UPDATES IN MINIMALLY INVASIVE SURGERY FOR MANAGEMENT OF RECTAL TUMORS

Essay

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List of Abbreviations

AJCC ..... American Joint Committee on Cancer

APR ..... Abdominoperineal resection

CAP..... College of American Pathologists

CAPR ..... Conventional abdomino-perineal resection

CEA ..... Carcino embryonic antigen

EMR ..... Endoscopic Mucosal Resection

ERUS ..... Endorectal ultrasound

FOBT ..... Fecal Occult Blood Testing

GPS..... General practitioners

HCG..... Human chorionic gonadotropin

MRI ..... Magnetic resonance imaging

PET ..... Positron Emission Tomography

TAR ..... transanal resection

TME ..... Total mesorectal excision

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Abstract

Worldwide, colorectal cancer represents 9.4% of all incident cancer in men and 10.1% in women. Colorectal cancer, however, is not uniformly common throughout the world. There is a large geographic difference in the global distribution of colorectal cancer. Colorectal cancer is mainly a disease of developed countries with a Western culture**.** In fact, the developed world accounts for over 63% of all cases. The incidence rate varies up to 10-fold between countries with the highest rates and those with the lowest rates. It ranges from more than 40 per 100, 000 people in the United States, Australia, New Zealand, and Western Europe to less than 5 per 100, 000 in Africa and some parts of Asia. However, these incidence rates may be susceptible to cancer, and these rates change with time. In parts of Northern and Western Europe, the incidence of colorectal cancer may be stabilizing, and possibly declining gradually in the United *States***.**

Laparoscopic resection results in more cosmetic appealing incisions, decreased analgesic requirements, and earlier return of patients to functionality. The use of this minimally invasive surgical technique found its way into colon and rectal surgery. Although it was accepted relatively quickly for surgical treatment of benign disease, the application of laparoscopic technique to colorectal malignancy was initially steeped in controversy because of concerns over port site recurrences and oncologic adequacy. This prompted the initiation of several randomized *trials***.**

In the current stage of minimally invasive surgery, laparoscopic surgery for colon cancer has been established as oncologically equivalent to conventional open surgery. The advantages of laparoscopic surgery have translated into smaller incisions and shorter recovery. However, the narrow confines of the bony pelvis and angling limits in current stapling technology, along with the standard practice of autonomic nerve-sparing total mesorectal excision, have made laparoscopic surgery in the setting of rectal cancer more challenging. The available literature focusing on laparoscopic resection for rectal cancer has been predominantly retrospective in nature, with a limited number of prospective studies**.**

Basic science research and large randomized controlled trials are now demonstrating that these fears were unjustified. The laparoscopic approach, however, involves a steep learning curve and requires the surgeon and ancillary operating room staff to have advanced skills in *laparoscopy***.**

The number of prospective randomized trials addressing laparoscopic rectal cancer resection is limited. In the largest trial, the UK Medical Research Council (MRC) trial of conventional versus laparoscopic-assisted surgery in colorectal cancer, an initial increased rate of positive circumferential margins within the laparoscopic anterior resection cohort, although non-significant, raised concerns regarding its oncologic adequacy. These concerns did not translate into a difference in local recurrence at 3 years. Improved short-term outcomes, including quicker recovery times, shorter hospital stays, and reduced analgesic requirements (albeit at the price of longer operative times and higher overall cost), have been demonstrated in some studies**.**

Keywords: Laparoscopic Resection, Minimaly Invasive Surgery, Colorectal Cancer, Robotic Surgery

Introduction

Management of rectal cancer has markedly evolved over the last two decades. New technologies of staging have allowed a more precise definition of tumor extension. Refinements in surgical concepts and techniques have resulted in higher rates of sphincter preservation and better functional outcome for patients with this malignancy. Although, preoperative chemo radiotherapy followed by total mesorectal excision has become the standard of care for locally advanced tumors, many controversial matters in management of rectal cancer still need to be defined. These include the feasibility of a non- surgical approach after a favorable response to neoadjuvant therapy, the ideal margins of surgical resection for sphincter preservation and the adequacy of minimally invasive techniques of tumor resection ***(Damin and Lazzaron 2014).***

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lowest rates. It ranges from more than 40 per 100, 000 people in the United States, Australia, New Zealand, and Western Europe to less than 5 per 100, 000 in Africa and some parts of Asia. However, these incidence rates may be susceptible to cancer, and these rates change with time. In parts of Northern and Western Europe, the incidence of colorectal cancer may be stabilizing, and possibly declining gradually in the United *States* ***(Jemal and Thun, 2008).***

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the bony pelvis and angling limits in current stapling technology, along with the standard practice of autonomic nerve-sparing total mesorectal excision, have made laparoscopic surgery in the setting of rectal cancer more challenging. The available literature focusing on laparoscopic resection for rectal cancer has been predominantly retrospective in nature, with a limited number of prospective studies ***(Ftow and Weiser, 2010).***

Basic science research and large randomized controlled trials are now demonstrating that these fears were unjustified. The laparoscopic approach, however, involves a steep learning curve and requires the surgeon and ancillary operating room staff to have advanced skills in *laparoscopy* ***(Berends and Kazemier 1994).***

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times and higher overall cost), have been demonstrated in some studies ***(Row and Weiser 2010).***

Since its inception in 2009, transanal minimally invasive surgery has been used increasingly in the United States and internationally as an alternative to local excision and transanal endoscopic microsurgery for local excision of neoplasms in the distal and mid rectum. Despite its increasing acceptance, the clinical benefits of transanal minimally invasive surgery have not yet been validated ***(Albert et al., 2013).***

The pace of innovation in the field of surgery continues to accelerate. As new technologies are developed in combination with industry and clinicians, specialized patient care improves. In the field of colon and rectal surgery, robotic systems offer clinicians many alternative ways to care for patients. From having the ability to round remotely to improved visualization and dissection in the operating room, robotic assistance can greatly benefit clinical outcomes. In the field of colon and rectal surgery, robotic systems offer clinicians many alternative ways to care for patients. From having the ability to round remotely to improved visualization and dissection in the operating room, robotic assistance can greatly benefit clinical outcomes. Although the field of robotics in surgery is still in its infancy, many groups are actively investigating technologies that will assist clinicians in caring for their patients. As these technologies

evolve, surgeons will continue to find new and innovative ways to utilize the systems for improved patient care and comfort ***(Pucd and Beekley 2013).***

Aim of the Work

This work aims at reviewing different methods of management of rectal tumors using minimally invasive techniques rather than traditional ways of surgical management.

Anatomy of Rectum

The rectum varies in length with age, sex and body habits. It starts opposite the third sacral vertebra, but the surgeons describe it at the beginning of sacral promontory ***(Fozard et al., 2006).***

The length of the rectum varies from 12.5 -15 cm. It ends 2 to 3 cm in front and below the tip of coccyx backward. It passes through the levator muscles to form the anal canal which has an average length of 3 to 4 cm and terminates at the anal orifice or anus ***(Goligher et al., 2007).***

Posterior to the rectum in the median plane are the lower three sacral vertebrae, coccyx, median sacral vessels and branches of superior rectal vessels. While on each side are the anterior rami of the lower three sacral and coccygeal nerves, sympathetic trunk, lower lateral sacral vessels and levator ani muscles. The rectum is attached to the sacrum along the lines of the anterior sacral foramina by fibro-areolor tissue enclosing the sacral nerve and pelvic splanchnic nerve from the anterior rami of the second to the fourth sacral nerves which join the pelvic plexus on the rectal wall, rami of superior rectal vessels, lymphatic vessels, lymph nodes and loose perirectal fat ***(Williams et al., 2009).***

Anteriorly in males and above the site of peritoneal reflection from the rectum are the upper part of the base of the bladder and of the seminal vesicle, the rectovesical pouch and its

content [Terminal coils of ileum and sigmoid colon]. Below the reflection, the lower part of the ureters and prostate. In females above the reflection are the uterus, cervix, upper part of posterior vaginal wall, rectouterine pouch and its content [Terminal coils of ileum and sigmoid colon] while below the reflection lies the lower part of the vagina. Laterally the upper part of the rectum is related to the pararectal fossa while below the peritoneal reflection laterally are the pelvic sympathetic plexuses and levator ani and branches of superior rectal vessels (Fig., 1, 2) ***(William et al., 2009).***

Curves of the rectum:

Anteroposterior curves: As the rectum penetrates the pelvic diaphragm to become the anal canal it angles anteroposteriorly at approximately 90 degrees. The lateral curves are usually three, the uppermost and the lowermost being both convex to the right while the middle one is convex to the left. The angulation of the bowel on the concave side of each of these curves is accentuated by infolding of the mucosa known as Houston valves. So there are upper and lower valves on the left side known as Kohlrausch fold. It is situated about the same level as the anterior peritoneal reflection. The part of the rectum lying a wider lumen than has the intraperitoneal part, this dilated lower portion is known as the ampulla of the rectum (Fig.3)