



Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Full length article

Total laparoscopic hysterectomy without uterine manipulator. A retrospective study of 1023 cases



Dimitrios Zygouris^{a,*}, Nektarios Chalvatzas^a, Antonios Gkoutzioulis^a, Georgios Anastasiou^b, Andreas Kavallaris^{a,b}

^a Department of Minimally Invasive Gynecology, St Luke's Hospital, Thessaloniki, Greece

^b Department of Gynecology and Obstetrics, Mother and Child Medical Center, Nikosia, Cyprus

ARTICLE INFO

Article history:

Received 5 May 2020

Received in revised form 6 August 2020

Accepted 21 August 2020

Available online xxx

Keywords:

Total laparoscopic hysterectomy

Uterine manipulator

Complication rate

Ureter injury

ABSTRACT

Objective: The aim of this study was to evaluate the feasibility and safety of a total laparoscopic hysterectomy (TLH) without the use of a uterine manipulator in women with benign indications for hysterectomy.

Study design: Between January 2011 and January 2020, 1023 patients underwent a TLH without the use of any type of uterine manipulator. The indications for hysterectomy were all benign conditions. The patients' details were obtained from the hospital medical records and the indications for hysterectomy, the surgical data and the intra and postoperative complications were evaluated. All operations were performed by the same surgical team.

Results: The median age was 48.2 years, while the BMI ranged from between 26.2 kg/m² and 47.8 kg/m². A small percentage of the women were menopausal (278, 27 %) and, following a detailed consultation with 563 (55 %) of the patients, we performed a TLH with adnexectomy. The mean operative time was 78 min (43–168 min), while the estimated blood loss was 59 mL (20–260 ml) and the mean uterine weight was 255 g (40–1510 g). There was no case of conversion to laparotomy. A blood transfusion was required for 14 patients (1.4 %), while there was one case of ureteral injury and three cases where the bladder was opened and fixed laparoscopically. The average hospital stay was 1.1 days, with only 38 patients staying for two or more days. In the long term, we had five cases (0.5 %) of vaginal vault dehiscence and one case of vaginal vault hematoma.

Conclusion: A TLH without the use of a uterine manipulator is a feasible and safe procedure. While it is perhaps a more demanding procedure for young doctors, when performed by well-trained and experienced laparoscopic surgeons, the procedure entails a short operative time and a low complications rate. As such, it should be the first step in the training of young doctors for performing laparoscopic radical hysterectomies.

© 2020 Elsevier B.V. All rights reserved.

Introduction

A hysterectomy is the most commonly performed gynaecological procedure and is one that can be carried out in abdominal, vaginal, laparoscopic or robotic terms with numerous variations [1]. The first laparoscopic approach was described some thirty years ago [2], and over the subsequent three decades, many changes and improvements have been made to the surgical procedure.

All minimally invasive techniques are generally described as incorporating the use of a uterine manipulator or another type of

vaginal tube [1,3–5], the aim of which is to optimise the surgical outcomes and minimise the intraoperative complications, especially in terms of the bladder and the ureter [1,6,7].

However, following the publication of the 'Laparoscopic Approach to Cervical Cancer (LACC) Trial' [8], many concerns were raised over the use of manipulators during the surgical procedure [9,10]. In fact, we first expressed our concerns some ten years ago, when we described in detail our surgical approach for a total laparoscopic hysterectomy (TLH) without the use of a uterine manipulator [11]. This approach was also adopted in terms of laparoscopic nerve-sparing radical hysterectomies [12] in research conducted following the publication of the LACC trial [8].

In both hospitals, the surgical teams perform TLH without the use of any type of uterine manipulator. However, an experienced and well-trained operative team is required to achieve satisfactory

* Corresponding author at: 16 Papazoglou Str, GR-45444, Ioannina, Greece.
E-mail address: dzygouris@hotmail.com (D. Zygouris).

surgical outcomes with low complications rates and short operating times. The aim of this study is to evaluate the feasibility and safety of this approach in women with benign indications for hysterectomy.

Materials and methods

Between January 2011 and January 2020, 1023 patients underwent a TLH without the use of a uterine manipulator or any other type of vaginal tube. All the data were collected and analysed retrospectively following the approval of the hospitals' ethical committees. Prior to the operation, an informed consent form was signed by all the patients following a detailed discussion of the surgical procedure. All operations were recorded using the ENDOBASE digital system (Olympus®, Hamburg, Germany).

The patients

The patients' details (age, weight, BMI, surgical history) were obtained from the hospital medical records and the indications for hysterectomy, the surgical data and the intra and postoperative complications were evaluated.

In all cases, the indications for hysterectomy were benign conditions and the exclusion criteria included the suspicion or diagnosis of a malignancy of the endometrium, cervix, or ovary. Moreover, any patients with POP stage III or IV were excluded as they were to subsequently undergo laparoscopic sacrocolpopexy.

All patients were evaluated in terms of a detailed clinical history, a physical examination, and a transvaginal ultrasound examination. One day before the scheduled operation, blood count, liver, and kidney tests were conducted, and the patients had nothing by mouth for eight hours prior to surgery, while no further bowel preparation was performed.

During the surgery, a single shot of prophylactic antibiotics (1.5 g cefuroxime IV) was administered, while eight hours after the surgery, antithrombotic prophylaxis was commenced until the day of discharge.

The patients were mobilised 6–10 h after surgery, and a follow-up blood count test was conducted after 24 h. We did not adopt the routine use of any type of drainage, while the transurethral catheter was removed when the patient was fully mobilised.

The estimated blood loss was calculated based on the difference in haemoglobin levels prior to and 24 h after surgery. The operating time was measured from the first umbilical incision to skin closure at the final incision site.

All operations were performed by the same surgical team (AK. and DZ.) following the previously described technique [11] without the use of any type of uterine manipulator.

Surgical technique

Our surgical technique without the use of any type of uterine manipulator was first described in 2010 [11], and all the current operations were performed using the same standardised approach.

Here, the patient is positioned in a modified lithotomy position before, while under general anaesthesia, four trocars are inserted as follows: one 10-mm trocar transumbilically for a 10-mm HD laparoscope, one 5-mm trocar suprapubically, and two 5-mm trocars lateral to the visualised inferior epigastric vessels. Then, during bladder dissection, the bladder is filled with 100 mL of NaCl and the catheter is then blocked. While this entails a more difficult laparoscopic handling of the bladder, it facilitates locating the dissection plane between the bladder and the cervix/vagina. At the same time, we are able to recognise immediately intraoperatively any bladder trauma.

Since no manipulator is used, before opening the vagina, the surgeon positioned on the patient's left inserts his left pointer finger into the vagina and, using laparoscopic scissors, finds the right plane and opens the anterior wall (Fig. 1). Following the initial opening in the vagina, the assistant grasps the vaginal wall and the operator removes his finger. Then, a wet and squeezed compress is inserted into the vagina for pneumoperitoneum maintenance. After a change of gloves, the procedure continues with grasping and pushing cephalad the cervix under direct vision, dislocating the cervix by cutting as close as possible to it. As such, we can preserve the maximum cervical length and avoid cutting any uterosacral ligaments, thus offering a better future suspension of the vaginal vault. In addition, the use of thermal energy during vaginal opening is minimised to avoid extensive tissue necrosis. Finally, the vagina is closed laparoscopically with O-Vicryl 30–40 mm round-bodied interrupted sutures via intracorporeal knotting.

Results

A total of 1023 patients met the inclusion criteria and underwent a TLH for benign indications. The preoperative demographic data, including age, BMI, and any history of previous laparotomy or caesarean section (CS) procedures, are shown in Table 1. The median age was 48.2 years, while the BMI ranged from between 26.2 kg/m² and 47.8 kg/m². A small number of the women were menopausal 278 (27 %), while following a detailed consultation with 563 (55 %) of the patients, we performed TLH with adnexectomy.

Table 2 presents the indications for hysterectomy. Our inclusion criteria included the presence of benign conditions only, while more than half of the patients (603, 59 %) presented symptomatic fibroids or adenomyosis. We also included a total of 102 (10 %)

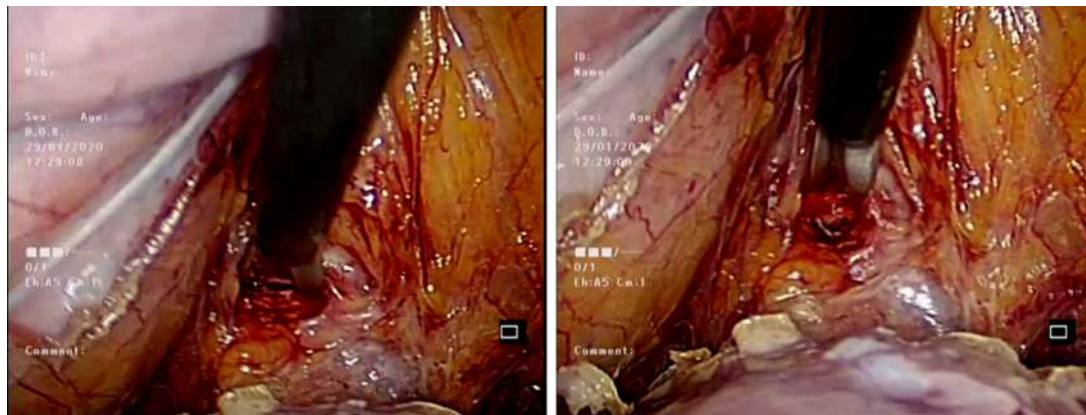


Fig. 1. Opening of the anterior vaginal wall.

Table 1
Patient's demographic data.

TLH	1023
TLH without adnexectomy	460 (45 %)
TLH with adnexectomy	563 (55 %)
Menopausal	278 (27 %)
Previous Laparotomy or CS	522 (51 %)
Age	48.2 (38–82) years
BMI	26.2 (20–47.8) kg / m ²

TLH: Total Laparoscopic Hysterectomy, CS: Caesarean Section, BMI: Body Mass Index.

Table 2
Indications for Hysterectomy.

	n = 1023
Fibroids / adenomyosis	603 (54 %)
Endometrial hyperplasia	133 (13 %)
Benign ovarian cyst	102 (10 %)
CIN	62 (6%)
Menorrhagia / DUB	123 (12 %)

CIN: Cervical Intraepithelial Neoplasia.

DUB: Dysfunctional Uterine Bleeding.

cases of benign ovarian cysts, with the patients undergoing TLH where the frozen section was normal.

The intraoperative data are shown in Table 3. The mean operative time was 78 min (43–168 min), which included 75 min (43–145 min) for the TLH without adnexectomy and 83 min (45–162 min) for the TLH with adnexectomy. The estimated blood loss was 59 mL (20–260 ml), while the mean uterine weight was 255 g (40–1510 g). There was no case of conversion to laparotomy.

Any complications were prospectively recorded at the time of surgery as well as on the first postoperative day, on postoperative days 8–10, at six weeks, six months, and one year after the surgery. A blood transfusion was required with 14 patients (1.4 %), while it should be noted that eight patients (57 %) had preoperative haemoglobin levels of < 10 g/dl. There was also one case of a ureteral injury (totally cut), which involved a large (10 cm in diameter) intraligamentary fibroid that was recognised during the operation and treated laparoscopically.

In three cases, the bladder was opened and subsequently repaired laparoscopically. Among these three cases, two involved severe endometriotic nodules and one a large cervical myoma. Meanwhile, the small bowel was superficially damaged in five cases due to tens adhesions and was subsequently laparoscopically sutured. A first-degree injury to the vaginal wall also occurred in 18 cases and the walls were, again, subsequently sutured – laparoscopically (upper-third of the vaginal wall) in seven cases and vaginally (mid- or lower-third) in the remaining 11 cases.

Table 4 summarises the postoperative data and the complications. The patients who experienced an uneventful postoperative

Table 3
Intraoperative outcomes (N = 1023).

Operating time (all cases) (range)	78 (43–168) minutes
Operating time TLH (range)	75 (43–145) minutes
Operating time TLH + adnexectomy (range)	83 (45–168) minutes
Blood loss (range)	59 (20–260) ml
Uterine weight (range)	255 (40 – 1.510) gr
Conversion to laparotomy	0
Women requiring blood transfusion	14 (1.4)
Ureteral injury	1
Bladder injury	3
Small bowel injury	5
Vaginal wall injury	18 (1.8 %)

TLH: Total Laparoscopic Hysterectomy.

Table 4
Postoperative complications (n = 1023).

Pyrexia, >37.5 °C	13 (1.3 %)
Urinary tract Infection	3 (0.3 %)
Deep vein thrombosis	0
Pulmonary embolism	0
Mean catheter duration (range)	1 (1–7) days
Patients with catheter ≥ 2 days	4 (0.4 %)
Hospital stay (range)	1.1 (1–8) days
Patients stayed ≥ 2 days	38
Wound infection	6 (0.6 %)
Vault hematoma	1 (0.1 %)
Vault dehiscence	5 (0.5 %)
Patients readmitted post – operatively	4 (0.4 %)

recovery were routinely discharged 24 h after the surgery, with the mean hospital stay 1.1 days and the maximum eight days. Only 38 patients (3.7 %) stayed for two or more days, with all these cases either at the patient's request (11 women) or due to postoperative pyrexia (13 women), delayed catheter removal (four women), or other medical conditions (10 women; blood pressure control, diabetes control, antibiotic allergy, chest discomfort, gastritis).

The long-term complications included five cases (0.5 %) of vaginal vault dehiscence and one case of vaginal vault hematoma. Conservative treatment was successfully administered in two of these cases, while four patients were re-admitted for surgical treatment (vaginally).

Discussion

To the best of our knowledge, this is the first study to involve more than 1000 cases of a TLH without the use of a uterine manipulator. While this is a retrospective study, the sample size was crucial to allowing us to reach conclusions on the feasibility and safety of this approach.

A uterine manipulator is routinely used in TLHs to lower the general complications rate and to prevent injuries, especially ureteral injuries. Our data indicates that a TLH without the use of a manipulator is a feasible and safe surgical procedure. The mean operative time with or without adnexectomy is satisfactory, with an average of less than 78 min, which is an improvement on other case studies involving the use of a manipulator [13,14]. In addition, there was only one occurrence of ureteral injury, which was the result of an intraligamentary fibroid and was diagnosed and repaired laparoscopically.

In fact, the existing literature indicates that the main reason for using a manipulator is to prevent ureter injury during uterine artery ligation that is in close proximity to the ureter [1,3,15]. In our experience, the required distance between the ureter and the uterine artery can be adequately achieved without the use of a manipulator, with the appropriate intra-abdominal use of the third laparoscopic instrument shown to be adequate. While many surgeons recommend peritoneal opening and the identification of the ureter's course to reduce the incidence of ureteral injury [1,15,16], we only followed this approach in cases of restored anatomy, mainly due to severe endometriosis, pelvic adhesions and pelvic masses. The routine opening of the peritoneum increases both the surgical time and the morbidity without offering any benefits in most cases. However, it is important to use appropriate laparoscopic instruments during the operation to effectively increase the distance between the ureter and the point of uterine artery ligation by laterally pushing the parametrium.

In this study, the rate of intraoperative vaginal trauma was 1.8 % (18 patients), which is higher than that recorded in other reports [3,17]. The vaginal injury occurred not during uterine manipulation, since there was no instrument in the vagina, but during the

vaginal removal of the uterus. Our approach was to minimise the use of a morcellator in cases of an enlarged uterus, while we had a detailed preoperative evaluation. This resulted in vaginal torsion in the enlarged uterus, especially among the elderly women with atrophic vaginas. However, all the cases involved a first-degree vaginal rupture that was treated immediately, either laparoscopically (upper-third vaginal mill) or vaginally (mid- and lower-third) without any notable morbidity.

All surgeries were performed by the same surgical team (AK and DZ) following standardised surgical steps. We must concede that a TLH without the use of a manipulator is a more demanding surgical procedure and that during the first operations performed by an inexperienced surgeon, special attention and guidance must be provided by the tutor to avoid high complication rates until the learning curve is met [4,5,18,19]. In addition, we strongly believe that this approach must be established as the first step in the training process for new doctors on performing a laparoscopic radical hysterectomy.

From our experience, we suggest that a new laparoscopic surgeon should perform around 30 surgeries under the surveillance and guidance of an experienced laparoscopic surgeon before operating without supervision. While, of course, the learning curve for performing TLHs without a uterine manipulator is likely to be longer [20,21], this should not discourage young surgeons from using this approach. The initial difficulties are acceptable, and the long-term benefits will be significant in oncological cases and in cases involving an enlarged uterus, where the manipulator is essentially useless. Nonetheless, a well-designed and structured training and tutorship programme is required for every trainer and trainee.

Another major concern with the laparoscopic approach relates to the significantly higher rate of vaginal cuff dehiscence when compared to other types of hysterectomy [22]. Here, we had five cases of vaginal dehiscence, one of which resulted from early sexual intercourse on postoperative day 10. Four of these patients required re-admission to undergo vaginal repair, while one was treated conservatively. We believe that the traditional use of a manipulator and the opening of the vaginal wall using monopolar energy [3] results in significantly greater thermal damage, tissue necrosis and delayed or poor healing of the vaginal vault. In our approach, we open the vaginal wall using scissors only without energy and limit the thermal use to bleeding sites only. Creating interrupted intra-corporeal knots in a well-vascularized tissue improves the healing and resulted in the reduction of our complication rates compared to those reported in other studies [3,17,23,24]. Nonetheless, a further evaluation of these findings through a randomized controlled study is required in view of confirming our results.

Another reported advantage of using a uterine manipulator relates to assisting the fornix presenter in accurately opening the vagina to minimise the removal. In our approach, we always make the initial vagina opening anteriorly using the surgeon's finger and the laparoscopic scissors to identify the precise cutting plane and to continue toward the posterior fornix under direct vision rather than blindly, as is the case when using a manipulator. We can then cut and preserve the maximal vaginal wall and the sacrouterine ligaments. Even in cases of deep endometriosis, we have been able to safely identify the correct incision plane without any concern for the bowel or the ureter, as we always cut between the cervix and the vagina under direct vision.

Out of the more than 1000 cases, we did not need to convert any to a laparotomy, even though we had many cases that involved an enlarged uterus. In fact, in such cases, the utility of the manipulator is limited and the outcomes largely depend on the surgeon's experience and ability [25,26].

The strengths of our study include the fact that we did not select our patients for the operation and that we included a number of obese patients (a BMI of up to 47.8 kg/m²). A high BMI is a known risk factor for morbidity in TLHs [27,28] and this factor thus enhanced the significance of our findings.

Conclusion

The major concern during a laparoscopic hysterectomy is ureteral injury and the use of a uterine manipulator is regarded as a precautionary measure. In our retrospective study involving 1023 TLHs without the use of a uterine manipulator, the operative time was acceptable, and the complications rate was low. All procedures were performed by the same surgical team, all of whom had undergone an adequate learning curve, which demonstrates that this approach is feasible and safe if performed by well-trained, experienced laparoscopic surgeons. Indeed, ureteral injury can be avoided without the use of a uterine manipulator when following basic surgical principles such as the traditional laparotomic approach. Of course, surgical experience and competence play a crucial role in minimising any potential morbidity and the initial longer learning curve should not discourage young surgeons, as the long-term benefit in surgical skills is significantly greater.

Author contribution

DZ: Project development, Responsible surgeon, Manuscript writing.

NC: Data collection, Data analysis, Manuscript review

AG: Data collection, Data analysis, Manuscript review

GA: Data collection, Data analysis, Manuscript review

AK: Project development, Responsible surgeon, Manuscript writing.

Ethics approval

Ethical approval was waived by the local Ethics Committee of the two Hospitals in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

Funding details

No funding was obtained for this study.

Declaration of Competing Interest

The authors report no declarations of interest.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Consent to publish

Patients signed informed consent regarding publishing their data and photographs.

References

- [1] Aarts JW, Nieboer TE, Johnson N, Tavender E, Garry R, Mol BW, et al. Surgical approach to hysterectomy for benign gynaecological disease. *Cochrane Database Syst Rev* 2015(8) CD003677.
- [2] Reich H. New techniques in advanced laparoscopic surgery. *Baillieres Clin Obstet Gynaecol* 1989;3(3):655–81.

- [3] 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;116(4):492–500.
- [4] Donnez O, 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;117(6):752–5.
- [5] Mueller A, Boosz A, Koch M, Jud S, Faschingbauer F, Schrauder M, et al. The Hohl instrument for optimizing total laparoscopic hysterectomy: results of more than 500 procedures in a university training center. *Arch Gynecol Obstet* 2012;285(1):123–7.
- [6] Reich H. Laparoscopic hysterectomy. *Surg Laparosc Endosc* 1992;2(1):85–8.
- [7] Karaman Y, Bingol B, Genenc Z. Prevention of complications in laparoscopic hysterectomy: experience with 1120 cases performed by a single surgeon. *J Minim Invasive Gynecol* 2007;14(1):78–84.
- [8] Ramirez PT, Frumovitz M, Pareja R, Lopez A, Vieira M, Ribeiro R, et al. Minimally invasive versus abdominal radical hysterectomy for cervical cancer. *N Engl J Med* 2018;379(20):1895–904.
- [9] Kohler C, Hertel H, Herrmann J, Marnitz S, Mallmann P, Favero G, et al. Laparoscopic radical hysterectomy with transvaginal closure of vaginal cuff - a multicenter analysis. *Int J Gynecol Cancer* 2019;29(5):845–50.
- [10] Kohler C, Schneider A, Marnitz S, Plaikner A. The basic principles of oncologic surgery during minimally invasive radical hysterectomy. *J Gynecol Oncol* 2020;31(1):e33.
- [11] Kavallaris A, Chalvatzas N, Kelling K, Bohlmann MK, Diedrich K, Hornemann A. Total laparoscopic hysterectomy without uterine manipulator: description of a new technique and its outcome. *Arch Gynecol Obstet* 2011;283(5):1053–7.
- [12] Kavallaris A, Hornemann A, Chalvatzas N, Luedders D, Diedrich K, Bohlmann MK. Laparoscopic nerve-sparing radical hysterectomy: description of the technique and patients' outcome. *Gynecol Oncol* 2010;119(2):198–201.
- [13] Johnson N, Barlow D, Lethaby A, Tavender E, Curr L, Garry R. Methods of hysterectomy: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2005;330(7506):1478.
- [14] Vree FE, Cohen SL, Chavan N, Einarsson JI. The impact of surgeon volume on perioperative outcomes in hysterectomy. *JSLs* 2014;18(2):174–81.
- [15] Elkington NM, Chou D. A review of total laparoscopic hysterectomy: role, techniques and complications. *Curr Opin Obstet Gynecol* 2006;18(4):380–4.
- [16] Lee Z, Kaplan J, Giusto L, Eun D. Prevention of iatrogenic ureteral injuries during robotic gynecologic surgery: a review. *Am J Obstet Gynecol* 2016;214(5):566–71.
- [17] Wattiez A, Soriano D, Cohen SB, 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(3):339–45.
- [18] Schollmeyer T, Elessawy M, Chastamuratidhs B, Alkatout I, Meinhold-Heerlein I, Mettler L, et al. Hysterectomy trends over a 9-year period in an endoscopic teaching center. *Int J Gynaecol Obstet* 2014;126(1):45–9.
- [19] 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;35:51–7.
- [20] Mavrova R, Radosa JC, Wagenpfeil G, Hamza A, Solomayer EF, Juhasz-Boss I. Learning curves for laparoscopic hysterectomy after implementation of minimally invasive surgery. *Int J Gynaecol Obstet* 2016;134(2):225–30.
- [21] Twijnstra AR, Blikkendaal MD, Kolkman W, Smeets MJ, Rhemrev JP, Jansen FW. Implementation of laparoscopic hysterectomy: maintenance of skills after a mentorship program. *Gynecol Obstet Invest* 2010;70(3):173–8.
- [22] 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;14(3):311–7.
- [23] Falcone T. Vaginal cuff dehiscence after hysterectomy. *Obstet Gynecol* 2012;120(3):511–2.
- [24] Mikhail E, Cain MA, Shah M, Solnik MJ, Sobolewski CJ, Hart S. Does laparoscopic hysterectomy increase the risk of vaginal cuff dehiscence? An analysis of outcomes from multiple academic centers and a review of the literature. *Surg Technol Int* 2015;27:157–62.
- [25] Maccio A, Madeddu C, Kotsonis P, Chiappe G, Lavra F, Collu I, et al. Feasibility and safety of total laparoscopic hysterectomy for huge uteri without the use of uterine manipulator: description of emblematic cases. *Gynecol Surg* 2018;15(1):6.
- [26] Mebes I, Diedrich K, Banz-Jansen C. Total laparoscopic hysterectomy without uterine manipulator at big uterus weight (>280 g). *Arch Gynecol Obstet* 2012;286(1):131–4.
- [27] Mueller A, Thiel F, Lermann J, Oppelt P, Beckmann MW, Renner SP. Feasibility and safety of total laparoscopic hysterectomy (TLH) using the Hohl instrument in nonobese and obese women. *J Obstet Gynaecol Res* 2010;36(1):159–64.
- [28] Guraslan H, Senturk MB, Dogan K, Guraslan B, Babaoglu B, Yasar L. Total laparoscopic hysterectomy in obese and morbidly obese women. *Gynecol Obstet Invest* 2015;79(3):184–8. eckmann MW, Renner SP. Feasibility and safety of total laparoscopic hysterectomy (TLH) using the Hohl instrument in nonobese and obese women. *The journal of obstetrics and gynaecology research*. 2010;36(1):159–64.
- [28] H. Guraslan. M.B. Senturk. K. Dogan. B. Guraslan. B. Babaoglu. L. Yasar. Total laparoscopic hysterectomy in obese and morbidly obese women. *Gynecol Obstet Invest* 79(3).