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Robot-assisted or conventional laparoscoic rectopexy for rectal prolapse? Systematic review and meta-analysis

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ABSTRACT

Aim: The use of robotic technology has proved to be safe and effective, arising as a helpful alternative to standard laparoscopy in a variety of surgical procedures. However the role of robotic assistance in laparoscopic rectopexy is still not demonstrated. **Methods**: A systematic review of the literature was carried out performing an unrestricted search in MEDLINE, EMBASE, the Cochrane Library, and Google Scholar up to 30th June 2014. Reference lists of retrieved articles and review articles were manually searched for other relevant studies. We meta-analyzed the data currently available regarding the incidence of recurrence rate of rectal prolapse, conversion rate, operative time, intra-operative blood loss, post-operative complications, re-operation rate and hospital stay in robot-assisted rectopexy (RC) compared to conventional laparoscopic rectopexy (LR). **Results**: Six studies were included resulting in 340 patients. The meta-analysis showed that the RR does not influence the recurrence rate of rectal prolapse, the conversion rate and the re-operation rate, whereas it decreases the intra-operative blood loss, the post-operative complications and the hospital stay. Yet, the RR resulted to be longer than the LR. Post-operative ano-rectal and the sexual functionality and procedural costs could not meta-analyzed because the data from included studies about these issues were heterogeneous and incomplete. **Conclusion**: The meta-analysis showed that the RR may ensure limited improvements in post-operative outcomes if compared to the LR. However, RCTs are needed to compare RR to LR in terms of short-term and long-term outcomes, specially investigating the functional outcomes that may confirm the cost-effectiveness of the robotic assisted rectopexy.

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1. Introduction

Pelvic floor disorders (PFDs) include several clinical conditions as urinary incontinence, fecal incontinence, pelvic organ prolapse, sensory and emptying abnormalities of the lower urinary tract, defecatory dysfunction, sexual dysfunction and several chronic pain syndromes. The three most common and definable conditions clinically encountered are urinary incontinence, anal incontinence and pelvic organ prolapse.

Rectal prolapse is a debilitating condition associated with significant comorbidity and a poor quality of life. Patients usually show tenesmus, pain, prolapse, bleeding, obstructed defecation or faecal incontinence and even acute rectal incarceration. Rectal prolapse frequently occurs in old women with a male to female rate of 1:6. In the US about 41% of women aged 50–79 years show some degree of pelvic floor disorder (PFD) in the form of symptomatic pelvic organ prolapse and it is likely that by the year 2050 nearly one-third of the adult female population in the US will be affected by a least one PFD [1,2]. Symptomatic PFDs require surgical correction and the need of surgery by age 80 has been estimated to be 7–12.2% [3].

Abbreviations: PFD, pelvic floor disorder; LR, laparoscopic rectopexy; RR, robotic rectopexy; RCT, randomized clinical trial.

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Surgical treatments can be either perineal or abdominal approach. Perineal approach includes Delorme's (mucosal sleeve resection) or Altemeier's (perineal rectosigmoidectomy) procedure. Both of them have a significant chance of recurrence (up to 40% and 16% respectively) and therefore they are often limited to elderly or peri-operative high risk patients [4]. The abdominal approach includes the rectopexy alone with the use of synthetic or biological mesh, (according to Ripstein's, Wells' or D'Hoore's technique) or the sigmoid resection and rectopexy (Goldberg–Frykman's procedure).

The abdominal approach ensures better outcomes with low recurrence and it can be often combined with cystopexy or colpopexy if need be [5]. Although incontinence is improved, the associated constipation may tend to get worse after surgery and occasionally a new-onset constipation may be a possible consequence of rectal denervation secondary to its postero-lateral mobilization as it occurs in posterior rectopexy [6]. Ventral rectopexy, proposed by D'Hoore, involves mobilization of the anterior wall of the rectum down to the levator ani muscle and anterior placement of a mesh which is sutured distally on the anterior wall of the rectum and secured proximally to the sacral promontory. This technique with laparoscopic approach showed successful long-term results (minor morbidity 7%, recurrence rate 3.7%), faster recovery, less blood loss, lower medical cost and less post-operative pain and this replaced the traditional open abdominal approach and it has led many authors to advocate this approach as the preferential technique [7–9].

Laparoscopic procedure is however technically demanding with a difficult learning curve because of the use of rigid instruments, limited freedom of wrist movement and technical difficulties operating in a deep pelvis. Development of robotics in surgery has overcome some of these limitations, thus introducing advantages as three-dimensional visualization, tremor filtering and motion scaling, enhanced dexterity and superior precision. However, some disadvantages of robot-assisted laparoscopic procedures must be considered, such as the loss of haptic feedback, the limited range of movement of the robotic harms, the increased operative time and the higher costs. Thus, the theoretical advantages and disadvantages of robotic surgical procedures might be carefully considered in order to justify the higher costs of robotic assistance.

There are few publications comparing robotic rectopexy (RR) and laparoscopic rectopexy (LR) to date in literature and there is no univocal conclusion about either technique is superior in terms of recurrence rate and post-operative outcome [10–15]. For this reason we have carried out a systematic review and meta-analysis of studies comparing robot-assisted with conventional laparoscopic rectopexy for rectal prolapse.

2. Materials and methods

A systematic review and a meta-analysis about the outcomes of RR compared to LR in patients undergoing elective rectopexy for rectal prolapse were performed.

A protocol was prospectively developed, detailing the specific objectives, criteria for study selection, approach to assess study quality, outcomes and statistical methods.

2.1. Study outcomes

The primary outcome of the study was to assess the incidence of recurrence of rectal prolapse in patients who underwent laparoscopic rectopexy with or without the use of robotic assistance.

The secondary outcomes were total operative time, intra-operative blood loss, conversion rate, post-operative complications, re-operation rate, hospital stay and post-operative mortality.

2.2. Search strategy and eligibility criteria

An unrestricted search was performed in MEDLINE, EMBASE, the Cochrane Library, and Google Scholar up to 30th June 2014. Research criteria included the terms “robotic”, “robot-assisted”, “laparoscopy”, “laparoscopic”, “rectopexy”, and “rectal prolapse”. Furthermore, reference lists of retrieved articles and review articles were searched manually for other relevant studies.

Two authors (RF and VF) independently performed the searches and reviewed all identified publications and abstracts for inclusion by using predetermined criteria. In order to be included in this review, studies needed to be reported on patients including what follows: number of patients who underwent RR and LR and incidence of recurrence in the two subgroups of patients. Disagreements were resolved by consensus with a third investigator (BM) and by means of discussion.

2.3. Data extraction and quality assessment

Data from included studies were independently extracted by 2 authors (VF and BW) and were confirmed by both. The following individual data were extracted for each study by using standardized extraction forms: general data (study design, year), characteristics of patients (number, gender, age, indication to surgery), main features of the interventions (surgical approach, total operative time, intra-operative blood loss, conversion rate), clinical outcome (post-operative complications, re-operation, hospital stay, post-operative mortality, recurrence of rectal prolapse).

The Meta-analysis Of Observational Studies in Epidemiology group checklist was used (MOOSE) [16]. The quality of studies was evaluated using the Newcastle–Ottawa quality assessment scale [17].

2.4. Selection of studies for meta-analysis

Data about patients with/without study outcomes and operated on with conventional/robot-assisted laparoscopy were required to be included in the meta analysis, thus allowing the creation of a 2×2 table.

2.5. Statistical analysis

We reported results according to fixed-effects model in absence of significant heterogeneity among the included studies. The appropriateness of pooling data across studies was assessed using the Cochran's χ-squared test and the I-squared test for heterogeneity which measures the inconsistency across the study results and describes the proportion of total variation in study estimates that is due to heterogeneity rather than sampling error. Statistically significant heterogeneity was considered to be present in case $p < 0.10$ and I squared greater than 50% [18]. Pooled odds ratios were reported with 95% confidence intervals (CIs). Funnel plots were used to assess for publication bias [19]. We planned to perform separate analyses of studies according to the different outcomes.

Analyses were performed using Review Manager 5.2 (The Cochrane Collaboration, Oxford, England).

The authors had full access to and take full responsibility for the integrity of all the data. All authors have read and agreed to the manuscript as written.

3. Results

Overall 6 studies were found: 3 retrospective studies [10–12], 2 pair-matched studies [13,15] and 1 prospective study [14]. The flow diagram for inclusion is shown in Fig. 1. A minimum of 33

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