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Robotic cystectomy

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Abbreviations: RC, radical cystectomy; WHO, world health organization; RARC, robot-assisted radical cystectomy; SPARC, survival prediction after radical cystectomy; ORC, open radical cystectomy; PLND, pelvic lymph node dissection

Introduction

Cystectomy is one of the most extensive surgical procedures and most probably the most extensive urological procedure. It involves simultaneous surgery to resect the urinary bladder and surgery on the gastrointestinal tract to reconstruct urinary diversion. Due to the complexity of the procedure, complications and morbidity occur and have a large impact on the patient's recovery and outcome.[1] Simple cystectomy is usually performed for crippling bladder symptoms due to neurogenic bladder, interstitial cystitis, pelvic radiation and severe incontinence. Radical cystectomy (RC) is the standard treatment for muscle-invasive bladder cancer, and it is also an option for some patients with high-grade non–muscle-invasive bladder cancer.[2] In addition to the operation on the bladder and intestines, radical cystectomy also involves lymph node dissection which makes the procedure more extensive.

Aims

There are multiple factors that may contribute to the development of postoperative complications in cystectomy patients. Robotic cystectomy (RC) as a minimally invasive procedure is a technical advancement in the field. However, the preoperative factor that may influence the outcome of this surgery has not been well understood. Although, RC is a minimally invasive procedure, the risks and complications are comparable with the open procedure. This review investigates the factors that may influence the outcome after this surgery in terms of patient selection, type of procedure, i.e. open versus intra corporeal diversion or neo bladder formation and the learning curve for the surgeons. As the intricacies of all these factors may influence the risk of postoperative complications, recovery and oncological out come.

Methods

A focused review of the literature from PubMed, Google scholar and WHO clinical trials database was performed. Articles comparing robotic versus open cystectomy, postoperative complications, outcome and the learning curve for the surgeons were included.

Results and discussion

A population based study by Isbarn et al.,[3] demonstrated 30-, 60-, and 90-day mortality at 1.1%, 2.4%, and 3.9%, respectively for radical cystectomy.[3] The average blood loss after RC has been reported to be between 560ml[4] and 3000ml.[5] This group of patients consequently requires transfusions which are associated with major complications.[6] Immediately after the procedure, there is an additional risk of intestinal anastomotic leak and urinary extravasations. The gastrointestinal complications are probably the most common during the initial postoperative period. Postoperative intestinal anastomotic leakage occurs in about 3% of patients,[7] postoperative ileus occurs in about 18% and intestinal obstruction may affect up to 23% of patients as recorded by Shabsigh et al.[8] Infectious events are the second most common complications of RC, constituting 25% of all complications within 90days of surgery. Wound related complications, such as dehiscence in the early postoperative period are about 15%.[8] Lymph node dissection performed with RC may lead to formation of lymphoceles or lymphatic leak.

Robot-assisted radical cystectomy (RARC) emerged as a minimally invasive modality and led to improvements in intra operative blood loss and length of hospital stay.[9] NG CK et al compared open and robotic RC, and they observed that the overall complication rate was greater after the open procedure, although the difference was not statistically significant (62% vs 48%, p = 0.07). Musch et al.,[10] reported a significant reduction in early postoperative morbidity in patients who have undergone RARC. Yet those patients had more serious comorbidities and a longer follow up period by 30days.[10]

Tang et al.,[11] in their systematic review robotic vs. open radical cystectomy in bladder cancer reported that robotic cystectomy is a safe and feasible procedure.[11] Leow et al.,[12] investigated the propensity matched comparison of morbidity and costs of open and robotic assisted radical cystectomies found that robotic cystectomy decreased minor complications, had no impact on major complications and was more costly than open surgery. The surgical outcomes after RARC are comparable with the open procedure which is still the gold standard.[12]

This is reassuring regarding the surgical and also the oncological outcome as reported by Kader et al. are comparable with open radical cystectomy with fewer overall or major complications.[13] Eisenberg et al.,[14] investigated the multi factorial model to predict the outcome for patients undergoing radical cystectomy using the SPARC (Survival Prediction after Radical Cystectomy) Score. This model is designed to predict the cancer specific survival but not the surgical related survival.[14]

Mayr et al.,[15] studied the overall survival in patients with previous bladder cancer and disease recurrence after radical cystectomy

using the Charlson comorbidity index in patients undergoing radical cystectomy. This study investigated the overall survival in patients after local and systemic recurrence of disease.[15] The comparison between open versus robotic cystectomy has been investigated in multiple studies. Niegisch et al.,[16] assessed the surgical and oncological outcome of robot assisted radical cystectomy (RARC) of 64 patients who underwent the procedure prospectively and a retrospective comparison with 79 patients who underwent open radical cystectomy (ORC). RARC provided significant advantages compared with ORC regarding blood loss and postoperative recovery, whereas surgical and oncological outcomes were not different.[16]

"These studies investigated the safety and efficacy and outcome of both open and minimally invasive/robotic cystectomy but the question that persists despite these investigations is 'what are the factors that affect the postoperative recovery period for cystectomy patients and how predicting these factors may affect the type of procedure offered and planning for a better outcome''. Although complications rates have been extensively reported, an investigation of risk factors at each stage of the peri-operative period has not been thoroughly investigated in the literature.

As open radical cystectomy and pelvic lymph node dissection (PLND) remains the standard of care.[17] The evolution of minimally invasive techniques opened new opportunities for better care, yet also challenges for the surgeon as open and minimally invasive techniques are different. As for all techniques in surgery, there is a learning curve that is essential to go through in order to develop safe and consistent practice. Hayn et al.,[18] investigated the learning curve for robotic cystectomy by looking at the operative time, surgical margin, and lymph node yield. It is interesting to note that a positive surgical margin of <5% were achieved after 30 patients. This is the number of procedures that were proposed by this report to achieve an acceptable level of operative proficiency.[18] The first minimally invasive laparoscopic approach to radical cystectomy and intra corporeal orthotropic neo bladder was described by Gill et al in 2002.[19] The Robotic intra corporeal orthotopic neo bladder was described by Jonsson[20] and Tyritzis[21] as a reproducible technique with operative efficiency and acceptable peri operative outcomes.[20,21]

Collins et al.,[22] investigated the effect of the learning curve on outcome of RARC with intra corporeal neo bladder. Although it is a complex procedure, it can be performed safely, with a structured approach, at a high volume centre without compromising peri operative and pathological outcomes during the learning curve for surgeons.[22] Various reports in the literature advocate intra corporeal diversion or neo bladder formation as safe and comparable with the open approach. Collins et al recommended that more complex cases should be operated by more experienced surgeons for optimum pathological outcome and reduced complication rates.

Conclusion

It is not clear from the literature how patient selection, their oncological burden and physiological status would affect their outcome in terms of post operative complications if they are assigned to open or robotic cystectomy and whether open or intra corporeal diversion or neo bladder formation is the suitable approach. The advances in surgical technology have lead to an evolution in the possibilities of performing various techniques to achieve similar surgical outcomes. However, standards of care for these techniques are also evolving. There are various factors that should be considered in developing surgical standards for RARC in order to optimize patient selection for the type of procedure improve outcomes and be able to compare studies.

In addition, a search of the WHO clinical trials database has revealed 116 trials when searching for the word cystectomy. There were no trials or studies in place that investigated the risk factors for complications at the peri-operative period. Further studies focusing on the peri-operative factors, patient selection and the learning curve for the surgeon are essential in order to standardize our approach and understand the main factors that lead to complications in this complex surgery.

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Conflict of interest

The author declares no conflict of interest.

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