European Journal of Obstetrics & Gynecology and Reproductive Biology 240 (2019) 347–350

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

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

Is post hysterectomy adnexal torsion a complication of laparoscopic approach? A retrospective cohort study

Eyal Ravid, Zvi Klein, Nissim Arbib, Merav Sharvit, Dana Josephy, Ron Schonman*

Department of Obstetrics and Gynecology, Meir Medical Centre, Kfar Saba, Israel[1]

ARTICLE INFO

Article history:
Received 21 April 2019
Received in revised form 29 June 2019
Accepted 20 July 2019

Keywords:
Hysterectomy
Adnexal torsion
Ovarian fixation

ABSTRACT

Objective: To investigate the correlation between the hysterectomy's surgical approach and post hysterectomy adnexal torsion.
Study design: Retrospective cohort study of patients with diagnosed adnexal torsion after hysterectomy (abdominal, vaginal and laparoscopic approaches) in a tertiary care medical center from 2007 through 2017 was done. Demographic data, clinical symptoms, type of previous hysterectomy, surgical findings and treatment were retrospectively reviewed from patient records. To calculate the risk of post-hysterectomy adnexal torsion (PHAH) and evaluate its association with type of hysterectomy, we used a national hysterectomy registry that included all hysterectomy done in region of our medical centre.
Results: Eight cases of AT after hysterectomy were operated during the study period, seven after laparoscopic and one after vaginal hysterectomy. Torsion occurred a mean of 27.25 ± 16.65 months (range 3–60 months) after surgery. Mean patient age at AT was 45 ± 4.6 years. All patients presented with abdominal pain, five (62.5%) had nausea and vomiting and one had diarrhoea. Laparoscopic findings revealed ovarian torsion in 5 cases, fallopian tube torsion in one and torsion of the adnexa in two cases. The national hysterectomy registry in the geographic region of our hospital summarized 705 patients with laparoscopic hysterectomy with adnexal preservation. The prevalence of post-laparoscopic hysterectomy adnexal torsion was significant high than after other types of hysterectomy ($P < 0.05$).
Conclusion: PHAT occurs more frequently after laparoscopic hysterectomy then after other approaches. Measures for prevention of adnexal torsion should be considered during the primary surgery.

Introduction

Adnexal torsion is one of the most common emergencies in gynecology. Post-hysterectomy adnexal torsion (PHAT) is considered a rare event and its incidence after vaginal, abdominal or laparoscopic hysterectomy is not established. However, preliminary reports suggest that laparoscopic hysterectomy (LH) could be a risk factor for post-operative adnexal torsion (AT). The connection between adnexal torsion and laparoscopic hysterectomy has been proposed previously by Mashiach et al. [1].

Previous studies suggested that laparoscopic surgeries, including LH result in decreased adhesion formation [2], as they involve fewer factors associated with adhesion formation, such as peritoneal trauma, excessive tissue manipulation [3], contact with foreign bodies, haemorrhage, infections [4,5] and inflammatory response [6]. Humidity is better preserved during laparoscopy, and the patients mobilize sooner and have less bowel dysfunction [7]. While less post-operative adhesion is formed the remain adnexa will be more mobile in the pelvic. These factors might explain PHAT. In addition, LH differs from the other surgical approaches as it leaves the adnexa completely free, with no sutures in the utero-ovarian ligament and the round ligament, which thus lack adhesions to the peritoneum.

This study investigated the relation between adnexal torsion and laparoscopic hysterectomy. We hypothesized that laparoscopic hysterectomy carries a higher risk for postoperative adnexal torsion than do other surgical approaches for hysterectomy. Such a connection may have important practical meaning, such as directed follow-up, greater attention to relevant symptoms and even modification to operative techniques and accompanying procedures.

Materials and methods

A retrospective cohort study was conducted from 2007 through 2017. The study population included all patients admitted to the

* Corresponding author at: Meir Medical Center, 59 Tchernichovsky, Kfar Saba, 44282, Israel.
E-mail address: ronschonman@gmail.com (R. Schonman).
[1] Affiliated with the Sackler School of Medicine, Tel Aviv University, Israel.

https://doi.org/10.1016/j.ejogrb.2019.07.029
0301-2115/

gynecology department during the study period, with adnexal torsion after hysterectomy without adnexectomy. The study was approved by the Meir Medical Centre Institutional Review Board (Approval No. 0133-18-MMC). Informed consent was not required, as the data was deidentified. There was no patient or public involvement in the study.

The inclusion criterion was proven adnexal torsion by laparoscopy in patients after hysterectomy. Demographic, clinical, surgical data and surgical approach (i.e. abdominal, laparoscopic or vaginal hysterectomy) were obtained from the electronic medical records.

The standard technique for laparoscopic total hysterectomy starts with insertion of uterine manipulator and Foley catheter. Then, a 10 mm laparoscopy trocar is inserted in the umbilical area and 3 trocars of 5 mm in the lower abdomen. Bipolar energy with cold scissors is used for the hysterectomy. In the end of the hysterectomy, circular colpotomy was done and removal of the uterus through the vagina. The vaginal cuff is closed with extracorporeal Vicryl 1/0 sutures. Ovaries are left connected to the infundibulo-pelvic ligament only. Since 2014, we routinely perform bilateral salpingectomy during laparoscopic and abdominal hysterectomies.

In order to calculate the risk of PHAT and to evaluate its association with the surgical technique, and since not all patients had their hysterectomy at our centre, we obtained data from the national registry of the Israeli Ministry of Health. The national registry include all patients that had hysterectomy according to geographic regions. Since our hospital is a tertiary centre that all emergent cases in this geographic area are referred to, e.g. adnexal torsion, and in order to not overestimate the prevalence of PHAT, we could compare the number of PHAT to the number of hysterectomies done in all our region by the national registry during the period of the study. This data was stratified by the surgical approach and was compared to the results of our study group.

Data was analysed using Microsoft Excel 2010 (Microsoft Corp., Redmond, WA) and Statistical Analysis System software program (Statistical Analysis System, SAS Institute Inc. Cary, NC, USA), version 9.4. Continuous variables are expressed as mean ± standard deviation (SD) and categorical variables as number and percentage. Independent samples *t*-test and the $\chi 2$ test were used to compare continuous and categorical differences, respectively. A p-value of $\leq .05$ was considered statistically significant.

Results

Eight cases of adnexal torsion after hysterectomy were operated during the study period in seven patients. One patient had two separate events of AT. In seven cases LH was preformed and in one case vaginal hysterectomy was performed. None of them had abdominal hysterectomy. Demographic and clinical characteristics, including hysterectomy details are summarized in Table 1.

The mean time between hysterectomy and adnexal torsion was 27.3 ± 16.7 months (range 3–60 months). The mean age of the patients at the time of torsion was 45 ± 4.6 years. All cases presented with abdominal pain, 5 (62.5%) complained of nausea and/or vomiting and one also had diarrhoea. Sonographic findings demonstrated ovarian oedema in 4 (50%) cases, hydrosalpinx in 3 (37.5%), functional cyst in 2 (25%) and "Whirlpool" sign (rotation of the infandibulo-pelvic ligament) in 2 (25%) cases.

Laparoscopic findings of the study group revealed ovarian torsion (OT) in 5 (62.5%) patients, fallopian tube torsion in 1 (12.5%) and torsion of the adnexa in two (25%) patients. Torsion was on the left side in 2 (25%) cases and on the right side in 6 (75%). There was a mean of 3.06 ± 1.08 (range 1.5–5) twists of the infandibulo-pelvic ligament. In two cases, unilateral oophorectomy was performed, due to necrotic appearance without recovery on de-torsion. In one case, bilateral salpingectomy was performed because the fallopian tube was necrotic and a hydrosalpinx was recognized in the contralateral adnexa. In two (25%) cases, bilateral salpingo-oophorectomy was performed due to patients' ages (48 and 51 years). In three (37.5%) cases, the adnexa was detorsed and the ovary was fixed to the round ligament stump and the peritoneum on the ipsilateral side.

There were no intraoperative complications during the eight surgeries. One patient underwent reoperation due to surgical wound bleeding and discharged after 10 days. Pathologic examination revealed hydrosalpinx in one case and no abnormal findings except for necrotic changes compatible with AT in any of the other cases. No malignancies were found.

Table 1
Basic characteristics of post-hysterectomy adnexal torsion cases.

Case	Age	Gravidity	Parity	Indication and type hysterectomy	Additional procedures at hysterectomy	General medical history	Gynecological history
1[a]	44	4	3	LH Adenomyosis	None		Endometriosis S/P Diagnostic laparoscopy
2[a]	45	4	3	LH Adenomyosis	None		
3	34	2	2	LH Adenomyosis	Salpingectomy	S/P TIA, S/P DVT & PE Turner syndrome, Homozygote Factor 2 def, PFO, Hypothyroidism	S/P Diagnostic laparoscopy
4	45	2	2	LH Fibroid Uterus	Salpingectomy		None
5	48	1	1	VH Uterine prolapse	Colporrhaphy, TVT		None
6	51	2	2	VH Fibroid Uterus	None		
7	47	3	3	LH Adenomyosis	None	Hypothyroidism Obesity S/P Bariatric surgery S/P Appendectomy	S/P Cesarean sections*3
8	46	2	2	LH Fibroid Uterus	Salpingectomy, TVT	HTN, Dyslipidemia Autoimmune hepatitis	None

LH – Laparoscopic hysterectomy; Vaginal hysterectomy; S/P- status post; TIA – Transient Ischemic Attack; DVT – Deep Vein Thrombosis; PE – Pulmonary Embolism; PFO – Patent Foramen Ovalle; TVT – Tension free Vaginal Tape.

[a] Cases #1 and #2 occurred in the same patient.

Table 2
Post-hysterectomy adnexal torsion rate, stratified by hysterectomy surgical approach[a].

	Abdominal	Vaginal	Laparoscopic	Total	P-value
Hysterectomy	3659	1725	1105	6532	
One or both ovaries left in situ	2545	1660	705	4947	
Torsion cases (%)	0 (0)	1 (0.06)	7 (1)	8 (0.16)	<0.05

[a] Regional hysterectomy rates, 2007–2016 (data from the Israeli Ministry of Health database).

Comparison between our results and the data from the national hysterectomy registry is summarized in Table 2. Between 2007–2016 there were a total of 6532 hysterectomies in the region, most of which were performed in our centre. Of these, 1105 were LH and in 705 one or both ovaries were left intact. Women who underwent LH were significantly more likely to experience AT compared to the other types of hysterectomy ($p < 0.05$). The prevalence of PHAT (all types) in the study population was 0.16%, while AT after LH was calculated as 1%.

Comments

This study summarizes our experience in PHAT from 2007 through 2016. The study data demonstrates that LH has significantly higher risk for PHAT then do abdominal or vaginal approaches.

Previous literature on PHAT is very limited. Mashiach el al. described 7 cases of adnexal torsion after LH, in 2004 [1]. Other publications consist of case reports alone. Singla et al. described a rare case of post vaginal hysterectomy AT [8]. Elhjouji et al. published the first case of AT post-abdominal hysterectomy [9]. Recently, Ciebiera et al. presented a case report on AT post-laparoscopic supra-cervical hysterectomy that mimicked ovarian carcinoma [10]. In the current study, we compared the different surgical approaches for hysterectomy. We found that PHAT is a complication that occurs significantly more often after laparoscopic hysterectomy.

According to our findings, the prevalence of this complication is 1%. However, it is important to note that due to the emergent nature of torsion, it is possible that some patients were diagnosed and treated elsewhere. There is also the possibility, although rare, that an asymptomatic torsion occurred, without diagnosis. This prevalence correlates with that of Mashiach et al. [1] who reported 0.79% incidence of PHAT.

Hysterectomy was not previously considered a risk factor for AT. A systematic review by Asfour et al. [11] evaluated the risk of AT under different clinical conditions, including with and without hysterectomy. Their conclusion highlights that hysterectomy is not a risk factor for AT as compared to patients without hysterectomy. However, this systematic review did not include a comparison between different types of hysterectomy and risk for AT.

Mashiach et al. [1] described three factors that theoretically may contribute to the development of AT post LH. These include the surgical technique that allows greater mobility to the ovary, less ovarian trauma and less adhesion formation after laparoscopy.

Several early studies implied that laparoscopy results in few adhesions postoperatively. In a systematic review, Gunn et al. [2] evaluated 15 clinical and experimental studies that compared laparoscopy to laparotomy. All clinical studies and most experimental ones showed the advantage of laparoscopy in reducing adhesion formation. Several factors contribute to reduced adhesion formation in laparoscopy, including less need for tissue manipulation [3] and preserving high humidity in the abdominal cavity [12].

The surgical technique might influence the risk for AT after LH. It may influence adhesion formation and ovarian mobility, as previously mentioned. The main difference between abdominal and laparoscopic hysterectomy is the use of sutures for haemostasis and ligation in abdominal and vaginal surgeries. Experimental studies [13] demonstrated more adhesion formation during ovarian surgery in an animal model when sutures were used compared to electrosurgery alone. Furthermore, bacteriological studies demonstrated that polyglycolic acid suture (Vicryl; Ethicon, Inc) is more bacterial adherent material and thus might be prone to wound infection [14]. This difference might give another explanation of higher prevalence of AT after LH.

After LH the ovaries are supported solely on the infandibulopelvic ligament, which allows the ovary to rotate more easily around it. This concern become more important in 2014, when we instituted a policy of concomitant prophylactic salpingectomy during hysterectomy in premenopausal women. In these cases, it seems that the remaining ovary has an even higher likelihood of rotating around its axis. However, it is still early to evaluate the impact of concomitant salpingectomy on the risk for PHAT and more studies should be done.

To date, no guideline has recommended ovariopexy during LH. Obviously, ovariopexy would not prevent all cases of PHAT. But we believe that during LH, the surgeon should evaluate the mobility of the ovary and consider the need for concomitant ovariopexy. This can be accomplished either by fixing the ovary to the ipsilateral remnant of the round ligament or by suturing the ovary to the surrounding peritoneum. We would consider ovarian fixation mainly after hysterectomy in premenopausal patients, since ovaries still hormonally viable and ovaries would be larger than during menopause.

The strength of this study is that our medical facility serves as a centre for all emergencies in the geographical district. However, data on hysterectomies were collected from a national database, based on the geographic distribution of the population and it allowed us to get more precise prevalence of this rare condition in our geographic area.

This study has several weaknesses. It is retrospective. A prospective study would be very difficult to accomplish and would need a very long time to accrue patients because PHAT is very rare. It would be even more difficult to evaluate surgical prevention techniques.

In conclusion, LH has higher risk for complication of PHAT in comparison to other surgical approaches. The laparoscopic surgical technique with less adhesion formation and greater ovarian mobility is likely the cause of this complication mainly in premenopausal patients. Ovariopexy may be considered during LH to reduce the risk for AT in those patients.

Funding

None.

Declaration of Competing Interest

All authors declare that there are no conflicts of interest.

Acknowledgements

None.

References

[1] Mashiach R, Canis M, Jardon K, Mage G, Pouly JL, Wattiez A. Adnexal torsion after laparoscopic hysterectomy: description of seven cases. J Am Assoc Gynecol Laparosc 2004;11:336–9.

[2] Gutt CN, Oniu T, Schemmer P, Mehrabi A, Büchler MW. Fewer adhesions induced by laparoscopic surgery? Surg Endosc Other Interv Tech 2004;18:898–906.

[3] Schonman R, Corona R, Bastidas A, De Cicco C, Koninckx PR. Effect of upper abdomen tissue manipulation on adhesion formation between injured areas in a laparoscopic mouse model. J Minim Invasive Gynecol 2009;16:307–12.

[4] Varela JE, Wilson SE, Nguyen NT. Laparoscopic surgery significantly reduces surgical-site infections compared with open surgery. Surg Endosc Other Interv Tech 2010;24:270–6.

[5] Sanabria A, Vega V, Dominguez LC, Espitia E, Serna A, Osorio C. The evolution of laparoscopy in abdominal surgery: a meta-analysis of the effect on infectious outcomes. Minim Invasive Ther Allied Technol 2014;23:74–86.

[6] Sammour T, Kahokehr A, Chan S, Booth RJ, Hill AG. The humoral response after laparoscopic versus open colorectal surgery: a meta-analysis. J Surg Res 2010;164:28–37.

[7] Kavic SM, Kavic SM. Adhesions and adhesiolysis: the role of laparoscopy. JSLS 2002;6:99–109.

[8] Singla A. An unusual case of torsion hydrosalpinx after hysterectomy: a case report. Aust New Zeal J Obstet Gynaecol 2007;47:256–7.

[9] Elhjouji A, Zahdi O, Baba H, Belhamidi S, Bounaim A, Aitali A, et al. Adnexal torsion after abdominal hysterectomy: a first observation. Pan Afr Med J 2015;7(22):9.

[10] Ciebiera M, Baran A, Słabuszewska-Jóźwiak A, Jakiel G. Case report of ovarian torsion mimicking ovarian cancer as an uncommon late complication of laparoscopic supracervical hysterectomy. Prz Menopauzalny 2016;5:223–6.

[11] Asfour V, Varma R, Menon P. Clinical risk factors for ovarian torsion. J Obstet Gynaecol 2015;35:721–5.

[12] Binda MM, Molinas CR, Hansen P, Koninckx PR. Effect of desiccation and temperature during laparoscopy on adhesion formation in mice. Fertil Steril 2006;86:166–75.

[13] Wiskind AK, Toledo AA, Dudley AG, Zusmanis K. Adhesion formation after ovarian wound repair in New Zealand white rabbits: a comparison of ovarian microsurgical closure with ovarian nonclosure. Am J Obstet Gynecol 1990;163:1674–8.

[14] Masini BD, Stinner DJ, Waterman SM, Wenke JC. Bacterial adherence to suture materials. J Surg Educ 2011;68:101–4.