Editorial

The role of robots in colorectal surgery and the difficulty of running reliable comparisons with conventional laparoscopy

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We read with great interest the recently published study by Pinar and colleagues. In their piece "*Long-Term Outcomes of Robot-Assisted Surgery in Patients with Colorectal Cancer*", the authors examine the oncological outcomes of patients receiving surgery for colorectal cancer (CRC) with curative intent (1). The authors have compared the outcomes of conventional laparoscopic surgery and those of robotic surgery with the aim of evaluating the relative survivals of the two techniques. They should be congratulated on their timely report, especially due to the relative paucity of specific analyses upon the argument (2-4).

Indeed, with special reference to oncological outcomes, during the last decade a number of studies have explored possible advantages of robotics over standard laparoscopy with respect only to immediate results (5-8).

Thus, the presented data are important.

The authors performed a nationwide register-based analysis and eventually included information about more than 9,000 CRC patients receiving minimally invasive, elective surgery over a 6-year period [2010–2015]. On total, nearly 5.5% of patients with colon cancer and 14% of patients with rectal cancer were offered robotic surgery. The robotic and laparoscopic group were substantially well-matched on most baseline patients' characteristics and tumor staging in the case of colon cancer. On the contrary, with regard to rectal surgery there were significant differences between the two techniques in terms of T and N status at the time of surgery, administration of neoadjuvant treatment and gender (patients in the robot group were more often men compared to those in the laparoscopic group).

Overall, the study by Pinar *et al.* did not reveal any difference between conventional and robotic laparoscopy on disease-free and overall survival. This data is consistent to what is currently available from the very recent literature (3-5). Actually, also the highest-level evidence comparing laparoscopy with the robot in performing colorectal surgery fails to show any clinically relevant oncological advantage (2-4,6,7).

However, we believe that some aspects of the study need further consideration.

The oncological outcomes provided by the authors are derived from a national database, without direct clinical assessment of each patient. Although its reliability is supposed to be high (1), it would be interesting to have some more specific cancer-specific results about immediate pathological data (3).

First, there is no mention of the percentage of patients with colonic cancer who received R-zero resection. Interestingly, the same group recently reported on an impressively large number of patients receiving minimally invasive surgery (laparoscopic *vs.* robotic) for CRC. The authors were able to collect the data of nearly 13,000 patients via the same national clinical database by the Danish Colorectal Cancer Group (8). Patients with both colonic (both right and left locations) and rectal malignancies receiving surgery with curative intent were included in the analysis. Invariably, pathologic examination did not return R-zero resection in more than 10% of cases, irrespective of the technique employed. The oncological outcomes reported by Pinar *et al.* should be thus interpreted with caution, as >10% of positive resection margins

following right and left minimally invasive hemicolectomy performed with curative intent is quite high (9). With special reference to rectal resection, there is a robust and growing evidence indicating that the plane of mesorectal excision can be used as a good predictor of the risk of local and distant recurrence, with strong correlation with long-term survival (10-12). Again, Pinar *et al.* did not report any data about resection quality in rectal cancer patients. Despite this, interestingly the use of the robot was associated with an increased odd ratio (OR) of receiving R-zero resection (OR: 1.45; 95% confidence interval, 1.04–2.00, P= not available) in the abovementioned study comparing pathologic outcomes between laparoscopic and robotic surgery (8). Indeed, some possible oncological advantages of using robotic platform have been indicated by a number of studies published over the recent years. Xiong *et al.* published an interesting meta-analysis revealing a statistically significant difference in favor of the robot with regard to the rate of circumferential resection margin (CRM) involvement (2.7% *vs.* 5.8%) (5). Araujo *et al.* reached similar data within a literature review investigating the oncological outcomes following robotic tumor-specific mesorectal excision. Overall, the authors noticed a trend toward lower CRM involvement with the robot as compared to standard laparoscopic or open surgery (6). Similar tendency has been confirmed in a recent systematic review with meta-analysis of all available randomized controlled trials comparing laparoscopic to robotic surgery (13). In this comprehensive analysis by Prete *et al.* the robot showed a lower risk ratio (RR) of returning an incomplete mesorectal sheats (RR: 0.92) or a circumferential margin positivity (RR: 0.82) at pathologic evaluation, although this difference did not reach statistical significance.

Finally, for the entire cohort it would be interesting to know about the extent of lymphadenectomy. In particular, it should be indicated what type of lymphadenectomy was performed for each patient according to tumor location and surgical procedure and whether any difference did exist between robotic and laparoscopic resections. Moreover, it should be evaluated how many patients (and how many in each group) had adequate amount of lymph nodes harvested to allow for an appropriate tumor staging (i.e., at least 12). This data is significantly correlated not only with appropriate tumor stadiation but also with improved survival, irrespective of neoadjuvant treatment in the case of rectal malignancy (10,14,15).

At this regard, by analyzing carefully the data provided by the authors of the recently published randomized controlled trial by Kim *et al.* comparing robot-assisted *vs.* laparoscopic surgery for rectal cancer, it is evident that the number of harvested lymph nodes was significantly higher with the robot and that significantly less patients in the robot group received inadequate lymphadenectomy. Interestingly, in this trial all procedures were performed by two expert colorectal surgeons, both of whom having behind the impressive experience of more than 500 laparoscopic total mesorectal excision (TME) procedures at the time of trial initiation. On the contrary, they had experience of robotic surgeries in about only 30 patients (4).

About this, one further aspect should not be underestimated.

Actually, currently most surgical equips are still at an early stage of their advanced minimally invasive surgery program, especially with regard to the use of the robot. Particularly, most leading teams worldwide have consolidated experience either in laparoscopic or in robotic surgery. As a consequence, reliable comparisons are still difficult to be run (16,17). With reference with the recently published ROLARR trial, (Robotic *vs.* Laparoscopic Resection for Rectal Cancer) this issue has been timely pointed out by Alfieri and colleagues (16). Some participating surgeons where still in their learning phase of robotic surgery, and several recruiting teams were likely to be at low-volume centers. This is suggested also by a relatively high incidence of intraoperative complications and postoperative morbidity in the group of patients who received surgery with the robot. Similar issues arise by evaluating nearly all prospective, randomized evidences comparing the robot with conventional laparoscopy on colorectal surgery (4,18). Park *et al.* (18) have recently analyzed the long-term oncologic outcomes following robotic *vs.* laparoscopic right colectomy. At the time of trial initiation (September 2009), the leading surgeon had the impressive experience of having already performed more than 400 laparoscopic right colectomy for malignancy. Contrariwise, his experience was of about 30 cases of robotic procedures.

During the last decade there has been perhaps too much enthusiasm surrounding the introduction of robotic systems for the surgery of the colon and rectum (2-4). Indeed, according to the available literature potential advantages over conventional laparoscopy have been indicated only with respect to functional outcomes (2,5,7,13) and specific subgroups of surgical patients (19-23). Nevertheless, it is evident that with oncological implications in particular, large, robust and reliable data is still needed to reach

definitive conclusions.

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Footnote

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