Laparoscopic coagulation of the uterine blood supply in laparoscopic-assisted vaginal hysterectomy is associated with less blood loss

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Summary

Background: Does laparoscopic coagulation of the uterine blood supply decrease blood loss compared with transvaginal ligature of the uterine vessels?

Methods: Intra- and postoperative data of 446 patients undergoing laparoscopic-assisted vaginal hysterectomy at the Department of Gynecology, University of Jena, between 1998 and 2001 were analysed. In 213 patients the uterine blood supply was transected laparoscopically at the origin of the uterine vessels (LAVH type II) and in 233 patients (LAVH type I) transvaginally.

Results: Patients in both groups were comparable with respect to median age, Quetelet index, and parity. The drop of hemoglobin between the preoperative day and postoperative day 3 was 0.8 mmol/l or 0.6 mmol/l for LAVH type I without or with BSO vs 0.3 mmol/l or 0.4 mmol/l for LAVH type II without or with BSO ($p = 0.001$), respectively. Median operative time was similar for both techniques: LAVH type I 136 min or with BSO 128 min vs LAVH type II 126 min or with BSO 131 min. The weight of the removed uteri was significantly lower in LAVH type I vs type II (220 vs 270 grams), but similar when LAVH was combined with BSO (160 vs 178 grams). The rate of intraoperative complications was 2.2% vs 0.9% between LAVH type I or II (n.s.), but 9% vs 3.3% for overall postoperative complications ($p = 0.01$).

Conclusions: Laparoscopic coagulation of the uterine blood supply at the origin of uterine vessels is a safe technique which minimizes blood loss in LAVH. In patients with a low preoperative hemoglobin value this technique is indicated.

Key words: Laparoscopic-assisted vaginal hysterectomy; Laparoscopic coagulation of the uterine artery; Morbidity; Blood loss.

Introduction

The role of laparoscopic or laparoscopic-assisted vaginal hysterectomy for treatment of benign and malignant diseases of the uterus has been well defined over the last years [2, 6, 8, 11, 14, 16, 18]. However, a wide variety of different techniques have been recommended. They vary with respect to the extension of the laparoscopic or vaginal part of the procedure [3, 10, 12-14, 18]. Since removal of the uterus can be done via the abdominal or transvaginal route, the most advantageous approach should be used. It is not clear if the laparoscopic or transvaginal route is better for the interruption of the uterine blood supply [1, 8, 19]. The laparoscopic approach has the disadvantage that transsection of the uterine vessels close to the uterus may be associated with considerable hemorrhage and injury to the ureter [20]. Additionally, a transvaginal approach may be anatomically difficult (narrow vagina) and is associated with retrograde bleeding, which is increased when morcellation is necessary [8, 10, 14, 18, 19]. Various techniques for the ligation of uterine vessels via laparoscopy have been described: bipolar coagulation, monopolar coagulation, ligation by extra- or endocorporal sutures, use of laser, ultrasound or Endo-GIA [3, 7, 10, 12, 13, 14, 15, 20]. In order to avoid problems with ureter and branching uterine vessels we recently have published a quick and safe technique to identify the origin of the uterine artery where the integrity of the ureter is preserved and where the uterine blood supply is coagulated and transsected under full vision of all vital structures avoiding complications [7]. We compared our peri- and postoperative results in patients treated for benign uterine disorders with this technique to a group of patients with identical disease where the uterine vessels were transected and ligated transvaginally.

Patients and Methods

History and clinical data of 446 patients that were treated between January 1998 and June 2001 in the Department of Gynecology at the Friedrich Schiller University, Jena were retrospectively recorded in a database and evaluated. Inclusion criterium was the presence of benign uterine or adnexal disease such as fibroids, adenomyosis uteri, adnexal mass, or lower abdominal pain with suspicion of adhesions. We differentiated patients where laparoscopic-assisted vaginal hysterectomy with transvaginal transection of the uterine vessels (LAVH type I) was performed with or without bilateral salpingo-oophorectomy (BSO) from patients where transection of the uterine vessels was done at the origin laparoscopically (LAVH type II) with or without BSO according to the classification of Munro *et al.* [11].

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Details of our technique of LAVH type II have been described previously [7]. LAVH type I was done in identical fashion with the only difference being that the uterine vessels were not exposed and transected laparoscopically. The laparoscopic part of all operations was recorded on video tape. This allowed us to discriminate between LAVH type I and type II and to measure duration of the lateral transection of the uterine vessels. The starting point for measurement was transection of the round ligament and coagulation of the uterine artery at its origin was the end point of the measurement. All patient data were registered retrospectively from patient charts. Parity, patient's weight and height, preoperative diagnosis, name of the surgeon, uterine weight, and histologic results were documented. The difference between preoperative hemoglobin and hemoglobin on the third postoperative day was calculated. Body mass index was calculated using the following formula: Quetalet-index = body weight/(body height)^2. Intra- and postoperative complications were recorded. Data were recorded in an Access database version 1997 (Microsoft, USA). Statistical evaluation was done by SPSS (Windows version 8.0, Microsoft, USA). Normal distribution was evaluated using the test for independent samples according to Kolmogorov-Smirnov. Comparison of mean values for the normal distributed parameters was done by the t-test. Parameters not normally distributed were evaluated by the Mann-Whitney test. With a mean value of 130 min operation duration, 99 patients per group were necessary to detect a difference of 20 min between the groups; 199 patients were necessary to detect a difference of 10% in an estimated mean complication rate of 10% with an alpha error of 5% and a power of 80%. Thirty-six patients per group were calculated to detect the difference of 0.5 mmol/l of hemoglobin between both groups with an estimated hemoglobin median value of 7.0 mmol/l.

Results

Two hundred and thirteen women were treated by laparoscopic hysterectomy with lateral coagulation of the uterine vessels (LAVH type II) of which 103 procedures were done without adnexae and 110 procedures included bilateral salpingo-oophorectomy (BSO). Two hundred and thirty-three women underwent laparoscopic-assisted vaginal hysterectomy with transsection of the uterine vessels via the transvaginal root (LAVH type I), of which 128 patients underwent exclusively LAVH and 105 patients additionally BSO (Figure 1).

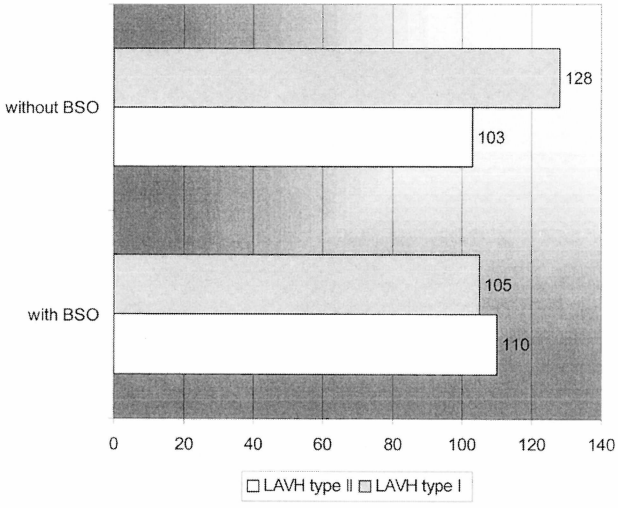

Figure 1. — Distribution of LAVH type in 446 patients undergoing LAVH with or without BSO.

Values for age, duration of operation, perioperative and postoperative complications and duration of transection of uterine vessels were distributed normally. BMI, parity, uterine weight and hemoglobin differences were not distributed normally.

The mean age of patients was 44 years (LAVH without BSO) and 52.9 years (LAVH with BSO), respectively. Distribution of age and Quetelet Index were similar for both groups (Table 1). Parity in patients with LAVH type I was 1.73, LAVH type I with BSO 1.65, LAVH type II 1.63 and LAVH type II with BSO 1.56. There was no difference in the operating time between LAVH type I and type II (Table 1). Additional time for coagulation and transsection of the uterine vessels was 8.2 (1.8-41.8) on the right side and 8.8 min (1.5-40.0) on the left side.

Comparison of weight of the uterine specimens showed a significant difference between patients undergoing LAVH type I and II, but no difference for LAVH types with BSO (Table 2).

Median drop of hemoglobin was significantly lower for LAVH type II compared to LAVH type I, independent of whether BSO was performed or not (Table 2).

Table 1. – *Distribution of age in years (mean, minimum, maximum) and distribution of BMI in kg/m^2 (median, 25th percentile, 75th percentile) and distribution of operating time in min (mean, minimum, maximum) in 446 patients undergoing LAVH with or without BSO.*

	LAVH type I without BSO (n = 128)	LAVH type II without BSO (n = 103)	p	LAVH type I with BSO (n = 105)	LAVH type II with BSO (n = 110)	p
Age (years)	44.0 (33.1-68.5)	43.9 (28.1-55.7)	n.s.	52.6 (30.4-87.1)	53.2 (31.7-91.5)	n.s.
Quetelet index (kg/m^2)	25.4 (22.7-29.0)	25.3 (22.1-27.3)	n.s.	26.6 (23.1-31.2)	25.7 (23.8-30.6)	n.s.
Operating time (min)	136 (44-401)	126.4 (52-346)	n.s.	128 (42-244)	130.8 (66-286)	n.s.

Table 2. – *Comparison of uterine weight in grams (median, 25th percentile, 75th percentile) and of hemoglobin drop in mmol/l (median, 25th percentile, 75th percentile) preoperative day and postoperative day 3 in 446 patients undergoing LAVH with or without BSO.*

	LAVH type I without BSO (n = 128)	LAVH type II without BSO (n = 103)	p	LAVH type I with BSO (n = 105)	LAVH type II with BSO (n = 110)	p
Uterine weight (grams)	220 (137-355)	270 (178-468)	0.006	160 (110-231)	178 (119-275)	n.s.
Hemoglobin drop (mmol/l)	0.8 (0.3-1.3)	0.3 (0.2-0.6)	< 0.0001	0.6 (0.3-1.1)	0.4 (0.2-0.7)	< 0.001

One patient undergoing LAVH type I received a blood transfusion. Histologic evaluation confirmed benign leiomyomas in 382 patients, adenomyosis in 35 patients, and other abnormalities in 19 patients. Histopathologic findings were distributed between patients undergoing LAVH type I and type II as follows: leiomyoma in 86% vs 85.5%, adenomyosis in 8.5% vs 7.0%, and other findings in 5.5% vs 7.5% (Table 3).

Table 3. – *Distribution of postoperative histological results in 446 patients undergoing LAVH with or without BSO.*

	LAVH type I without BSO (n = 128)	LAVH type I with BSO (n = 105)	LAVH type II without BSO (n = 103)	LAVH type II with BSO (n = 110)
Fibroids	116	84	98	84
Adenomyosis	9	11	3	12
Cervical intraepithelial neoplasia	2	1	1	3
Endometrial polyp	1	5		7
Endometrial hyperplasia			1	1
Cystadema/cystic corpus luteum		3		1
Endomyometritis		1		
Salpingitis				1
Teratoma				1

The intraoperative complication rate was 2.1% in LAVH type I vs 0.9% in LAVH type II (non-significant). With regard to postoperative complications there was a significant difference between the two LAVH types (Figure 2).

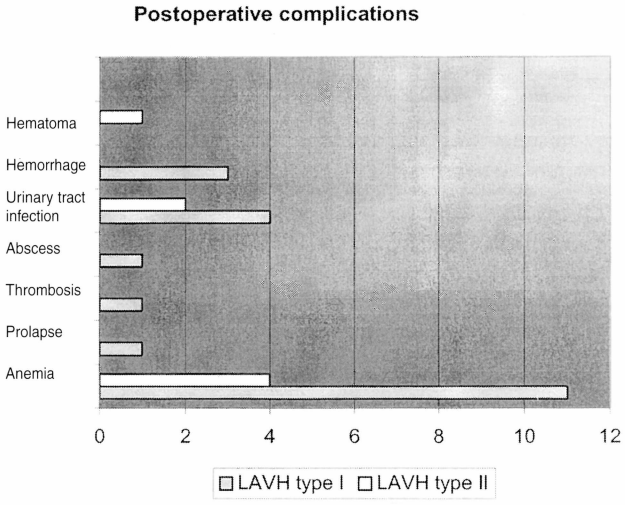

Figure 2. — Postoperative complications in 446 patients undergoing LAVH with or without BSO.

The overall postoperative complication rate in LAVH type II was 3.3% compared to 9.0% in LAVH type I (p = 0.01). Postoperative hospital stay was on average five days (4-7) for all patients. During the study period the duration of surgery decreased from 135 min in 1998 to 120 min in 2000. Duration for identification and transsection of the uterine vessels also decreased from ten to seven minutes. Residents took a mean of 134 min for an LAVH type II compared to 117 min for attendents and 119 min for senior registrars (p < 0.01), respectively. Extremely large uteri were usually operated by attendents or senior registrars (Figure 3). The percentage of operations performed by attendants, residents or senior registrars was comparable between LAVH type I and II with and without BSO.

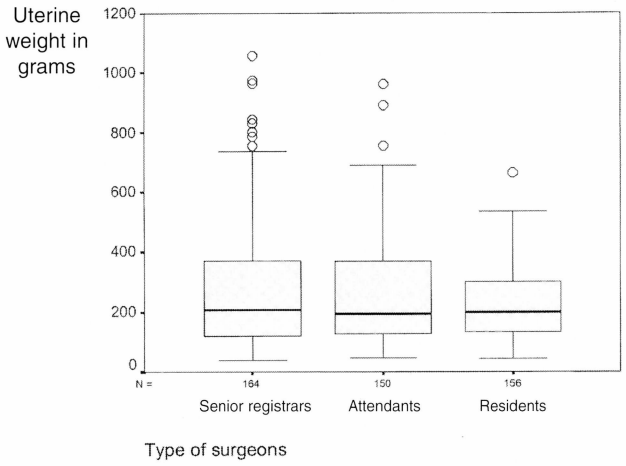

Figure 3. — Distribution of uterine weight according to experience of surgeons in 446 LAVH with or without BSO.

Discussion

Laparoscopic hysterectomy allows surgeons with limited experience in vaginal surgery to remove the uterus in the presence of pelvic adhesions, endometriosis, adnexal disease or enlargement of the uterus [4, 17]. However, vaginal hysterectomy is the procedure with the lowest intra- and postoperative complication rate and is the most cost effective [1, 9, 19]. Laparoscopic-assisted vaginal hysterectomy is the most costly hysterectomy technique especially when disposable instruments are used [13, 14, 20]. However, blood loss in the transvaginal approach may be diminished when the uterine blood supply has been stopped laparoscopically. Combining the advantages of an abdominal with vaginal access can therefore be advantageous. From our experience in laparoscopic-assisted radical hysterectomy we developed a quick approach for identification of the origin of the uterine artery which can be bipolarly coagulated and transected [7]. We integrated this technique into laparoscopic-assisted vaginal hysterectomy for the treatment of benign disorders. Like other authors, with this technique of LAVH we could reduce the rate of abdominal hysterectomies to a minimum [1, 3, 4, 16].

In the literature various techniques for LAVH have been described which differ in the method of interruption of the uterine blood supply (coagulation or suturing vaginally or laparoscopically), the use of disposable or non disposable instruments, weight of the uterus removed and thus blood loss, duration of operation, and intra- and

postoperative complications [3, 7, 10, 12-14, 18]. Patient's age and parity, and indications for LAVH are comparable to the studies reported in the literature. The median uterine weight of the patients reported in our studies are also comparable to data of others [9, 10, 11, 13, 15, 17, 18]. Total duration of surgery is also comparable to the literature [3, 5, 13, 14], though for our patients the position had to be changed two times during surgery and transection of the uterine vessels usually took 17 min for both sides. Laparoscopic transection of the uterine vessels leads to a decrease in the duration of operation as reported by Song *et al.* [15]. This finding was confirmed in our study and was due to less hemorrhage during the vaginal part which decreased the duration of transvaginal surgery. We also found a considerable decrease in duration of the operation over time as described by others previously [4, 5, 9, 12]. Laparoscopic coagulation of the uterine artery close to the uterus leads to less blood loss [15]. We confirmed this finding using our technique of lateral transsection where a significant reduction in the hemoglobin difference between the preoperative and postoperative day 3 was observed. The total complication rate of LAVH was 13.2% in a previous study [9]. Severe complications occurred in 5.6% of 106 patients such as bowel injury (0.9%), vesico-vaginal fistula (0.9%), uretero-vaginal fistula (0.9), lesion of the ureter leading to obstruction (0.9%), and bladder injury (1.9%). In another study the total complication rate in LAVH was 11.1% [12]. The majority of complications were of a minor nature such as urinary tract infections, persistent fever, hematoma of the abdominal wall and pneumonia. Two injuries of the small bowel, a bladder injury and injury to the epigastric vessels were also described [12]. Others report bladder lesions, fistulas, and conversion to laparotomy [13, 14]. Our total complication rate was 7.8% with a perioperative complication rate of 1.6%, which was even lower in LAVH Type II (0.9%). This shows that our technique is safe and compares favorably to the reported rates in the literature. Duration of hospital stay was five days which is above the international standard, but is due to the reimbursement system in Germany [3, 12, 13, 14, 18]. From a medical point of view discharge on the second postoperative day would have been possible in the majority of patients.

In comparison with the literature we could show that our technique of LAVH with selective transection of the uterine artery at its origin proves to be advantageous especially with respect to intra- and postoperative complications and blood loss. Therefore, especially in patients with anemia or patients with large uteri where morcellation has to be done transvaginally this technique of selective coagulation and transection of the uterine blood supply by an approach through the pararectal fossa seems a valid alternative to conventional techniques.

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