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Original Article

Analysis of 300 total laparoscopic hysterectomy cases performed by the same surgeon

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ABSTRACT

Objective: This study aimed to evaluate the results of 300 cases of total laparoscopic hysterectomy (TLH) performed by the same surgeon. **Material and methods:** During the study period, a total of 300 TLH operations were performed between January 2017 and December 2018. Demographic characteristics, indications of hysterectomy, uterine weights, intra-operative and post-operative complications, duration of the operation, length of hospital stay, blood loss of patients, visual analogue scores and amount of analgesics needed were retrospectively evaluated. Complications were analyzed and compared with literature. **Results:** Parameters analyzed for 300 patients included in the study were as follows: mean age 47.82 ± 6.18 years, mean parity 3.4 ± 2.0 (0–11), BMI 27.41 ± 4.36 (kg/m²), mean uterine weight 367.67 ± 266.21 g (50–1600 g), mean operative time 89.07 ± 37.94 min (30–240 min), mean hospital stay 54.37 ± 21.95 h (24–168 h) and total complication rate 28 (9.3%). Conversion to open surgery was required in 29 (9.7%) patients. The level of technical difficulty and existence of prior abdominal surgery were associated with a higher risk of complications and conversions to laparotomy. **Conclusion:** Total laparoscopic hysterectomy is a well-designed surgical procedure for the management of benign gynecological conditions, and after adequate training, it seems to be a safe and effective procedure for patients. **Keywords:** uterine weight; complications; total laparoscopic hysterectomy

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Introduction

Among the most common gynecological surgeries for hysterectomy, laparoscopy became widespread in the presence of adequate equipment. Based on nationally representative data on patients undergoing laparoscopic hysterectomy for benign indications, total laparoscopic hysterectomy (TLH) was widely used between 2007 and 2012 [1]. As the technology has developed and surgical skills have improved, the nature and characteristics of laparoscopic procedures have also become more complex. Some drawbacks in gynecologic laparoscopy such as longer operation time and time-consuming learning curve may increase the frequency of severe complications [2]. Fortunately, the incidence of complications may decrease depending on the surgeon's experience. Laparoscopic surgery has become widely accepted by surgeons and patients as an effective technique to treat gynecologic pathologies; better recovery, shorter hospital stay and less post-operative pain and infection, low incidence of deep venous thrombosis, early return of bowel activity, less risk of adhesion formation and higher patient satisfaction are the main arguments in favour of this approach [1]. In cases where vaginal hysterectomy is not suitable according to the guideline of ACOG, it is emphasised that TLH should be done to avoid abdominal approach [2].

In fact, some studies have published results stating that TLH is superior to other approaches [3].

The goal of this paper is to present the results of a retrospective study of the complication rate after our total laparoscopic hysterectomies and compare with data in the literature.

Material and methods

This study was performed in the University of Health Science, Antalya Training and Research Hospital, Obstetrics and Gynaecology Department. This is a descriptive, retrospective study; ethics committee approval (2018-198) and informed consent were taken. The aim of this study is to retrospectively evaluate the complications of 300 patients who underwent total laparoscopic hysterectomy between January 2017 and December 2018 for benign reasons and various indications. All operations were performed by the same surgeon (BM). Demographic characteristics, hysterectomy indications, uterine weight, amount of bleeding, intra-operative and post-operative complications, duration of operation, hospital stay, pain scores and analgesic amount required after the operation were retrospectively evaluated. Inclusion criteria are as follows: age > 35 years, signed written informed consent, uterine benign disease and indication for laparoscopic hysterectomy.

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Exclusion criteria were malign disease, adnexal pathology with suspicion of malignancy and contraindications to laparoscopy. The operation time was calculated as the time between the first incision made to the umbilicus and the time of withdrawal of the main trocar. Uterine weights were measured by precision weighing in the operating room immediately after the operation. Blood loss was calculated based on the difference between pre-operative and post-operative hemoglobin values. The duration of hospitalization was calculated as the time between the operation hours of the patient and the hours of discharge from the hospital. Complications were classified as bowel, ureter and bladder damage, haemorrhage requiring transfusion, vaginal cuff dehiscence and infection, vaginal bleeding, trocar site infection, fever above 38.5 °C and vesicovaginal fistula. Before surgery, patients underwent routine examinations, including blood tests, gynaecological examination, gynecological ultrasound scanning and endometrial biopsy and smear. All patients consulted pre-operatively with anesthetic clinic. All patients underwent mechanical bowel cleaning before the operation, and prophylactic antibiotics were given simultaneously with the induction of anaesthesia. All laparoscopic procedures were performed under general anaesthesia and endotracheal intubation. An oral gastric tube was placed for gastric decompression. Foley catheter was inserted before the operation. As anti-thrombotic prophylaxis, early mobilisation in low-risk patients, 40 mg of enoxaparin and compression stockings were given 2 h before the operation in mid-risk patients and until discharge after the operation, and enoxaparin and compression stockings were applied in high-risk patients 2 h before the operation and post-operatively. Patients were subsequently examined 4 to 6 weeks after surgery. In this retrospective study, SPSS programme was used. Data were expressed as mean \pm standard deviation (SD), median (minimum–maximum) and percentage value.

TLH Surgical Technique

A vertical incision of 1 cm was performed in the umbilicus. With the patient in a supine position, the umbilicus was lifted up by hand, and the abdomen was entered with the 10 mm direct trocar from the umbilicus. Pneumoperitoneum was generated until the intra-abdominal pressure was 14 mmHg and entered from the lateral of supra-pubic and supra-pubic with 5 mm trocars. If the uterus was larger than 21 cm in any direction, the Lee Huang point was used for the trocar and the optic camera port. The patient was then placed in the Trendelenburg position. Monopolar, bipolar, advance bipolar electrocoagulation (Ligasure®Covidien Company, MA, USA vey a Enseal®, Ethicon Company, NJ, USA) and ultrasonic energy (Harmonic®) were used as energy. The RUMI uterine manipulator system (CooperSurgical Company, Connecticut, USA) was used as the uterine manipulator. All vascular pedicles were ligated and cut by using the ligature. Both round ligaments were cut. The anterior peritoneal fold of the broad ligament was cut from both sides to the bladder peritoneum, and the bladder peritoneum was separated from the uterine cervix by sharp blond dissection. The posterior leaf of the broad ligament peritoneum was cut laterally parallel to the infundibulopelvic ligament. After discontinuation of the uterine artery, the parametrical tissues around the cervix were separated. Circular vaginal incision was performed with the guidance of the uterine manipulator, and the uterus was removed from the abdomen through the vaginal cuff. Cuff suture was performed using suture or polyglactin 0-0 interrupted suture. TLH with bilateral salpingo-ovariectomy was suggested to menopausal patients, while prophylactic bilateral salpingectomy was offered to the other patients.

Results

In our study, we included 300 patients with benign indication, and the median gravida was 3 (1–9), parity was 2 (1–8), mean age was 47.82 \pm 6.18 years, BMI was 27.41 \pm 4.36 (kg/m²), mean uterine weight was 367.67 \pm 266.21 g (50–1600 g), mean operating time was 89.07 \pm 37.94 min (30–240 min) and mean duration of hospital stay was 54.37 \pm 21.95 h (24–168 h). A total of 87 patients (29%) had a history of previous operations, 37 (12.3%) of them had caesarean section, 21 patients (7%) had cholecystectomy, 14 patients (4.7%) had appendectomy, nine patients (3%)

Age (mean \pm sd)	47.82 \pm 6.18
Gravida (median)	3 (1-9)
BMI (kg/m ²) (mean \pm sd)	27.41 \pm 4.36
Postmenopausal status	245 (81.7 %)
Uterine weight (g) (mean \pm sd)	367.67 \pm 266.2
Operating time (min) (mean \pm sd)	89.07 \pm 37.94
Myoma size (cm) (mean \pm sd)	6.19 \pm 2.66
Duration of hospital stay (hours)	54.37 \pm 21.95
History of previous operations	87 (29 %)
Pre-operative hemoglobin levels (gr/dL)	11.79 \pm 1.50
Postoperative hemoglobin levels (gr/dL)	10.18 \pm 1.43
Decrease in hemoglobin levels (gr/dL)	1.62 \pm 0.94

had myomectomy and six patients had other operations (Table 1).

Table 1. Clinical and demographic data of the patients

Hysterectomy indications were noted in 154 (51.3%) patients with fibroids, 66 (22%) patients with abnormal uterine bleeding, 33 (11%) patients with ovarian cyst, 21 (7%) patients with endometrial hyperplasia, 17 (5.7%) patient with myoma and uterine bleeding, 3 (1%) patients with tubal cyst and 1 (0.3%) patient with endometrioma (Table 2).

Table 2. Indications for total laparoscopic hysterectomy

Myoma uteri	154 (51.3%)
Abnormal uterine bleeding	66 (22 %)
Ovarian cyst (Cystic lesions with complicated malignancy risk)	33 (11 %)
Endometrial hyperplasia	21 (7%)
Myoma uteri+Uterine bleeding	17 (5.7%)
Tubal cyst (Cystic lesions with complicated malignancy risk)	3 (1 %)
Prolapsus uteri (symptomatic advanced age + laparoscopic sling operation)	3 (1%)
Stress urinary incontinence (symptomatic advanced age + laparoscopic sling operation)	1 (0.3%)
Hydrosalpinx (cystic lesions with complicated malignancy risk)	1 (0.3%)
Endometrioma	1 (0.3%)

Mean fibroid size of patients operated with myoma indication was 6.19 ± 2.66 cm. Fifteen (5%) patients due to 7 cm fibroids, 10 (3.3%) patients due to 8 cm fibroids, 10 (3.3%) patients due to 9 cm fibroids, 12 (4%) patients due to 10 cm fibroids, 2 (0.7%) patients due to 12 cm fibroids and 7 (2.3%) patients due to 15 cm fibroids were operated. The amount of intra-operative bleeding was 139.48 ± 131.25 cc (10–650). The mean pre-operative and post-operative haemoglobin levels of the patients were 11.79 ± 1.50 gr/dL and 10.18 ± 1.43 gr/dL, respectively. The decrease in haemoglobin was noted to be 1.62 ± 0.94 . Further, 245 (81.7%) patients were menopausal, and bilateral salpingo-oophorectomy was also performed (Table 1). The mean operative time for laparoscopic operations was 89.07 ± 37.64 min (30–240). The total complication rate was 28 (9.3%). These were in order of frequency: seven patients with bladder injury, five patients with transfusion requiring haemorrhage, three patients with vesicovaginal fistula, three patients with post-operative vaginal cuff dehiscence, three patients with vaginal bleeding, two patients with ureteral injury (complications of ureters were related to thermal damage), two patients with wound infection, one patient with vaginal cuff infection, one patient with bowel serosal injury and one patient with post-operative fever (Table 3).

Table 3. Complication data of patients who underwent total laparoscopic hysterectomy

Ureter injury	2 (0.66 %)
Bladder injury	7 (2.33 %)
Bowel injury	1 (0.33 %)
Blood transfusion	5 (1.66 %)
Vaginal cuff bleeding	3 (1 %)
Fever	1 (0.33 %)
Trocar site infection	2 (0.66 %)
Cuff infection	1 (0.33 %)
Vaginal cuff dehiscence	3 (1 %)
Vesicovaginal fistula	3 (1 %)

Conversion to open surgery was required in 29 (9.7%) patients. Six cases were converted to laparotomy because of intra-abdominal adhesions, Surgery was required for six patients because of anatomical difficulties, six patients because of bladder injury, four patients because of uterine myoma size and two patients because of bleeding (Table 4).

Table 4. Reasons for conversion to laparotomy

Adhesions	6 (2%)
Anesthetic problems (Low saturation, High carbon dioxide)	2 (0.7 %)
Anatomic difficulties (obesity, patient position difficulty etc.)	6 (2 %)
Myoma size	4 (1.3 %)
Uterin size	3 (1 %)
Vascular injury	2 (0.7 %)
Bladder injury	6 (2 %)

The median visual analogue scores were 6 (1–10) in the post-operative period, 3 (0–10) in the post-operative day 1 and 1 (0–7) in the post-operative day 2. The median amounts of analgesics needed were as follows: twice (1–5) in post-operative period, twice (0–4) in post-operative day 1 and none (0–3) in post-operative day 2.

Discussion

TLH has many advantages such as shorter hospitalisation time, less intra-operative blood loss, less post-operative skin infection, less post-operative pain, short recovery time, quicker return to daily activities and avoidance from big abdominal scar. Generally, according to most cases in literature, myoma is the first reason for TLH [4]. In one study involving 257 cases of TLH, the most frequent indication for surgery was abnormal uterine bleeding, followed by uterine myoma [5]. In our study, the first reason for operation was uterine myoma (51.3%), and the second reason was abnormal uterine bleeding (22%), which was resistant to medical treatment.

When we look at the complication rates reported in the literature, TLH complications were found by Makinen et al. [6,7] in 19% of 2434 cases, HarkkiSiren et al. [8] in 2.5% of 5104 cases, Wattiez et al. [9] in 11.7% of 1647 cases and Donnez et al. [10] in 0.5% of 3190 cases. The study by Fuentez et al. [11] included 2888 laparoscopies, and the overall frequency of major complications was 1.93% and that of minor complications was 4.29%. The study by Terzi et al. [5] included 257 cases, and the total complication rate was 6.2%. The total complication rate in our study was 9.3%. Ng et al. indicated that the ureter injury occurred especially during the exposure of the uterine vessels and cardinal ligament to the excessive electrocoagulation [12]. According to the literature, the incidence of ureteral injury after TLH is reported to be approximately 0.5–1% [13,14]; this rate was 2% in our study. Lower urinary tract injuries are a serious potential complication of laparoscopic hysterectomy. The risk of such injuries may be as high as 3%, and most, but not all, are detected during intra-operative cystoscopy. The American Association of Gynaecologic Laparoscopists recommends the use of cystoscopy in TLH but does not recommend making cystoscopy an integral component of TLH because of the current level of evidence and limited data available [15]. The rate of detectable but unsuspected lower urinary tract injuries is enough to suggest that surgeons must consider cystoscopic evaluation following TLH as a routine procedure. The rate of bladder injuries is low and decreases depending on the surgeon's experience [13]. This complication has a low morbidity, especially if the diagnosis is performed at the time of surgery and the bladder is laparoscopically repaired [14]. In our study, bladder injury in six patients was laparotomically repaired owing to difficulty in anatomy. Urological consultation was requested based on intraoperative intra-abdominal pathological fluid flow, the status of the urinary catheter and urine output, as the obese and widespread adhesions secondary to endometrioma and previous surgery, especially in the pelvic region, made it difficult to reveal the bladder and ureter anatomy. and laparotomy was initiated together with urology, and there was no postop urological sequela in any of our patients. Post-operative follow-up in complex TLH cases is important because approximately >50% of ureter and bowel injuries are post-operatively recognised, and early diagnosis is crucial because mortality rates are higher [16]. In our case series, there was one bowel injury, and the serosa was repaired primary. One patient had fever higher than 38.5 °C, and two patients had a trocar site infection; they were treated with antibiotics for 5–7 days. In laparoscopic surgery

performed in patients with a previous history of abdominal surgery, the main cause of concern is injury to the abdomen. Sokol et al. informed that excessive BMI, uterine weight, previous surgery and related intra-abdominal adhesions increased the risk of return from laparoscopy to laparotomy [3].

In our series, mean weight of the uterine removed was 367 ± 266 g; this value is higher than the ones reported by other authors (Mereu 2018 [4], 327 ± 249 g; Kim 2015 [17], 259 ± 149 ; Wallwiener 2013 [18], 220 ± 205 ; Twinjstia 2012 [19], 217 ± 196 and Boosz 2011 [20], 243 ± 198). The level of technical difficulty and existence of prior abdominal surgery were associated with a higher risk of major complications and conversions to laparotomy. In the literature, the rates varied for conversion from laparoscopy to laparotomy, from 6.6% to 0.03% [17]. Conversion to laparotomy generally occurred more frequently in the early learning phase. Fuentes et al. documented that among the 2272 laparoscopies, 3.57% of the cases converted to laparotomy [11]. Donnez declared that previous caesarean operation and previous laparotomy were the main risk factors for conversion to laparotomy [10]. In our study within the 300 cases, 29 of them were converted to laparotomy with a failure rate of 9.7%. Six cases (2%) was converted to laparotomy because of adhesions, six cases (2%) due to difficulty in anatomy, six cases (2%) due to bladder injury, four cases (1.3%) due to the size of myoma, three cases (1%) due to the size of uterus, two cases (0.7%) due to vascular complication and two cases due anaesthesia recommendation. There were three women (1%) with vaginal vault dehiscence; one had sexual intercourse within three weeks of surgery, the other strained to defecate during an episode of constipation within 2 weeks of surgery and the third one had diabetes. These three women underwent secondary closure by the vaginal route. Post-operative coitus is one of the most important triggering events in terms of cuff dehiscence after TLH. The other risk factors are smoking, obesity, constipation, menopause and vaginal cuff infection. The average length of hospital stay in TLH is reported as 1.4 days to 4 days [21]. In our study, we found this time to be 54.37 ± 21.95 h on average. The high rate of complications observed in some studies is not the result of the technique but of the lack of experience of surgeons who are still in the learning curve. Studies state that each surgeon needed to have performed at least 25 of each procedure to minimise potential adverse effects as a result of the learning curve. From the series of Wattiez et al., the learning curve greatly exceeds 21 procedures [9]. Terzi et al. documented that the first 75 cases have an important value in the learning curve of TLH. A plateau in the learning curve for TLH was reached after this point. They can infer that there is a learning curve for TLH as confirmed by the decrease in operating time correlated to the gain in experience. On the other hand, TLH is not a complication-free surgery, and achievement of the learning curve does not exclude complications.

Study Limitation

This is a descriptive, retrospective study and conducted in one center. Because all procedures were performed by the same surgeon after an adequate learning curve, we believe that TLH has to be the technique of choice. Laparoscopic surgery was a safe procedure in the cases we analysed at our centre, but it is not without risks and serious complications. The surgeon should always be aware that TLH is not the one without any complications but should be the one who is able to recognise and manage these complications timely. Technical difficulty and prior abdominal surgery were associated with the appearance of complications. In light of this finding, individual patient evaluation should be done.

Conclusion

Total laparoscopic hysterectomy is a well-designed surgical procedure for the management of benign gynaecological conditions, and after adequate training, it seems to be a safe and effective procedure for patients.

Disclosure

Authors have no potential conflicts of interest to disclose.

References

- [1] Desai VB, Guo XM, Fan L, Wright JD, Xu X J. . Inpatient Laparoscopic Hysterectomy in the United States: Trends and Factors Associated With Approach Selection Minim Invasive Gynecol. 2017 Jan 1;24(1):151-158.e1. doi:10.1016/j.jmig.2016.08.830. Epub 2016 Sep 7.
- [2] Choosing the route of hysterectomy for benign disease. ACOG Committee Opinion No. 444. American College of Obstetricians and Gynecologists. Obstet Gynecol 2009;114:1156-8
- [3] Sokol AI, Chuang K, Milad MP. Risk factors for conversion to laparotomy during gynecologic laparoscopy. J Am Assoc Gynecol Laparosc 2003;10:469-73. doi:10.1016/S1074-3804(05)60146-6
- [4] Liliana Mereu, Roberta Carlin, Alice Pellegrini, Francesca Guasina, Valeria Berlanda and Saverio Tateo. Total laparoscopic hysterectomy for benign disease: outcomes and literature analysis Gynecological Surgery 2018;15:19 .doi:10.1186/s10397-018-1052-6
- [5] Terzi H, Biler A Demirtas O, Guler OT, Peker N, Kale A. Total laparoscopic hysterectomy: Analysis of the surgical learning curve in benign conditions. Int J Surg. 2016 Nov;35:51-57. doi: 10.1016/j.ijso.2016.09.010. Epub 2016 Sep 12
- [6] Mäkinen J, Brummer T, Jalkanen J, Heikkinen A, Fraser J, Tomás E et al. Ten years of progress--improved hysterectomy outcomes in Finland 1996-2006: a longitudinal observation study. BMJ Open. 2013 Oct 28;3(10):e003169. doi: 10.1136/bmjopen-2013-003169.
- [7] Jokinen E, Brummer T, Jalkanen J. Hysterectomies in Finland in 1990-2012: comparison of outcomes between trainees and specialists. Acta Obstet Gynecol Scand. 2015 Jul;94(7):701-707. doi: 10.1111/aogs.12654. Epub 2015 May 7.
- [8] Härkki-Siren P, Sjöberg J, Kurki T. Major complications of laparoscopy: a follow-up Finnish study. Obstet Gynecol. 1999 Jul;94(1):94-8. PMID: 10389725
- [9] Wattiez A, Soriano D, Cohen S B, Nervo P, Canis M, Botchorishvili R et al. The learning curve of total laparoscopic hysterectomy: comparative analysis of 1647 cases. J Am Assoc Gynecol Laparosc 2002;9: 339-45. doi: 10.1016/s1074-3804(05)60414-8
- [10] Donnez O(1), Donnez J. A series of 400 laparoscopic hysterectomies for benign disease: a single centre, single surgeon prospective study of complications confirming previous retrospective study. BJOG. 2010 May;117(6):752-5. doi: 10.1111/j.1471-0528.2010.02520.x. Epub 2010 Feb 22.
- [11] Fuentes MN, Rodríguez-Oliver A, Naveiro Rilo JC, Paredes AG, Aguilar Romero MT, Parra JF. JSLS. Complications of laparoscopic gynecologic surgery. 2014 Jul-Sep;18(3). pii: e2014.00058. doi: 10.4293/JSLS.2014.00058
- [12] Ng CC, Chern BS. Total laparoscopic hysterectomy: a 5-year experience. Arch of Gynecol Obstet 2007;276:613-8. doi:10.1007/s00404-007-0385-6 PMID:17508217
- [13] Lafay Pillet MC, Leonard F, Chopin N, Malaret JM, Borghese B, Herve F et al. Incidence and risk factors of bladder injuries during laparoscopic hysterectomy indicated

for benign uterine pathologies: a 14.5 years experience in a continuous series of 1501 procedures. *Hum Reprod*. 2009 Apr;24(4):842-9. doi: 10.1093/humrep/den467. Epub 2009 Jan 3.

[14] Léonard F, Fotso A, Borghese B, Chopin N, Foulot H, Chapron C. Ureteral complications from laparoscopic hysterectomy indicated for benign uterine pathologies: a 13-year experience in a continuous series of 1300 patients. *Hum Reprod*. 2007 Jul;22(7):2006-11. Epub 2007 May 8. doi: 10.1093/humrep/dem111

[15] AAGL Advancing Minimally Invasive Gynecology Worldwide. AAGL Practice Report: Practice guidelines for intraoperative cystoscopy in laparoscopic hysterectomy. *J Minim Invasive Gynecol* 2012; 19:407. doi: 10.1016/j.jmig.2012.05.001

[16] B Mülayim. Zor Total Laparoskopik Histerektomi, Nasıl Kolaylaştırılır? *Journal of Gynecology Obstetrics-Special Topics*, 2017 turkiyeklinikleri.com

[17] Kim SM, Park EK, Jeung IC, Kim CJ, Lee YS. Abdominal, multi-port and single-port total laparoscopic hysterectomy: eleven-year trends comparison of surgical outcomes complications of 936 cases. *Arch Gynecol Obstet* 291:1313-1319. doi: 10.1007/s00404-014-3576-y

[18] Wallwiener M, Taran FA, Rothmund R, Kasperkowiak A, Auwärter G, Ganz A .Laparoscopic supracervical hysterectomy (LSH) versus total laparoscopic hysterectomy (TLH): an implementation study in 1,952 patients with an analysis of risk factors for conversion to laparotomy and complications, and of procedure-specific re-operations. *Arch Gynecol Obstet* 288:1329-1339. doi: 10.1007/s00404-013-2921-x

[19] Twijnstra AR, Blikkendaal MD, van Zwet EW, van Kesteren PJ, de Kroon CD, Jansen FW Predictors of successful surgical outcome in laparoscopic hysterectomy. *Obstet Gynecol* 119:700-708. doi: 10.1097/AOG.0b013e31824b1966.

[20] Boosz A, Lermann J, Mehlhorn G, Loehberg C, Renner SP, Thiel FC. Comparison of re-operation rates and complication rates after total laparoscopic hysterectomy (TLH) and laparoscopy-assisted supracervical hysterectomy (LASH). *Eur J Obstet Gynecol Reprod Biol* 158:269-273. doi: 10.1016/j.ejogrb.2011.04.021.

[21] Cohen SL, Vitonis AF, Einarsson JI. JSLS. Updated hysterectomy surveillance and factors associated with minimally invasive hysterectomy. 2014 Jul-Sep;18(3). pii: e2014.00096. doi: 10.4293/JSLS.2014.000

