Int Surg 2019;**104:**255–261
DOI: 10.9738/INTSURG-D-15-00072.1

Laparoscopic "Core-Pulling" Salpingectomy: A Novel and Minimally Invasive Modified Salpingectomy

Zhan-Fei Li[1], Jing-He Lang[1], Hui-Bing Liu[2], Quan-Ling Feng[3]

[1]*Department of Obstetrics and Gynecology, Peking Union Medical College Hospital, Peking City, Republic of China*

[2]*Department of Ultrasonography and* [3]*Department of Gynecology, Third Affiliated Hospital, Zhengzhou University, Zhengzhou, People's Republic of China*

The present study aimed to evaluate the feasibility, safety, and efficacy of laparoscopic "core-pulling" salpingectomy for tubal pregnancy. Laparoscopic core-pulling salpingectomy is a novel and minimally invasive salpingectomy variant, whose technical details are described here. In this retrospective study, 154 patients with tubal pregnancy underwent laparoscopic salpingectomy. In total, 76 and 78 patients underwent laparoscopic core-pulling salpingectomy (LCPS) and conventional multiport laparoscopic salpingectomy (MPLS), respectively. Then, clinical characteristics, intraoperative findings, and operative outcomes were compared between the 2 groups. Surgery was successful in all 154 patients, and no significant differences were found between the LCPS and MPLS groups in clinical characteristics, intraoperative findings, and operative outcomes. These findings indicated that LCPS is feasible and constitute a practical alternative to conventional salpingectomy.

Key words: Laparoscopic salpingectomy – Laparoscopic core-pulling salpingectomy – Tubal diseases

Corresponding author: Jing-He Lang, PhD, Department of Obstetrics and Gynecology, Peking Union Medical College Hospital, Dongdan North Street, Shuaifuyuan No.1, Dongcheng District, Peking City, Republic of China, 100005.
Tel.: +86 010 65296201; Fax: +86 010 65126212; E-mail: langjhpumch@163.com, langjh@hotmail.com

In recent decades, great efforts have been devoted to the improvement of salpingectomy. Indeed, various salpingectomy methods, including abdominal salpingectomy, vaginal salpingectomy, conventional multiport laparoscopic salpingectomy (MPLS), and single-port laparoscopic salpingectomy, have been developed.[1–4] Minimally invasive salpingectomy can serve as a reliable therapeutic method that reduces the unwanted adverse effects, especially on fallopian tube's blood vessels and ovarian function. Generally, minimally invasive surgery refers to minimizing the surgical impacts on body structure and function to the lowest level. Currently, minimally invasive surgery intends for the least disturbance to the target organ and surrounding tissues, rather than being limited to the patient's abdominal wall.

With regard to salpingectomy, the minimally invasive procedure should include 2 aspects: (1) it induces less invasion to the abdominal wall through which the surgery is performed, and (2) it reduces the effects on the mesosalpinx, the blood vessel system of the fallopian tube, and the ovarian function. A number of methods have been used in salpingectomy to minimize invasion to the abdominal wall.[1–4] However, studies need to be carried out to minimize the structural damage to the mesosalpinx and reduce the effects on the blood vessel system of the fallopian tube and ovary.

Here, a novel variant of salpingectomy is reported: the laparoscopic "core-pulling" salpingectomy (LCPS). In this technique, the core of the fallopian tube is pulled out, leaving the serous coat; this is followed by suturing.

In this study, the modified laparoscopic core-pulling salpingectomy was compared with conventional laparoscopic salpingectomy. A detailed description of the procedure, surgery outcomes, and complication rates is also provided. The objective of this study was to assess whether LCPS would be a feasible and practical alternative to conventional salpingectomy.

Materials and Methods

Patients

The medical records of 154 patients with tubal pregnancy who underwent salpingectomy from January 2012 to June 2014 were reviewed, with their consent. All surgeries were performed at the Department of Gynecology, the Third Affiliated Hospital of Zhengzhou University, Henan Province, China. The study was approved by the institutional review board of the hospital. Overall, 78 and 76 patients underwent conventional MPLS and LCPS, respectively. A complete medical history was obtained from all patients. In addition, the patients underwent physical and laboratory examinations, including pelvic examination, pelvic ultrasonography, and β-human chorionic gonadotrophin assay. Initial diagnosis was made through a combination of clinical and video-assisted examination.

Patients with severe obesity (body mass index $>$ 35 kg/m^2) and high risks for general anesthesia were excluded from the study. Patients with fimbrial, cornual, or nontubal ectopic pregnancies, who had undergone salpingostomy, salpingotomy, or partial salpingectomy, were also excluded. All patients provided informed consent forms, and surgical procedures were performed by the same team.

Surgical technique

MPLS

For MPLS, patients were administered general anesthesia via the endotracheal tube and placed in the lithotomy position. After sterile draping to provide adequate exposure of the surgical region, the bladder was catheterized. Then, a uterine manipulator was inserted into the uterine cavity to facilitate the surgery. The pneumoperitoneum was created by insufflating CO_2 into the abdominal cavity using a Veress needle introduced via a small umbilical incision. The laparoscope and camera were introduced through a 10-mm umbilical trocar site. Subsequently, two 5-mm trocars were inserted into the left lower quadrant and another into the right lower quadrant of the abdominal wall. After removal of blood and blood clot from the pelvic cavity, and examination of the contralateral fallopian tube and other pelvic organs, the adhesion around the tube, if any, was separated. Total salpingectomy was performed by stepwise dissection of the mesosalpinx and fallopian tube using bipolar laparoscopic electrocautery forceps and laparoscopic scissors. The pelvic cavity was irrigated, and the specimen was extracted through the trocar sleeve using a retrieval bag. After inspecting the salpingectomy site for bleeding, a drainage tube was inserted through one of the lower 5-mm abdominal trocar sites, if needed.

LCPS

LCPS was also performed under general anesthesia in the lithotomy position, as described for MPLS.

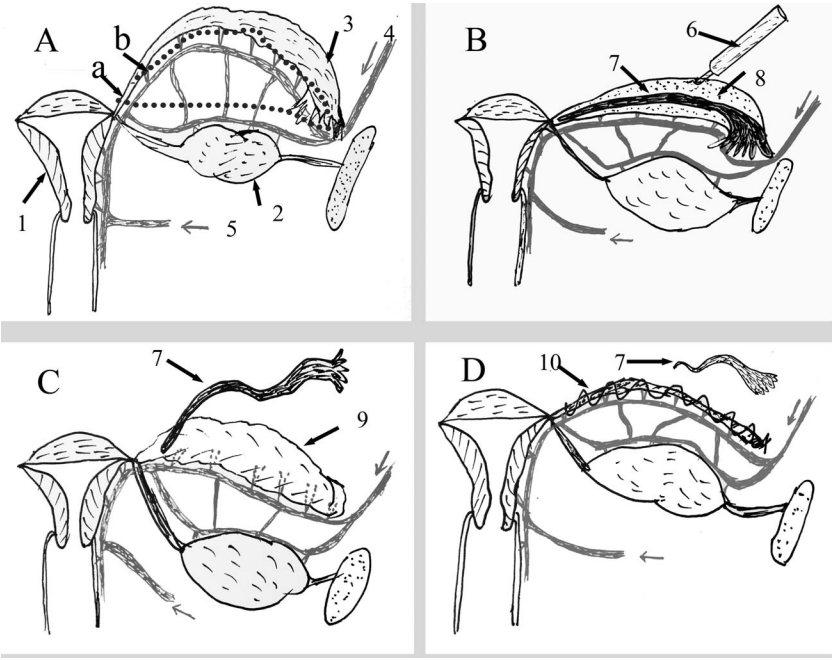

Fig. 1 Schematic diagram of LCPS. (A) Regional anatomy of fallopian tube and incision line. (B) Infusing normal saline beneath the serosa layer. (C) Pulling out of the fallopian tube's core. (D) Suturing of the serosa. (a) Incision line in MPLS. (b) Incision line in LCPS. 1, uterus; 2, ovary; 3, fallopian tube; 4, ovarian artery; 5, uterine artery; 6, puncture needle; 7, fallopian tube's core; 8, normal saline; 9, serosa; 10, continuous suture.

The bladder was catheterized, and the uterine manipulator was used as described above. The pneumoperitoneum was created, and the laparoscope and camera were introduced as described for MPLS. The three trocars were also inserted as described for MPLS. After removal of blood and blood clot from the pelvic cavity, and examination of the contralateral fallopian tube and other pelvic organs, the adhesion around the tube, if any, was then separated. The principle of LCPS is shown in Fig. 1. The fallopian tube comprises three layers: mucosa, muscular layer, and serosa. In the main LCPS procedure, sufficient normal saline was first infused between the serosa and muscular layer, from the *cornu uteri* to the fallopian tube's fimbria, using a laparoscopic puncture needle. Then, on swelling of the fallopian tube by the infusion, a longitudinal incision was made in the serosa layer along the fallopian tube, from the *cornu uteri* to the fallopian tube's fimbria. Then, the fallopian tube's core (including the muscular layer and mucosa) was separated from the serosa. When the fallopian tube's core was totally pulled out, bipolar laparoscopic electrocautery forceps were used to coagulate the naked isthmus portion of the fallopian tube. Next, the naked core of the fallopian tube was cut off at this site. After bipolar coagulation of the most active bleeding spot, a longitudinal continuous suture of the serosa was made along the fallopian tube using 3-0 absorbable sutures. Finally, the specimen (naked core of the fallopian tube) was extracted through the trocar sleeve using the specimen retrieval bag. The remaining steps were the same as described for MPLS. The procedure of LCPS is shown in Fig. 2.

Statistical analysis

Data were analyzed using SPSS 11.0 (SPSS, Chicago, Illinois). The χ^2 test was used for categorical variables and Student's *t*-test for continuous variables. $P < 0.05$ was considered statistically significant.

Results

The 154 patients underwent laparoscopic surgery (76 LCPS and 78 MPLS) successfully without switching over to abdominal surgery. In addition, the 76 patients of the LCPS group were successfully treated without recourse to conventional laparoscopic salpingectomy. Clinical characteristics and history of pelvic diseases in both groups are presented in Table 1. The patients were 29.9 ± 4.4 and 31.0 ± 4.1 years old in the MPLS and LCPS groups, respectively. Body mass index values for the patients were 27.4 ± 4.0 (MPLS) and 27.1 ± 3.3 kg/m^2 (LCPS). There were no statistically significant differences between the 2 groups. In addition, both groups had similar pathological statuses with

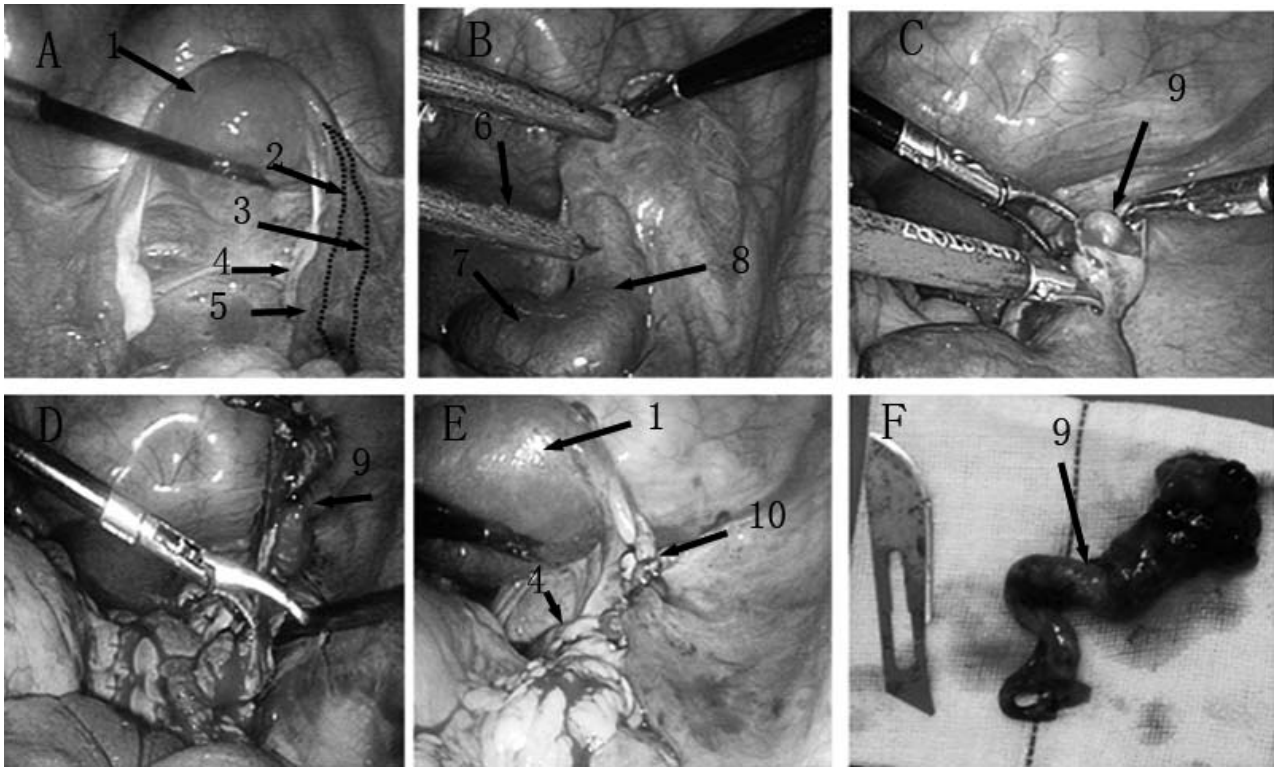

Fig. 2 Procedure of LCPS. (A) Regional anatomy of fallopian tube and incision line. (B) Infusing normal saline beneath the serosa layer. (C) Exposing the fallopian tube's core. (D) Pulling out of the fallopian tube's core. (E) Suturing of the serosa. (F) Naked core of the fallopian tube. 1, uterus; 2, incision line in LCPS; 3, incision line in MPLS; 4, ovary; 5, fallopian tube; 6, puncture needle; 7, ectopic fallopian pregnancy; 8, swollen fallopian tube; 9, naked core of the fallopian tube; 10, continuous suture.

regard to the medical history of abdominal surgery, pelvic diseases (including endometriosis and chronic inflammation), and other pathological states.

Intraoperative tubal pathology findings in both groups are shown in Table 2. No significant difference was observed with regard to the state of the fallopian tube and location of tubal pregnancy. Grades of tubal adhesion were also similar between the 2 groups: mild or moderate adhesion was defined as no or filmy adhesion and severe adhesion as dense and fibrous adhesion.

Surgery outcomes in the 2 groups are presented in Table 3. There were no significant differences between the LCPS and MPLS groups in terms of operative time, estimated blood loss, incidence of postoperative fever, and duration of hospitalization after surgery. Importantly, no intraoperative complications, including bowel injury, wound infection,

Table 1 Characteristics of patients (n = 154)

Characteristics	MPLS group	LCPS group	*P*
Number	78	76	
Age (years)	29.9 ± 4.4	31.0 ± 4.1	0.094
BMI (kg/m^2)	27.4 ± 4.0	27.1 ± 3.3	0.553
History of abdominal surgery	11/78 (14.1)	10/76 (13.2)	0.864
History of pelvic diseases			0.841
Endometriosis	15/78 (19.2)	18/76 (23.7)	
Chronic inflammatory	20/78 (25.7)	19/76 (25.0)	
Other	43/78 (55.1)	39/76 (51.3)	

Values are given as number (percentage) or mean ± SD. BMI, body mass index.

Table 2 Intraoperative findings of tubal pathological characteristics

Characteristics	MPLS group	LCPS group	*P*
Number	78	76	
State of fallopian tube			0.721
Leaking	33/78 (42.3)	30/76 (39.5)	
Ruptured	45/78 (57.7)	46/76 (60.5)	
Location of tubal pregnancy			0.902
Ampullar	50/78 (64.1)	48/76 (63.2)	
Isthmmic	28/78 (35.9)	28/76 (36.8)	
Grades of tubal adhesion			0.863
Mild or moderate adhesion	37/78 (47.4)	35/76 (46.1)	
Severe adhesion	41/78 (52.6)	41/76 (53.9)	

Values are given as number (percentage).

Table 3 Comparison of operative outcomes

Outcomes	MPLS group	LCPS group	*P*
Number	78	76	
Operative time (minutes)	56.0 ± 6.6	54.4 ± 6.5	0.139
EBL (mL)	55.0 ± 9.5	52.0 ± 10.2	0.062
Incidence of postoperative fever	4/78 (5.1)	3/76 (3.9)	0.725
Length of hospital stay (days)	4.9 ± 0.8	5.1 ± 0.8	0.425

Values are given as number (percentage) or mean ± SD. EBL, estimated blood loss (calculated as the difference between the total amount of suction and irrigation plus the difference between the total weight of the gauze after and before surgery).

heavy bleeding, severe shock, and blood transfusion, were observed in either group. Finally, no wound-related problems were observed during postoperative follow-up.

Discussion

To be more minimally invasive has been the trend in the development of surgery methods in recent years. Generally, minimally invasive surgery refers to minimizing the surgical impacts on body structure and function to the lowest level. With the extensive development achieved in recent decades, laparoscopic surgery is widely accepted and can serve as a minimally invasive approach for the surgical treatment of many gynecologic diseases, including abnormal uterine bleeding, cervical cancer, and benign gynecologic conditions in women, among others.[5–7]

However, laparoscopic surgery in itself is just a surgical technique, with advantages and shortcomings, despite all its reported virtues. Also, laparoscopic surgery in itself does not equal minimally invasive surgery; indeed, laparoscopy must be used properly to make surgery minimally invasive.

Salpingectomy is one of the most common surgical procedures performed in the gynecologic clinical practice; with decades of efforts by gynecologists worldwide, many types of salpingectomy have been developed, including traditional abdominal salpingectomy, conventional MPLS, single-port laparoscopic salpingectomy, transvaginal salpingectomy, transvaginal single-port natural orifice transluminal endoscopic salpingectomy, and even hybrid transvaginal and trans-umbilical laparoendoscopic salpingectomy. These surgeries are devoted to reducing invasion to the abdominal wall, minimizing irritation to the intestinal tissue, and yielding better cosmetic or perioperative outcomes.[2,8–12] However, as far as minimal invasiveness is concerned, the surgeon's attention should focus not only on invasion of the abdominal wall and pelvic cavity, but also on the surgical effects on the mesosalpinx's structure and blood vessel system of the fallopian tube. In all the surgeries mentioned, similar methods are used to remove the fallopian tube: coagulation and cutting of tubal mesosalpinx, followed by cutting of the fallopian tube. Therefore, damage to the blood vessel system of the relevant fallopian tube and ovary could be similar and severe in these surgeries.

The effects of salpingectomy on the body are still a hot topic in gynecologic research.[13] If salpingectomy alters the blood flow to the ovary, it may cause unwanted adverse effects such as decreased ovarian function and premature surgical menopause in the long run. Orvieto *et al* observed a significant reduction in the ipsilateral ovarian response after salpingectomy, as reflected by the reduced quantity of follicular development during controlled ovarian hyperstimulation for *in vitro* fertilization (IVF).[14] In addition, Johnson *et al* found that laparoscopic tubal occlusion can improve pregnancy rates of IVF in women compared with laparoscopic salpingectomy.[15] However, Dar *et al* concluded that salpingectomy does not influence ovarian response in controlled ovarian hyperstimulation or other artificial reproductive technology cycles.[16,17] In a study, Findley and Siedhoff also found that salpingectomy at the time of laparoscopic hysterectomy with ovarian preservation is a safe procedure, with no apparent short-term deleterious effects on ovarian reserve, as measured by the levels of anti-Müllerian hormone.[18]

LCPS is a novel and minimally invasive salpingectomy variant. It was first described and applied in a study of assisted reproduction pretreatment in patients with hydrosalpinx before IVF embryo transfer conducted by Bao *et al* and Hao *et al*.[19,20]According to their original findings, patients who underwent a previous laparoscopic core-pulling salpingectomy and subsequently received IVF embryo transfer achieved a significantly increased clinical conception rate, compared with individuals treated with the conventional procedure of laparoscopic salpingectomy. In addition, Bao *et al* indicated that 50% of the total ovarian blood supply comes from the ovarian branch of uterine artery, with ovarian blood supply totally coming from the uterine artery in 10% of cases.[20] Borell *et al* and Zhang *et al* reported that blood supply of ovary shows an anatomic variation in its local distribution

in peoples.[21,22] These findings indicate that, in a traditional procedure of salpingectomy, the ovarian function is slightly affected when the ovarian blood supply is partially from the uterine artery and seriously altered when it totally comes from the uterine artery.

On the basis of these results, it can be deduced that, in LCPS, the damage to the blood vessel system of the relevant fallopian tube and the ovarian function alteration could be avoided through the core-pulling procedure. The principle of LCPS is shown in Fig. 1; the reserved microvessel of the fallopian tube promises a relatively better and minimally invasive postoperative outcome. In a previous study assessing salpingectomy, Chan *et al* found that antral follicle counts and 3-dimensional power Doppler indices are significantly reduced on the side operated by laparoscopic salpingectomy. The ovarian function seemed to be impaired after laparoscopic unilateral salpingectomy in short-term assessment.[23] Lass *et al* also reported that among the patients submitted to salpingectomy, significantly fewer follicles develop and consequently fewer oocytes are retrieved from the ovary on the operated side.[24] These studies all demonstrate the possible influence of traditional laparoscopic salpingectomy on the ovarian function, suggesting the necessity of modifying the salpingectomy surgery and improving its practical value.

According to the results presented here, longer operative time, more pronounced blood loss, and increased postoperative complications were not observed in the LCPS group compared with the MPLS group. All the LCPS operations were performed successfully. No increased intraoperative or postoperative complications were observed, including bowel injury, wound infection, heavy bleeding, severe shock, and blood transfusion. No wound-related problems were observed during postoperative follow-up. These data indicated that LCPS is safe, feasible, and effective.

On the basis of our results and previous reports, LCPS presents several advantages. First, one removes only the core of the fallopian tube in LCPS (Fig. 1), leaving the blood vessel system of the relevant fallopian tube and ovary intact while maintaining the integrity of the tubal serous membrane. After suturing of the tubal serous membrane, the damaged blood capillary around the muscular layer can be restored and recanalized, which results in a new microcirculatory blood vessel system supplying blood to the ipsilateral ovary. Second, the suturing, not electrical coagulation, of the tubal serous membrane can prevent thermal damage to the fallopian tube's blood vessel. Indeed, Zakherah *et al* reported that thermal damage affects the ovary function.[25] Third, with severe adhesion around the fallopian tube, it is not required to separate the adhesive tissues from the fallopian tube as in traditional surgery. The serosa must be opened, the core removed, and the serosa sutured. This procedure avoids additional injuries to the fallopian tube's blood vessel. Finally, in this study, all surgeries were successful: no increased difficulties or complications were found in the LCPS group compared with traditional laparoscopic salpingectomy.

In this study, LCPS, a novel and minimally invasive salpingectomy variant, was used for the treatment of ectopic tubal pregnancy, demonstrating promising value. In gynecologic clinical practice, salpingectomy is widely used for the treatment of many gynecologic diseases, including hydrosalpinx, tubal pregnancy, tubal adhesion of chronic pelvic inflammation, and endometriosis. Indeed, laparoscopic salpingectomy and other laparoscopic surgeries provide improved perioperative outcomes and better long-term follow-up, including less blood loss, reduced bowel injury, decreased wound infection, less postoperative pain, and better outcome in many artificial reproductive technologies.[26–28] Recently, researchers described special uses of prophylactic salpingectomy in preventing ovarian cancer; clinicians hypothesized that ovarian cancer likely originates in the fallopian tube and sheds cells onto the ovary and peritoneal surfaces.[29–31] Thus, the application of LCPS provides a balance between the requirement for the treatment of tubal or ovarian diseases and the consideration of minimizing adverse effects on tubal blood flow and ovarian function.

In conclusion, LCPS can be used for the treatment of many tubal diseases, preventing unwanted adverse effects on ovarian blood flow and function. It is safe, feasible, and effective, with a promising future. More studies are needed to reveal its exact effects on ovarian blood flow and function.

References

1. Xu B, Liu Y, Ying X, Fan Z. Transvaginal endoscopic surgery for tubal ectopic pregnancy. *JSLS* 2014;**18**(1):76–82
2. Yoshiki N, Okawa T, Kubota T. Hybrid transvaginal and transumbilical laparoendoscopic adnexal surgery. *J Laparoendosc Adv Surg Tech A* 2012;**22**(10):992–995

3. Ahn KH, Song JY, Kim SH, Lee KW, Kim T. Transvaginal single-port natural orifice transluminal endoscopic surgery for benign uterine adnexal pathologies. *J Minim Invasive Gynecol* 2012;**19**(5):631–635
4. Lee CL, Wu KY, Su H, Ueng SH, Yen CF. Transvaginal natural-orifice transluminal endoscopic surgery (NOTES) in adnexal procedures. *J Minim Invasive Gynecol* 2012;**19**(4):509–513
5. Bogani G, Cromi A, Serati M, Di Naro E, Casarin J, Pinelli C, *et al*. Laparoscopic and vaginal approaches to hysterectomy in the obese. *Eur J Obstet Gynecol Reprod Biol* 2015;**189**:85–90
6. Kavallaris A, Zygouris D, Dafopoulos A, Kalogiannidis I, Terzakis E. Nerve sparing radical hysterectomy in early stage cervical cancer. Latest developments and review of the literature. *Eur J Gynaecol Oncol* 2015;**36**(1):5–9
7. Paraiso MF. Robotic-assisted laparoscopic surgery for hysterectomy and pelvic organ prolapse repair. *Fertil Steril* 2014; **102**(4):933–938
8. Fagotti A, Bottoni C, Vizzielli G, Alletti SG, Scambia G, Marana E, *et al*. Postoperative pain after conventional laparoscopy and laparoendoscopic single site surgery (LESS) for benign adnexal disease: a randomized trial. *Fertil Steril* 2011;**96**(1):255–259
9. Kim YW, Park BJ, Kim TE, Ro DY. Single-port laparoscopic salpingectomy for surgical treatment of tubal pregnancy: comparison with multi-port laparoscopic salpingectomy. *Int J Med Sci* 2013;**10**(8):1073–1078
10. Ghezzi F, Cromi A, Uccella S, Bogani G, Serati M, Bolis P. Transumbilical versus transvaginal retrieval of surgical specimens at laparoscopy: a randomized trial. *Am J Obstet Gynecol* 2012;**207**(2):112.e1–112.e6
11. Lee ES, Hahn HS, Park BJ, Ro DY, Kim JH, Kim YW. Single-port laparoscopic cornual resection for a spontaneous cornual ectopic pregnancy following ipsilateral salpingectomy. *Fertil Steril* 2011;**96**(2):e106–e110
12. Song T, Kim TJ, Kang HJ, Choi CH, Lee JW, Bae DS, *et al*. Single-port access laparoscopic surgery using a novel laparoscopic port (Octo-Port). *Taiwan J Obstet Gynecol* 2011;**50**(4):436–440
13. Backes FJ. Salpingectomy, why not? *Am J Obstet Gynecol* 2014; **210**(5):385–386
14. Orvieto R, Saar-Ryss B, Morgante G, Gemer O, Anteby EY, Meltcer S. Does salpingectomy affect the ipsilateral ovarian response to gonadotropin during in vitro fertilization-embryo transfer cycles? *Fertil Steril* 2011;**95**(5):1842–1844
15. Johnson N, van Voorst S, Sowter MC, Strandell A, Mol BW. Tubal surgery before IVF. *Hum Reprod Update* 2011;**17**(1):3
16. Dar P, Sachs GS, Strassburger D, Bukovsky I, Arieli S. Ovarian function before and after salpingectomy in artificial reproductive technology patients. *Hum Reprod* 2000;**15**(1):142–144
17. Almog B, Wagman I, Bibi G, Raz Y, Azem F, Groutz A, *et al*. Effects of salpingectomy on ovarian response in controlled ovarian hyperstimulation for in vitro fertilization: a reappraisal. *Fertil Steril* 2011;**95**(8):2474–2476
18. Findley AD, Siedhoff MT, Hobbs KA, Steege JF, Carey ET, McCall CA, *et al*. Short-term effects of salpingectomy during laparoscopic hysterectomy on ovarian reserve: a pilot randomized controlled trial. *Fertil Steril* 2013;**100**(6):1704–1708
19. Hao CF, Bao HC, Qu QL, Zhuang LL. Laparoscopic core-pulling procedure for salpingectomy. *Chin J Reprod Health* [in Chinese] 2007;**18**(3):175–176
20. Bao HC, Hao CF, Wang MM, Zhua LL, Wang XR. Assisted reproduction of pretreatment with laparoscopic "core-pulling" salpingectomy for patients with hydrosalpinx before in vitro fertilization embryo transfer. *J Reprod Contracept* 2010; **21**(3):147–154
21. Borell U, Fernstrom I. The adnexal branches of the uterine artery: an arteriographic study in human subjects. *Acta Radiol* 1953;**40**(6):561–582
22. Zhang CY. Urogenital system. In: Lei JZ, Han YN, Liao R, Liu S, eds. *Human Anatomy* [in Chinese]. Vol 1. Beijing, China: People's Medical Publishing House, 1998:566–858
23. Chan CC, Ng EH, Li CF, Ho PC. Impaired ovarian blood flow and reduced antral follicle count following laparoscopic salpingectomy for ectopic pregnancy. *Hum Reprod* 2003; **18**(10):2175–2180
24. Lass A, Ellenbogen A, Croucher C, Trew G, Margara R, Becattini C, *et al*. Effect of salpingectomy on ovarian response to superovulation in an in vitro fertilization-embryo transfer program. *Fertil Steril* 1998;**70**(6):1035–1038
25. Zakherah MS, Kamal MM, Hamed HO. Laparoscopic ovarian drilling in polycystic ovary syndrome: efficacy of adjusted thermal dose based on ovarian volume. *Fertil Steril* 2011;**95**(3): 1115–1118
26. Seracchioli R, Mabrouk M, Montanari G, Manuzzi L, Concetti S, Venturoli S. Conservative laparoscopic management of urinary tract endometriosis (UTE): surgical outcome and long-term follow-up. *Fertil Steril* 2010;**94**(3):856–861
27. Darai E, Lesieur B, Dubernard G, Rouzier R, Bazot M, Ballester M. Fertility after colorectal resection for endometriosis: results of a prospective study comparing laparoscopy with open surgery. *Fertil Steril* 2011;95(6):1903–1908
28. Var T, Batioglu S, Tonguc E, Kahyaoglu I. The effect of laparoscopic ovarian cystectomy versus coagulation in bilateral endometriomas on ovarian reserve as determined by antral follicle count and ovarian volume: a prospective randomized study. *Fertil Steril* 2011;**95**(7):2247–2250
29. Morelli M, Venturella R, Mocciaro R, Di Cello A, Rania E, Lico D *et al*. Prophylactic salpingectomy in premenopausal low-risk women for ovarian cancer: primum non nocere. *Gynecol Oncol* 2013;**129**(3):448–451
30. Morelli M, Venturella R, Zullo F. Risk-reducing salpingectomy as a new and safe strategy to prevent ovarian cancer. *Am J Obstet Gynecol* 2013;**209**(4):395–396
31. Dietl J, Wischhusen J, Hausler SF. The post-reproductive Fallopian tube: better removed? *Hum Reprod* 2011;**26**(11):2918–2924