Review Article

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Laparoscopic Infections in Urogenital and Gynecological System: A Systematic Review

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Abstract

There are several advantages of laparoscopic surgery, which is employed only in the presence of some indications, as follows: minimally invasive procedure, reduced postoperative pain and analgesic use, and short hospital stay. In this paper we examined infections of laparoscopic operations by scanning MEDLINE and PubMed. A total of forty-seven papers were examined using a meta-analytical framework. In studies including a large series in adrenalectomy, the infectious complication rate, including various infections such as pneumonia, urinary tract infection, sepsis, and wound infection, is observed to be less than 1%. While infection is generally not developed during laparoscopy in nephrectomy patients, it may occasionally be seen, generally in the form of wound infection. The infectious complication rate associated with laparoscopic cystectomy was found to be high, which was attributed to surgical inexperience, presence of chronic diseases, and a lack of adequate equipment in hospitals. Complications of infection of prostactomy were not observed after procedures. The infection rate of hysterectomy is low; abscess and urinary tract infection are the most common infectious complications. Myomectomy cases generally showed no infection. Finally, it is associated with a lower wound infection rate and a reduced degree of abdominal damage and incisional hernia due to less scarring.

Key words: *Laparoscopy, infection, adrenalectomy, nephrectomy, cystectomy, prostatectomy, hysterectomy, myomectomy*

Minimally Invasive Surgery: Laparoscopy

Laparoscopy application has been commonly used in abdominal surgery for more than 10 years. There are several advantages of laparoscopic surgery, which is employed only in the presence of some indications, as follows: minimally invasive procedure, reduced postoperative pain and analgesic use, and short hospital stay. Moreover, it is associated with a lower wound infection rate and a reduced degree of abdominal damage and incisional hernia due to less scarring.

A. Adrenalectomy

Laparoscopic adrenalectomy for adrenal benign masses has been performed since 1992. There are two methods: laparoscopic adrenalectomy (LA) and retroperitoneal adrenalectomy (RPA). Among some of the indications, we can mention malignant diseases such as primary and metastatic cancers, and benign diseases such as Cushing's disease, hyperaldosteronism, pheochromocytoma, androgenital diseases and other benign adrenal neoplasms. Patients suitable for laparoscopy are those who have a tumor <7cm and a

BMI <45 kg/m2 [1].

A multicenter study was conducted on 155 patients in 19 centers. In terms of complications, 4 deep wound infections, 1 intraabdominal abscess, 2 cases of pneumonia and 1 urinary tract infection were determined [2].

The robot-assisted LA (especially the da Vinci robot) is a minimally invasive technique and offers a wide range of applications (a good visibility, easy technique, etc.) area. In a study (100 patients), complications of robotic adrenalectomy (RA) were as follows: 3 wound infections, 3 cases of pneumonia and 3 urinary tract infections [3].

LA performed cases in 211 centers between 2007 and 2008; they were categorized and defined based on The American College of Surgeons' National Surgical Quality Improvement Program (NSQIP). The patient group consisted of 988 people. Distribution of postoperative infections was as follows: 10 (1%) pneumonia, 7 (0.7%) sepsis, 3 (0.3%) organ-space infection, 1 (0.1%) deep wound infection, 14 (1.4%), urinary tract infection and 8 (0.8%) superficial wound infection [4].

According to the data of the Nationwide Inpatient Sample (NIS) in the United States between 1998 and 2006, adrenalectomy was performed in 40,363 patients, and 83% of them consisted of benign diseases. Postoperative complications of pneumonia are just below the prevalence of 0.5%, and all general infections (except pneumonia) have remained between 0.7% and 0.9% [5].

B. Nephrectomy

Laparoscopic surgery was first defined by Clayman in urology [6]. Previously, it has been referred with different names. In 2008, a surgical consortium termed it as "LESS – Laparoendoscopic Single-Site Surgery". LESS uses a single entry point that is concealed under the umbilicus [7]. Other commonly employed methods are transperitoneal, hand-assisted, and retroperitoneal techniques. Since 1995, nearly 5000 laparoscopic live donor nephrectomy (LLDN) procedures have been performed worldwide [8].

Only 1 urinary tract infection was seen among 100 patients who underwent LESS with a novel single-port device [9].

In a study evaluating a two-sided approach with the LESS-DN (live donor nephrectomy) method, the infection rate in the right kidney group was 3.14% (5/159) (1 urinary infection, 3 wound infection and 1 pneumonia case), whereas it was 4.8% (6/124) in the left kidney group. These was 1 pneumonia case and 5 wound infections [10].

In a meta-analysis conducted in 2008, the wound infection rate for laparoscopic nephrectomy in 3751 patients was reported as 1.9% [11].

In two studies using the hand-assisted transperitoneal laparoscopic method, which is a live donor for nephrectomy, no infectious complication was encountered [12,13].

Robot-assisted laparoendoscopic single-site surgery (RLESS) has been developed to eliminate the disadvantages of LESS. RLESS is particularly preferred in tumor patients. The use of robotic surgery in renal tumors still has a long way to go. The first robotic surgery was reported by Gettman et al. in 2004 [14]. Robot-assisted laparoscopic partial nephrectomy (RALPN) is particularly applied in two cases: 1. Kidney tumor, 2. Renal reconstruction.

In the studies on RALPN, no infectious complication was observed in patients [14-16].

C. Cystectomy and Lymph Node Dissection

Radical cystectomy and lymph node dissection (LND) is the gold standard for high-grade invasive transitional cell carcinoma. This treatment also provides a perfect cancer control [17]. In 1992, Parra and Puppo performed the first laparoscopic cystectomy [18]. There are 3 methods: (a) Laparoscopic radical cystectomy (LRC), (b) Robot-assisted laparoscopic cystectomy (RALC), (c) Hand-assisted laparoscopic cystectomy [18].

In a study where 1142 patients (mean age: 68 years, range: 31-90 years) were evaluated between 1995 and 2005 within the first 90 days after undergoing LRC/urinary diversion: 282 cases (25%) had infection (55 fever of unknown origin, 49 abscess, 113 urinary tract infection, 51 sepsis, 25 urosepsis, 29 pyelonephritis, 2 diverticulitis, 4 gastroenteritis, and 3 cholecystitis cases), 106 (9.2%) had wound infection, 28 (2.5%) had Clostridium difficile colitis and 45 (3.9%) had pneumonia. The mortality rate was 0.9% (n=10) and 2 patients died due to septic shock [19].

Ng et al. performed a study on 187 patients (104 open and 83 RALC) between 2002 and 2008 and found RALC complication in approximately 10% of the cases. Except for pneumonia and wound infection, the infection rate after laparoscopic application was higher than the open operation [20].

The complication rate of lymph node dissection is not high, and the most common complication is infection in the form of lymphocele [21,22].

D. Prostatectomy

Minimally invasive surgical techniques have been commonly used in prostate cancer for more than 10 years, and laparoscopic radical prostatectomy (LRP) is recognized as the standard treatment [23]. Robot-assisted laparoscopic surgery (RALP), the da Vinci robotic system, has been used since 1999 [24].

An article evaluating the first 1000 laparoscopic radical prostatectomy (LRP) cases in England revealed that 0.003% (3/1000) of the patients demonstrated port site infection. After the "learning curve" period (150-200 cases), the complication rate was reported to be low [25].

Generally, complications of infection were not observed after the procedure of LRP and RALP methods [26-29].

E. Hysterectomy

Hysterectomy is the most commonly applied gynecologic operation. The early cervical cancer laparoscopy technique was first defined in the 1990s, and laparoscopy-assisted radical vaginal hysterectomy (LARVH) was first performed by Canis et al. [30] and Nezhat [31].

In one study, the "learning curve" period found high complication in the initial patients undergoing total laparoscopic radical hysterectomy (TLRH) [32].

In a case-control study (n=40/n=40) in Switzerland, "da Vinci robotic laparoscopic surgery" demonstrated 5 urinary infectious complications. The conventional laparoscopic surgery group demonstrated only 1 wound infection [33].

Seamon et al. compared the robot-assisted technique and conventional laparoscopic hysterectomy and lymphadenectomy in 181 endometrial cancer patients (105 robotic surgery and 76 laparoscopic surgery), and they found no postoperative infection [34].

In some studies conducted in Saudi Arabia (n=35), Italy (n=33) and Turkey (n=25), patients received TLRH and no infection was observed postoperatively [35-37].

In a case series of 16 patients who had undergone TLRH, 2 postoperative infectious complications (1 pneumonia and 1 access site infection) were observed [38].

In another study performed in Korea, where laparoscopic hysterectomy (n=263) and open radical hysterectomy (263) were evaluated, pelvic abscess formation (2.7 % vs. 6.5 %, p=0.052, respectively) was found to be the most common complication [39].

In the different case series consisting of 200 patients, 2 complications (infected lymphocyst and cuff abscess) were determined [40,41].

F. Myomectomy

Myomectomy is the most commonly observed pelvic neoplasm among women. It should be performed to preserve fertility. Previously, conventional laparoscopy was the standard procedure; however, due to the occurrence of many significant complications (pain, hemorrhage, and urinary and gastrointestinal dysfunction) associated with multi-layer closure, robot-assisted laparoscopic myectomy (RALM) has been developed. In 2008-2010, 106 open and 27 RALM procedures were compared. Myoma weight was classified as 100g, 100-200g, and >200g. Moreover, uterine size was categorized as <12 weeks, 12-16 weeks, and >16 weeks. The general complication rate was 21% in open procedures and 10% in RALM procedures. In the RALM group, only 3 patients exhibited postoperative fever [42].

In a study conducted between 2006 and 2009, 'morcellation in situ' (SMI) was applied simultaneously with a laparoscopic procedure for removal of leiomyomas > 9cm. The myoma diameter was >14cm in 5 patients and 9-14cm in 21 patients. No infectious complication was observed [43].

In a study performed between 2006 and 2010, 31 patients with deep intramural myoma were treated by robot-assisted laparoscopic myomectomy. The mean myoma size was 7cm, and 68% of the patients who received robot-assisted laparoscopic myomectomy got pregnant. Three patients exhibited a mild fever postoperatively and were treated with antibiotics as a precau-

tion. But later, an infection symptom was not seen in the patients [44].

In another study, 575 myomectomy procedures were carried out: 393 (68.3%) abdominal, 93 (16.2%) laparoscopic, and 89 (15.5%) robot-assisted laparoscopic cases. Patients who received a laparoscopic procedure showed no infection [45].

Intraperitoneal infection and abscess are frequently observed in patients that undergo posterior colpotomy. In one study, uterine fibroid weight was <80g in 63 patients and >80g in 113 patients. The >80g group demonstrated a postoperative low-grade fever (<38.5°C). The patients were treated with antibiotics. Each of the two groups had only 1 case of urinary tract infection. The >80g group demonstrated 2 cases of uterine abscess, as well [46].

A study where another colpotomy method was used, only 1 abscess complication was found in 45 patients [47].

Conflict of interest statement

The authors have no conflicts of interest to declare.

References

1. Dickson PV, Alex GC, Grubbs EG, Ayala-Ramirez M, Jimenez C, Evans DB, et al. Posterior retroperitoneoscopic adrenalectomy is a safe and effective alternative to transabdominal laparoscopic adrenalectomy for pheochromocytoma. Surgery 2011;150:452-458.
2. Villar JM, Moreno P, Ortega J, Bollo E, Ramírez CP, Muñoz N, et al. Results of adrenal surgery. Data of a Spanish National Survey. Langenbecks Arch Surg 2010;395:837-843.
3. Brunaud L, Ayav A, Zarnegar R, Rouers A, Klein M, Boissel P, et al Prospective evaluation of 100 robotic-assisted unilateral adrenalectomies. Surgery 2008;144:995-1001.
4. Gupta PK, Natarajan B, Pallati PK, Gupta H, Sainath J, Fitzgibbons RJ Jr. Outcomes after laparoscopic adrenalectomy. Surg Endosc 2011;25:784-794.
5. Murphy MM, Witkowski ER, Ng SC, McDade TP, Hill JS, Larkin AC, et al. Trends in adrenalectomy: a recent national review. Surg Endosc 2010;24:2518-2526.
6. Clayman RV, Kavoussi LR, Soper NJ, Dierks SM, Merety KS, Darcy MD, et al. Laparoscopic nephrectomy. N Engl J Med 1991;324:1370-1371.
7. Kaouk JH, Haber GP, Goel RK, Desai MM, Aron M, Rackley RR, et al. Single-port laparoscopic surgery in urology: initial experience. Urology 2008;71:3-6.
8. Lau H. Technical Notes Laparoscopic Live Donor Nephrectomy. Hong Kong Journal of Nephrology 2005;7:47–50.
9. Desai MM, Berger AK, Brandina R, Aron M, Irwin BH, Canes D, et al. Laparoendoscopic single-site surgery: initial hundred patients. Urology 2009;74:805-812.
10. Dols LF, Kok NF, Alwayn IP, Tran TC, Weimar W, Ijzermans JN. Laparoscopic donor nephrectomy: a plea for the right-sided approach. Transplantation 2009;87:745-750.
11. Nanidis TG, Antcliffe D, Kokkinos C, Borysiewicz CA, Darzi AW, Tekkis PP, et al. Laparoscopic versus open live donor nephrectomy in renal transplantation: a meta-analysis. Ann Surg 2008;247:58-70.
12. Hamidi V, Andersen MH, Oyen O, Mathisen L, Fosse E, Kristiansen IS. Cost effectiveness of open versus laparoscopic living-donor nephrectomy. Transplantation 2009;87:831-838.
13. Troppmann C, Daily MF, McVicar JP, Troppmann KM, Perez RV. The transition from laparoscopic to retroperitoneoscopic live donor nephrectomy: a matched pair pilot study. Transplantation 2010;89:858-863
14. Gettman MT, Blute ML, Chow GK, Neururer R, Bartsch G, Peschel R. Robotic-assisted laparoscopic partial nephrectomy: technique and initial clinical experience with DaVinci robotic system. Urology 2004;64:914-918.
15. Caruso RP, Phillips CK, Kau E, Taneja SS, Stifelman MD. Robot assisted laparoscopic partial nephrectomy: initial experience. J Urol 2006;176:36-39.
16. Kaul S, Laungani R, Sarle R, Stricker H, Peabody J, Littleton R, et al. da Vinci-assisted robotic partial nephrectomy: technique and results at a mean of 15 months of follow-up. Eur Urol 2007;51:186-191.
17. Stein JP. Contemporary concepts of radical cystectomy and the treatment of bladder cancer. J Urol

2003;169:116-117.
18. Parra RO, Andrus CH, Jones JP, Boullier JA. Laparoscopic cystectomy: initial report on a new treatment for the retained bladder. J Urol 1992;148:1140-1144.
19. Shabsigh A, Korets R, Vora KC, Brooks CM, Cronin AM, Savage C, et al. Defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. Eur Urol 2009;55:164-174.
20. Ng CK, Kauffman EC, Lee MM, Otto BJ, Portnoff A, Ehrlich JR, et al. A comparison of postoperative complications in open versus robotic cystectomy. Eur Urol 2010;57:274-281.
21. Stein JP, Penson DF, Cai J, Miranda G, Skinner EC, Dunn MA, et al. Radical cystectomy with extended lymphadenectomy: evaluating separate package versus en bloc submission for node positive bladder cancer. J Urol 2007;177:876-881.
22. Leissner J, Hohenfellner R, Thüroff JW, Wolf HK. Lymphadenectomy in patients with transitional cell carcinoma of the urinary bladder; significance for staging and prognosis. BJU Int 2000;85:817-823.
23. Touijer K, Eastham JA, Secin FP, Romero Otero J, Serio A, Stasi J, et al. Comprehensive prospective comparative analysis of outcomes between open and laparoscopic radical prostatectomy conducted in 2003 to 2005. J Urol 2008;179:1811-1817.
24. Binder J, Kramer W. Robotically-assisted laparoscopic radical prostatectomy. BJU Int 2001;87:408-410.
25. Eden CG, Neill MG, Louie-Johnsun MW. The first 1000 cases of laparoscopic radical prostatectomy in the UK: evidence of multiple 'learning curves'. BJU Int 2009;103:1224-1230.
26. Leewansangtong S, Wiangsakunna W, Taweemankongsap T. Perioperative outcomes of open radical prostatectomy versus laparoscopic radical prostatectomy in Asian men: comparison of two initial series by the same surgeon. Int Braz J Urol 2009;35:151-156.
27. Oktay B, Koc G, Vuruskan H, Danisoglu ME, Kordan Y. Laparoscopic extraperitoneal simple prostatectomy for benign prostate hyperplasia: a two-year experience. Urol J 2011;8:107-112.
28. Ou YC, Yang CR, Wang J, Cheng CL, Patel VR. Learning curve of robotic-assisted radical prostatectomy with 60 initial cases by a single surgeon. Asian J Surg 2011;34:74-80.
29. Parrado CL, Alonso y Gregorio S, Martín-Martínez A, Martín-Vega A, Caballero JG, Barthel JJ. Impact of a clinical pathway in patient care following surgery on laparoscopic radical prostatectomy. Qual Manag Health Care 2008;17:234-241.
30. Canis M, Mage G, Wattiez A, Pouly JL, Manhes H, Bruhat MA. [Does endoscopic surgery have a role in radical surgery of cancer of the cervix uteri?]. [Article in French]. J Gynecol Obstet Biol Reprod (Paris) 1990;19:921
31. Nezhat CR, Burrell MO, Nezhat FR, Benigno BB, Welander CE. Laparoscopic radical hysterectomy with paraaortic and pelvic node dissection. Am J Obstet Gynecol 1992;166:864-865.
32. Reade C, Hauspy J, Schmuck ML, Moens F. Characterizing the learning curve for laparoscopic radical hysterectomy: buddy operating as a technique for accelerating skill acquisition. Int J Gynecol Cancer 2011;21:930-935.
33. Sarlos D, Kots L, Stevanovic N, Schaer G. Robotic hysterectomy versus conventional laparoscopic hysterectomy: outcome and cost analyses of a matched case-control study. Eur J Obstet Gynecol Reprod Biol 2010;150:92-96.
34. Seamon LG, Cohn DE, Henretta MS, Kim KH, Carlson MJ, Phillips GS, et al. Minimally invasive comprehensive surgical staging for endometrial cancer: Robotics or laparoscopy? Gynecol Oncol 2009;113:36-41.
35. Sait KH. Early experience with the da Vinci surgical system robot in gynecological surgery at King Abdulaziz University Hospital. Int J Womens Health 2011;3:219-226.
36. Marengo F, Larraín D, Babilonti L, Spinillo A. Learning experience using the double-console da Vinci surgical system in gynecology: a prospective cohort study in a University hospital. Arch Gynecol Obstet 2012;285:441-445.
37. Göçmen A, Sanlikan F, Uçar MG. Turkey's experience of robotic-assisted laparoscopic hysterecto-

my: a series of 25 consecutive cases. Arch Gynecol Obstet 2010;282:163-171.
38. Reynolds RK, Advincula AP. Robot-assisted laparoscopic hysterectomy: technique and initial experience. Am J Surg 2006;191:555-560.
39. Nam JH, Park JY, Kim DY, Kim JH, Kim YM, Kim YT. Laparoscopic versus open radical hysterectomy in early-stage cervical cancer: long-term survival outcomes in a matched cohort study. Ann Oncol 2012;23:903-911.
40. Chong GO, Park NY, Hong DG, Cho YL, Park IS, Lee YS. Learning curve of laparoscopic radical hysterectomy with pelvic and/or para-aortic lymphadenectomy in the early and locally advanced cervical cancer: comparison of the first 50 and second 50 cases. Int J Gynecol Cancer 2009;19:1459-1464.
41. Song T, Kim TJ, Lee YY, Choi CH, Lee JW, Kim BG, et al. What is the learning curve for single-port access laparoscopic-assisted vaginal hysterectomy? Eur J Obstet Gynecol Reprod Biol 2011;158:93-96.
42. Nash K, Feinglass J, Zei C, Lu G, Mengesha B, Lewicky-Gaupp C, et al. Robotic-assisted laparoscopic myomectomy versus abdominal myomectomy: a comparative analysis of surgical outcomes and costs. Arch Gynecol Obstet 2012;285:435-440.
43. Zhang P, Song K, Li L, Yukuwa K, Kong B. Application of simultaneous morcellation in situ in laparoscopic myomectomy of larger uterine leiomyomas. Med Princ Pract 2011;20:455-458.
44. Lönnerfors C, Persson J. Pregnancy following robot-assisted laparoscopic myomectomy in women with deep intramural myomas. Acta Obstet Gynecol Scand 2011;90:972-977.
45. Barakat EE, Bedaiwy MA, Zimberg S, Nutter B, Nosseir M, Falcone T. Robotic-assisted, laparoscopic, and abdominal myomectomy: a comparison of surgical outcomes. Obstet Gynecol 2011;117(2 Pt 1):256-265.
46. Wang CJ, Yuen LT, Lee CL, Kay N, Soong YK. Laparoscopic myomectomy for large uterine fibroids. A comparative study. Surg Endosc. 2006;20:1427-1430.
47. Agostini A, Deval B, Birsan A, Ronda I, Bretelle F, Roger V, et al. Vaginal myomectomy using posterior colpotomy: feasibility in normal practice. Eur J Obstet Gynecol Reprod Biol 2004;116:217-220.