

New Trends in Robotic Colorectal Surgery

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Robotic surgery developed exponentially over the last few years, as can testify the increasing number of publications related to this topic [1]. In parallel, in the colorectal field, numerous articles have been published [2], confirming the interest of the surgical community for the robotic approach. Right [3,4] or left [5] robotic colectomy has been reported feasible and safe, even if clear advantages over standard laparoscopy are still awaited and are still a matter of debate [6]. On the other hand, rectal resection might be a better indication for robotics. Indeed, operating in a deep and narrow space is recognized to be challenging by a standard approach. Robotic technology might thus improve the outcomes in this situation. Several authors and reviews have reported very interesting results [2,7], even if a large randomized study is still needed [8].

Recently, robotic single-site surgery has been introduced with success in almost all surgical fields [9]. Thanks to this new robotic platform, robotic single-site cholecystectomy has been proven feasible and safe [10,11], and probably easier than its laparoscopic counterpart [12]. For colorectal resection, the experience is still limited but promising. Even if preliminary, right colectomy has been reported with encouraging results [13-15]. In cases where a specimen extraction is required, a single-site approach might be a good option.

The development of image-guided surgery is another field with growing interest in colorectal surgery. As it was demonstrated for biliary surgery [16,17], the introduction of a new robotic near-infrared camera using indocyanine green (ICG) showed promising results. Indeed, ICG can be used to assess the vascularization of the colorectal anastomosis either by laparoscopy [18] or by robotic surgery as recently reported by Jafari et al. [19]. Indeed, they found a reduction in terms of anastomotic leak (6% in ICG group versus 18% in control group) for low anterior resection. In addition, Hellan and colleagues [20] showed that fluorescence imaging provides additional data motivating to change the bowel transection location in 40% of patients. Moreover, ICG might be useful to identify the sentinel lymph node [21]. If today the exact role of this sentinel lymph node for colorectal cancer is not clearly elucidated, it might be an interesting direction for further research [22]. We could imagine customizing the management according to the result of intraoperative pathology. For example, in case of negative sentinel lymph node, a simple resection might be enough from an oncological point of view, as it was demonstrated for breast cancer. Of course, this strategy is purely hypothetical for colorectal cancer today, but might become a standard of care in a near future. In addition, by associating preoperative radiological images to intraoperative view, augmented-reality or virtual-enhanced world is another developing field of interest. The robotic technology is the perfect interface to create this augmented reality environment, as reported for several other indications [23-25]. For colorectal surgery, we have recently shown the interest of augmented reality for the intraoperative evaluation of the colonic vascularization [26]. The same might be true for ureteral identification.

Another field of interest is the development of robotic transanal surgery for total mesorectal excision (TME). Recently, Atallah et al. [27] have reported their initial experience with this approach that could be interesting for low rectal cancer. Especially in obese male patient, a

“reverse” TME might be a good option to avoid an abdominoperineal amputation, while assuring a good distal margin. Obviously, the treatment of selected low rectal tumor is evolving. The development of the transanal resection was seen as a valid option for low grade tumors, especially in comparison to more aggressive treatment (low anterior resection or abdominoperineal resection) [28]. However, the standard transanal endoscopic microsurgery (TEM) and more recently the transanal minimally invasive surgery (TAMIS) have drawbacks that could be overcome by the robotic technology. Few centers have reported their preliminary experience with this approach [29,30]. The results are more than promising and clearly robotic TEM requires larger studies to draw more consistent conclusions.

We live currently a fascinating period of time, especially in the field of robotic colorectal surgery. Many developments and technological innovations are tested every day, often with success. Even if strong evidences are still waited, the driving force and the interest are clearly present and should help to support these efforts.

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