

## **Lower Urinary Tract Complications and Vault Prolapse Following TAH compared With LAVH**

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### **Abstract**

Hysterectomy, whether abdominal or vaginal, is one of the most frequently performed of all gynaecological surgical operations (Visco et al 2001, Gor et al 2006). When the vaginal route is employed, and the surgery is assisted in any form or extent laparoscopically, it is termed laparoscopically assisted vaginal hysterectomy (LAVH).

Indications of LAVH are previously considered as contraindications of vaginal hysterectomy (Mishra, 2008) These include previous pelvic surgery, extensive endometriosis, acute or suspected adnexal pathology, uterine myomata, previous caesarean deliveries, chronic pelvic pain, chronic pelvic inflammatory disease, restricted or reduced uterine mobility and limited vaginal access due to nulliparity or narrow sub-pubic arch. The aim of LAVH is to convert a potential abdominal hysterectomy to a vaginal one. These newer methods are however not without a price to pay in terms of associated complications, especially during the learning curve of the surgeons. The study aims to compare the frequency of lower urinary tract injuries and long term vault prolapse in association with TAH as compared with LAVH. Review of 28 contemporary documentations on the subject were obtained through literature search using the Google search engine to link Springerlink, Pubmed, Cochrane review, Ovid, Science Direct and others. It was noted that injuries to ureter were most common in the LAVH group (relative risk[RR] of 7.2 when compared with TAH). Bowel injuries were most frequent in the VH group (RR was 2.5) (Makinen et al 2001) Eight year follow up of large series did not show any significant difference between LAVH and TAH in long term complications such as vault prolapse, cystocele, rectocele, enterocele, postcoital spotting and cuff granulation (Brill 2006, Vaisbuch et al 2006, Shen et al, 2005) The incidence of lower urinary tract injuries is more in the open surgery than laparoscopically assisted method although the morbidity is reduced if discovered intra-operatively and repaired. The incidence of long term complications like vault prolapse is however similar in both situations.

### **Keywords**

Long term complications, Ureteric injury, Bladder injury, Vault prolapse, LAVH, TAH

### **Introduction**

Hysterectomy, whether abdominal or vaginal, is one of the most frequently performed of all gynaecological surgical operations (Visco et al 2001, Gor et al 2006). When the vaginal route is employed, and the surgery is assisted in any form or extent laparoscopically, it is termed laparoscopically assisted vaginal hysterectomy (LAVH).

Since the days of old the uterus has been removed by an either abdominal or vaginal route depending on the indication and associated pathology. Indications of LAVH are previously considered as contraindications of vaginal hysterectomy (Mishra, 2008) These include previous pelvic surgery, extensive endometriosis, acute or suspected adnexal pathology, uterine myomata, previous caesarean deliveries, chronic pelvic pain, chronic pelvic inflammatory disease, restricted or reduced uterine mobility and limited vaginal access due to nulliparity or narrow sub-pubic arch (Shah and Mishra 2007). Vaginal route was mainly reserved for treatment of pelvic relaxation and removal of small uteri in through capacious vagina. When the laparoscope is used to assist removal of the uterus, a potential abdominal hysterectomy can be converted to a vaginal one and a difficult vaginal hysterectomy can be converted into a fairly simple vaginal hysterectomy. It can also facilitate the vaginal route in cases of suspected adnexal disease, endometriosis, and narrow vagina and even in cases where uterine size is greater than 12 weeks gestation or 280g (Kovac, 1995)

The aim of LAVH is to convert a potential abdominal hysterectomy to a vaginal one.

The best approach to remove the uterus would retain the advantages of the abdominal route, which include clear visualization and ease of manipulation of the adnexal structures, and to combine these features with the main advantage of vaginal route, namely avoidance of a large abdominal incision. Laparoscopic hysterectomy has attempted to combine these techniques thereby minimizing hospital stay and aiding early recovery (Härkki-Sirén, 1999; Härkki-Sirén et al 1999) These newer methods are however not without a price to pay in terms of associated complications, especially during the learning curve of the surgeons. Some complications are more prevalent in one route more than the other though the incidence tends to reduce with increasing skill and expertise, on the surgeon's side, and increasing sophistication of equipment technology. Pelvic adhesions arising from different underlying diseases are associated with increased complication and conversion rates during LAVH (Hsu et al, 2007).

In this review, attempts have been made to examine the lower urinary tract injury and vault prolapse associated with these two routes. They are examples of short and long term complications respectively for the different approaches.

## **Aim**

To compare the frequency of lower urinary tract injuries and long term vault prolapse in association with TAH as compared with LAVH.

## **Methods**

Review of 28 contemporary documentations on the subject were obtained through literature search using the Google search engine to link Springerlink, Pubmed, Cochrane review, Ovid, Science Direct and others. The different rates of these complications in the immediate and long term were compared, the predisposing factors to these are examined as well as ways of minimizing them.

## **Results and Discussion**

### **Complications associated with hysterectomy**

Approximately 670,000 hysterectomies are performed annually in the United States (Visco et al, 2001). The United States has highest rate while Norway and Sweden have the lowest rate (Ishaque 2008). These are done via the vaginal route, abdominal route or assisted with laparoscopy to make the vaginal route feasible. Apart from the complications associated with anaesthesia, there could be problems due to positioning such as deep venous thrombosis, cerebral oedema, pressure injuries on nerves, there are intraoperative, early and long term complications associated with hysterectomy. The intraoperative ones include bleeding complications, injury to abdominal or pelvic structures such as small and large bowel, bladder, ureters, and the rectum. The early complications include infections, pulmonary complication, febrile morbidity while the late problems are usually due to damage to pelvic support or injury to pelvic nerves resulting in weakness and descent or herniation through urogenital diaphragm.

Makinen et al (2001) presented a series of 10,110 hysterectomies in which 5875 cases were by TAH with an overall complication rate of 17.2%, 1801 were through VH with complication of 23.3% while 2434 cases were done by LAVH with complication rate of 19%. It was noted that injuries to ureter were most common in the LAVH group (relative risk [RR] of 7.2 when compared with TAH). Bowel injuries were most frequent in the VH group (RR was 2.5). Significance of the surgeon's skills and experience in reducing complications was observed to be apparent. This fact is also illustrated by the review of Ureteric injuries with hysterectomy carried out by Visco et al (2001) Ottosen et al (2000) in randomized prospective study evaluated the difference in clinical short term outcomes between TAH (40), VH (40) and LAVH (40). They found no major significant difference between LAVH and VH except that duration was significantly longer in LAVH than VH and TAH, and the hospital stay longer in TAH compared with VH and LAVH. The conversion rate, which is an indication of complication was 4(10%) in LAVH and 1 (2.5%) in VH. There were two cases that required re-operation plus blood transfusion in the VH group but only one in the LAVH group. One patient had blood transfusion in the TAH group but no need for re-operation. They concluded that vagina hysterectomy should be the primary method of uterine removal. McPherson et al (2004) in the VALUE study modeled the determinants of serious operative and postoperative complications of hysterectomy and their potential risk factors. A cohort of 37,512 patients was studied prospectively with six weeks follow up. Severe operative complications occurred in 3% (risk reduced with age but increased with greater parity and history of serious illness). Laparoscopic procedures (6.1%) were found to double the risk of operative complications of abdominal hysterectomy (3.6%) (adjusted odd ratio = 1.9 at 95% CI 1.5 – 2.5). Postoperative complication occurred in 1% (with slight reduction with age). They concluded that younger women with more vascular pelvises, who undergo hysterectomy, especially LAVH for symptomatic fibroids are at most risk of experiencing severe complications. As more experience is being acquired and more sophistication is being introduced into laparoscopic surgery, more physicians are showing a shift away from abdominal route after they have learnt LAVH (Hulka et al 2006)

### **Incidence of lower urinary tract injury in LAVH compared with TAH**

In the US, the general incidence of ureteric injury is low, estimated at 0.03–2.0% for abdominal hysterectomy (Goodno et al; Härkki-Sirén et al, 1999) , 0.02–0.5% for vaginal hysterectomy (Härkki-Sirén, 1999; Stanhope et al 1991), and 0.2–6.0% for laparoscopically assisted vaginal hysterectomy (LAVH) (Visco et al 2001). In this, it was noted that incidence of ureteric was highest with LAVH but the larger and more recent of the quoted studies showed fewer complications than the earlier ones.

This is probably due to skills and experience gained with increasing number of cases handled. The above is illustrated with the table presented by the group:

### **Reported Frequencies of Ureteral Injuries with Hysterectomy**

Study operations	Year	No. of ureteral injuries	No. of injury	% Ureteral
<b><u>Total abdominal hysterectomy</u></b>				
Harkki-Siren et al	1998	43,149	18	0.04
Stanhope et al	1991	2833	2	0.07
Goodno et al	1995	2469	8	0.32
Dicker et al	1982	1283	3	0.23
Amirikia and Evans	1979	4228	5	0.12
Thompson & Benigno	1971	2287	9	0.39
Falk and Bunkin	1954	1114	1	0.09
Holloway	1950	808	6	0.74
Newell	1939	944	8	0.85
Solomons et al	1960	172	3	1.8
Conger et al	1954	1440	11	0.76
Neuman et al	1991	409	3	0.73
Boyd and Groome	1993	3322	7	0.2
<b><u>Total vaginal hysterectomy</u></b>				
Harkki-Siren et al	1998	5636	1	0.02
Stanhope et al	1991	2546	13	0.5
Goodno et al	1995	1054	5	0.47
Dicker et al	1982	568	0	0
Amirikia and Evans	1979	2111	3	0.14
Holloway	1950	328	1	0.30
Thompson & Benigno	1971	1533	1	0.07
Falk and Bunkin	1954	1664	2	0.1
Copenhauer	1962	1000	2	0.2
Edwards and Beebe	1949	570	2	0.35
Conger et al	1954	310	1	0.32
Newell	1939	128	1	0.78

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Vaginal hysterectomy**

Harkki-Siren et al	1998	2741	38	1.4
Saidi et al	1996	489	1	0.2
Tamussino et al 1998	70		4	5.7
Ribeiro et al	1999	118	4	3.4

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In Choe et al (2006) series evaluating urinary tract injuries after total hysterectomy, 18,721 cases were done over six years. The total urinary complication rate was 0.59% (0.51% for bladder injury and 0.09% for Ureteric injury)

The breakdown for the different methods can be summarized as follows:

Method	Total urinary complications	Bladder injury	Ureteric injury
TAH	0.55%	0.51%	0.04%
LAVH	0.64%	0.57%	0.07%
VH	0.62%	0.62%	0.0%
RH	0.69%	0.21%	0.49%
LRH	1.56%	1.79%	0.89%

TAH – total abdominal hysterectomy, LAVH – laparoscopically assisted vaginal hysterectomy, VH – vaginal hysterectomy; RH – radical vaginal hysterectomy, LRH – laparoscopically assisted RH

They observed that there was no significant difference in the incidence of urinary injury and type of operation with benign conditions ( $p > 0.05$ ) but there was significant difference in the incidence of injury between type of operation with benign when compared with malignant conditions.

Johnson et al (2000) did a systematic review and meta-analysis of randomized controlled trials in Auckland, involving 27 trials with 3,643 participants, to evaluate the most appropriate method of hysterectomy for women with benign disease. They found more urinary injuries with LAVH rather than TAH (Odd ratio 2.61 at 95% CI 1.22 to 5.6). No other intraoperative visceral injury showed any significant difference. Data were absent for many important long term outcomes where analyses were underpowered to detect any meaningful difference.

Their conclusion was that vaginal hysterectomy was more preferable to abdominal hysterectomy, but where not possible LAVH should be the option. They cautioned that that higher risk of bladder and ureteric injuries are still associated with LAVH. This is especially so in inexperienced hands.

**Incidence of vault prolapse following LAVH compared with TAH**

In a retrospective cohort study, Shen et al (2005) compared short term and long term clinical results of LAVH (150) with those of TAH (146). Short term clinical results in terms of blood loss, narcotic analgesia requirements and hospital stay, the measurement indices were higher for

TAH ( $p < 0.05$ ) but 8 year follow up did not show any statistically significant difference in vaginal prolapse and other long term problems.

Brill (2006) made similar observation in his 8 year follow up of similar cohorts but noted that operation time was higher in LAVH while hospital stay, convalescent time were significantly higher in TAH ( $p < 0.05$ ). The longer duration has been attributed to the mandatory learning curve. His regrets is that the state of education in most residency programs is not providing a level of surgical competency to meet the new challenges of modern gynaecological surgery. He concluded that the best available evidence gives advantage to the vaginal route in benign conditions but LAVH offers the best alternative whenever vaginal surgery is an option.

Vaisbuch and his group (2006) did not find any significant difference in all the parameters studied while comparing 167 cases of LAVH and 119 cases of TAH. The only difference they observed was for the operation time that was prolonged during the learning curve in LAVH.

Nwosu and Gupta (1998), in an earlier smaller study, had made a similar observation. They made a comparison between vaginal hysterectomy with BSO (21), and TAH with BSO (19) and LAVH with BSO (19) and concluded that vaginal hysterectomy with BSO had the quickest long term recovery.

### **Predisposition to lower urinary tract injury during LAVH compared with TAH**

There are conditions that have been associated with higher risk of having surgical complications during hysterectomy. Soriano et al (2001) evaluated the short term recovery of patients undergoing vaginal hysterectomy (VH) (40) compared with LAVH (40) in a prospective, randomized, multi-centre study. Inclusion criteria were uterine size  $\geq 280g$  plus one or more of the followings: previous pelvic surgery, history of pelvic inflammatory disease, moderate to severe endometriosis, concomitant adnexal masses, and indication for adnexectomy. There were 3 cases that needed conversion in the LAVH group. Operation time was shorter for VH (108 +/- 35min.) compared with LAVH (160 +/- 50min.) ( $p < 0.001$ ). Despite having cases with known predisposing factors they found no advantage of one method over the other.

In another study to determine if previous Caesarean section is an independent risk factor for incidental cystostomy at the time of hysterectomy (Rooney et al, 2005). Five thousand and ninety-two subjects were studied: TAH 3140 (61.7%), TVH 1519 (29.8%) and LAVH 433 (8.5%). Fifty-one cases of incidental cystostomy occurred – TAH 24 (47.1%) TVH 19 (37.3%) LAVH 8 (15.7%). They concluded that previous Caesarean section is an independent risk factor for injury to the lower urinary tract at the time of hysterectomy [OR = 2.04; 95% CI 1.2 – 3.5]. Independently for different route TAH = 1.26, TVH = 3.00 and LAVH 7.50 (significant  $p = 0.05$ ; 95%CI 1.8 – 31.4). A significant difference in the incidence of injury between the type of operation with benign compare with malignant findings have also been observed by many authors (Choe et al 2006, Mishra 2008). Risk of complication has been found to reduce with increasing patient age but increased with greater parity and history of serious illness (McPherson et al 2004). These authors also drew a conclusion from their observation that younger women having highly vascular pelvises in symptomatic myomata are at most risk of operative and postoperative complications when undergoing LAVH.

### **Predisposition to vault prolapse following LAVH compared with TAH**

The main predisposing factors to vault prolapse following hysterectomy is the skill of the surgeon. Inadequate attention to meticulous surgical technique and damage to the pelvic fascia and support structures lead to descent of the pelvic content.

These complications were found to be a function of the experience and skill of the surgeon, and the underlying pathology, and indication for the surgery as well as the sophistication of the equipment employed.

### **Minimizing the incidence of lower urinary tract injury during hysterectomy**

Ureteric injuries are of particular concern to the gynaecologist because three-quarters of ureteric injuries occur during gynaecologic surgery and mostly following abdominal operations.

One of the methods of minimizing unrecognized injury to the lower urinary tract is to do routine intraoperative cystoscopy. The cost effectiveness of this proposal was evaluated by Visco and his colleagues in 2001. They concluded that the cost-effectiveness of routine cystoscopy depends on the rate of ureteric injury independent of the method of hysterectomy. If the rate of injury is more than 1.5% for TAH and 2% for VH or LAVH, then routine cystoscopy is cost-effective. Ribeiro and his team had earlier emphasized the importance of intraoperative cystoscopy in minimizing (Ribeiro et al 1999)

A retroperitoneal downstream tracking of the ureters to do a preligation of the uterine vessels was evaluated by Hsu et al in 2007. Later they recommended it as a way of minimizing bladder and ureteric injury and having a successful LAVH in patients with extensive pelvic adhesions (Chang et al 2008). This proposal is a way of minimizing injury to the lower urinary tract when the dense vesico-uterine and or vesico-cervical adhesion following previous pelvic surgery or in association with pelvic pathology such as endometriosis and chronic pelvic inflammatory disease are anticipated or encountered at hysterectomy. The lateral windows of the vesico-cervical space should be opened first from the vaginal route. It is usually possible to develop the potential spaces lateral to the adhesions by blunt finger dissection under direct vision. Once adequate lateral spaces are created, the index finger should be swept medially to define the margin of the adhesions such as arising from previous Caesarean delivery scar. The finger is guided under direct vision to dissect the dense adhesions with more confidence and safety. The bladder could now be mobilized away to avert unexpected tearing or injury along the intrafascial hysterectomy. This transvaginal intervention has been found to minimize bladder injury during LAVH in patients with previous Caesarean section.

The other way to prevent bladder and ureteric injury during hysterectomy where the risk is high is by putting a stent, ureteric catheter, into the ureters to make them stand out during dissection and suturing. An indwelling catheter to rest the bladder when injury is suspected but not obvious is also advocated to promote good healing and recovery.

### **Minimizing the incidence of vault prolapse following hysterectomy**

The main thing to focus on is ways of improving the training of surgeon to sharpen their skills by training and retraining.

Tsai et al (2003) compared the results of a modified LAVH procedure, using light-endorsed transvaginal section using two ports, with those of TAH in a prospective, randomized, short-term study. They concluded that as compared with TAH and other modified LAVH procedures

reported previously, the present technique is easy to learn and timesaving with fewer complications. The time taken for their few earlier cases was much longer than the latter cases, re-echoing the need for more training and acquisition of experience and skills in minimizing complications.

Brill (2006) has advocated better training in residency programs.

Most of the complications of hysterectomy were found to be a function of the experience and skill of the surgeon, and the underlying pathology, and indication for the surgery as well as the sophistication of the equipment employed. Better training, good patient selection and improvement in available facility will minimize these injuries

## **Conclusion**

The centres with larger series, hence more experience are reporting fewer complication rates. Whereas people who have not acquired adequate skills of laparoscopic surgery tend to discredit it but those who have learnt the art are shifting away from open surgery.

The incidence of lower urinary tract injuries is more in the open surgery than laparoscopically assisted method although the morbidity is reduced if discovered intra-operatively and repaired.

The incidence of long term complications like vault prolapse is however similar in both situations.

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