a laparoscopic culdotomy and suturing. This combination of anatomical and descriptive classification retains the simplicity of use of Garry's descriptive method, incorporating different anatomical levels and defining the vaginal vault closure. The description of LAVH or TLH would need no further explanation, whereas LH would need to be typed as II, III or IV. (Table 1)

Table 1. Proposed classification of Laparoscopic Hysterectomies

Description	Type
LAVH	I
LH	II
LH	III
LH	IV
TLH	IV

#### References :

1. Reich H. Total laparoscopic hysterectomy: indications, techniques and outcomes. *Curr Opin Obstet Gynecol.* 2007 Aug;19(4):337-44.

2. Leminen A. Comparison between personal learning curves for abdominal and laparoscopic hysterectomy. *Acta Obstet Gynecol Scand.* 2000 Dec;79(12):1100-4.
3. Nieboer T, Johnson N, Lethaby A, Tavender E, Curr E, Garry R, et al. Surgical approach to hysterectomy for benign gynaecological disease. *Cochrane Database Syst Rev.* 2009(3):CD003677.
4. Garry R, Fountain J, Mason S, Hawe J, Napp V, Abbott J, et al. The eVALuate study: two parallel randomised trials, one comparing laparoscopic with abdominal hysterectomy, the other comparing laparoscopic with vaginal hysterectomy. *BMJ.* 2004 Jan;328(7432):129.
5. Donnez O, Jadoul P, Squifflet J, Donnez J. A series of 3190 laparoscopic hysterectomies for benign disease from 1990 to 2006: evaluation of complications compared with vaginal and abdominal procedures. *BJOG.* 2009 Mar;116(4):492-500.
6. Soong Y, Yu H, Wang C, Lee C, Huang H. Urinary tract injury in laparoscopic-assisted vaginal hysterectomy. *J Minim Invasive Gynecol.* 2007;14(5):600-5.
7. Härkki-Sirén P, Sjöberg J, Mäkinen J, Heinonen P, Kauko M, Tomás E, et al. Finnish national register of laparoscopic hysterectomies: a review and complications of 1165 operations. *Am J Obstet Gynecol.* 1997 Jan;176(1 Pt 1):118-22.
8. Tan J, Tsalts J, Hengrasme P, Lawrence A, Najjar H. Evolution of the complications of laparoscopic hysterectomy after a decade: a follow up of the Monash experience. *Aust N Z J Obstet Gynaecol.* 2009 Apr;49(2):198-201.
9. Leung S, Chan C, Lo S, Pang C, Pun T, Yuen P. Comparison of the different types of "laparoscopic total hysterectomy". *J Minim Invasive Gynecol.* 2007;14(1):91-6.
10. Walsh C, Walsh S, Tang T, Slack M. Total abdominal hysterectomy versus total laparoscopic hysterectomy for benign disease: a meta-analysis. *Eur J Obstet Gynecol Reprod Biol.* 2009 May;144(1):3-7.
11. Marana R, Busacca M, Zupi E, Garcea N, Paparella P, Catalano G. Laparoscopically assisted vaginal hysterectomy versus total abdominal hysterectomy: a prospective, randomized, multicenter study. *Am J Obstet Gynecol.* 1999 Feb;180(2 Pt 1):270-5.
12. Agdi M, Al-Ghafri W, Antolin R, Arrington J, O'Kelley K, Thomson A, et al. Vaginal vault dehiscence after hysterectomy. *J Minim Invasive Gynecol.* 2009;16(3):313-7.
13. David-Montefiore E, Rouzier R, Chapron C, Daraï E. Surgical routes and complications of hysterectomy for benign disorders: a prospective observational study in French university hospitals. *Hum Reprod.* 2007 Jan;22(1):260-5.
14. Cholkeri-Singh A, Narepalem N, Miller C. Laparoscopic ureteral injury and repair: case reviews and clinical update. *J Minim Invasive Gynecol.* 2007;14(3):356-61.
15. Wattiez A, Cohen S, Selvaggi L. Laparoscopic hysterectomy. *Curr Opin Obstet Gynecol.* 2002 Aug;14(4):417-22.
16. Olive D, Parker W, Cooper J, Levine R. The AAGL classification system for laparoscopic hysterectomy. Classification committee of the American Association of Gynecologic Laparoscopists. *J Am Assoc Gynecol Laparosc.* 2000 Feb;7(1):9-15.
17. Munro M, Parker W. A classification system for laparoscopic hysterectomy. *Obstet Gynecol.* 1993 Oct;82(4 Pt 1):624-9.
18. Johns D, Diamond M. Laparoscopically assisted vaginal hysterectomy. *J Reprod Med.* 1994 Jun;39(6):424-8.
19. Nezhat C, Nezhat F, Admon D, Nezhat A. Proposed classification of hysterectomies involving laparoscopy. *J Am Assoc Gynecol Laparosc.* 1995 Aug;2(4):427-9.

