CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.2549687

Available online at: http://www.iajps.com ***Review Article***

TREATMENT OF COLORECTAL CANCER WITH MINIMAL INVASIVE SURGERY TECHNIQUE

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Abstract:

The purpose of this review is to sum up current information relating the types and use this minimally invasive surgery for colorectal cancer. This narrative review was performed using electronic medical databases; PubMed, Embase, and Google scholar, searched was targeting relevant studies concerned with Treatment of colorectal cancer with minimal invasive surgery published up to the end of 2018. The main goal of minimally invasive surgery is to lower intraoperative injury. Mini-invasive surgical procedure has actually been shown to be secure and feasible for colon cancer and also caused boosted short-term end results as well as equal oncologic end results when compared to open surgical procedure. Mini-invasive surgery for rectal cancer cells has actually not been definitively identified, however the results of recurring, multicenter, randomized, controlled tests will offer us conclusive responses.

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Please cite this article in press Mohammed Saad alshammari et al., ***Treatment of Colorectal Cancer With Minimal Invasive Surgery Technique.,*** *Indo Am. J. P. Sci, 2019; 06(01).*

INTRODUCTION:

Colorectal cancer is the 4th most deadly cancer in the world, since 700 000 people die of colorectal cancer cells annually [1]. Incidence and also death rates of colorectal cancer cells are still going up rapidly in many countries with the exception of some of one of the most developed countries on the planet [2]. In recent times, laparoscopic surgery has acquired raising approval and use for CRC treatment beyond clinical tests since the first report of this minimally invasive surgery (MIS) in 1991 [2]. Based upon the effects from both randomized medical tests (RCTs) and observational research studies, application of MIS for resection of colon cancer is as effective as open resectional surgery (ORS) without any negative impact on the total and disease-free survival rate of individuals [3], [4]. Moreover, there is proof that laparoscopic surgical treatment in CRC people is related to reduced mortality, lower difficulty rates, and a much shorter median length of health center stay. Recent studies indicate benefits of this treatment also among older patients, sophisticated stage, as well as incurable people [3].

Nevertheless, there are additionally some controversies concerning the temporary and also long-term advantages of MIS in comparison with ORS [5]. Application of MIS in therapy of CRC might be limited by several elements, including surgeons' experience, and also clinical conditions of people such as prohibitive abdominal adhesions and severe bowel obstruction [5]. Furthermore, significant debates surrounded the application of MIS for resection of transverse colon cancer as well as for proctectomy in rectal cancer cells people [5]. There are also some patient-specific elements such as high BMI, older age, and disease-specific elements such as T4 cancers cells that commonly result in conversion of MIS to open surgery in treatment of CRC patients. Conversion of MIS to open surgical treatment has actually been reported to occur in greater than 20% of colon cancer and more than 40% in rectal cancer treatment [4]. Allaix et al reported that conversion of MIS per se is though not connected with even worse early postoperative end results or adverse lasting survival of patients. However, unfavorable results after converted MIS have additionally been reported [6].

Since the introduction of laparoscopic surgical procedure, minimally invasive strategies have been extensively used throughout numerous specialties for both benign and malignant conditions. The purpose of this review is to sum up current information relating the types and use this minimally invasive surgery for colorectal cancer.

METHODOLOGY:

This narrative review was performed using electronic medical databases; PubMed, Embase, and Google scholar, searched was targeting relevant studies concerned with Treatment of colorectal cancer with minimal invasive surgery published up to the end of 2018. Search strategy restricted to only English language articles and no restriction to human since animal model studies were included. More search was performed through the references list of the included articles.

DISCUSSION:

- **Minimally Invasive Surgery**

Throughout the last 10 years, minimally invasive surgery has actually affected the strategies made use of in every specialty of surgical medicine. This growth has not only resulted in the replacement of conventional procedures with minimally invasive ones, however has additionally stimulated surgeons to reevaluate conventional strategies when it comes to perioperative parameters such as ache medication. However, two major drawbacks have emerged with the introduction of this brand-new method: to start with, the extended knowing contour for most surgeons, in comparison with the knowing process in open surgery; and also second of all, increased costs because of investment in the tools required and also the use of disposable tools, along with longer operating times. In the numerous health care systems all over the world, these raised costs are not constantly compensated for by shorter hospital keeps. As mini-invasive surgery for colorectal cancer gains appeal around the globe, several technologic innovations have actually been made (Table 1). Robotic surgical procedure is an emerging modern technology that offers 3-dimensional imaging, tremor filtering, and motion scaling [7]. With these advantages, robotic rectal cancer cells resection might get over the constraints of traditional laparoscopic surgery. With the development of laparoscopic methods and also the development of new medical devices, scarless surgical procedure is becoming significantly preferred. In single-incision laparoscopic surgery (SILS), also called single-port laparoscopic surgical treatment, the surgeon operates with a single entry point with a single incision of just 25-30 mm. Several research studies have found that colorectal SILS is practical and secure as well as requires a substantially shorter total skin incision [8], [9]. An additional development is natural orifice specimen extraction (NOSE). For this procedure, the sampling is extracted from an all-natural orifice such as the vaginal area or anus; for that reason, an extra incision in the abdominal wall is not needed.

Numerous research studies validate that NOSE is a safe and effective technique with appropriate complication rates [10-12]. The final advancement is natural orifice transluminal endoscopic surgery (NOTES). NOTES is the only kind of surgical procedure that does not have scarring of the abdominal wall, hence, NOTES might stand for the following action in the advancement of mini-invasive surgical procedure [13].

Table 1. Advantages and disadvantages of different mini-invasive surgical techniques for colorectal cancer [7-33].

Surgery pattern	Advantages	Disadvantages
Conventional laparoscopic surgery	Relatively cheaper, a mature technology, shorter operation time	Steep learning curve, requires an abdominal wall incision, tremor, 2-dimensional vision, poor ergonomics, requires a skilled assistant, and limited degrees of freedom of the instruments
Robot-assisted laparoscopic surgery	Three-dimensional vision, 7 degrees of freedom of the instruments, enhanced ergonomics, tremor filtration, superior dexterity, less steep learning curve	Lack of tactile sensation and tensile feedback, expensive, limited intracorporeal range of motion, long operation time
SILS	Smaller abdominal wall incision, better short-term outcomes	High cost, requires specific articulated instruments, steep learning curve
NOSE	No need of an abdominal wall incision or specific devices, better short-term outcomes.	Not suitable for every patient, risk of intraabdominal contamination and extraction site tumor implantation, highly variable in operative steps and devices.
NOTES	No scar on the abdominal wall, avoidance of incision-related complications, less impairment of the peritoneal immune system.	Risk of abdominal infection, hernia, and extraction site tumor implantation, difficulty in achieving a stable operating field, unavailability of adequate instrumentation.

- **Laparoscopic Colorectal Surgery**

The use of the laparoscopic method is expanding in colorectal surgery, and also in some specialized centers it has actually mainly replaced open colorectal surgical treatment for a number of indications. A significant problem is the discovering stage and also its troubles. A huge possible multicenter trial is being accomplished to investigate the relationship between experience and also the results of therapy [14]. This multicenter test, in which 1658 people were included in between 1995 as well as 1999, was carried out by the Laparoscopic Colorectal Study Group in Germany. Two teams of surgeons were contrasted: the first had experience with more than 100 laparoscopic colorectal operations, and also the 2nd included institutions as well as surgeons with less than 100 procedures. In the knowledgeable group, there were more treatments entailing the rectum (26.7 % vs. 9.5 %), as well as significantly a lot more cancers were operated on (37.3 vs. 17.3%). This group performed a lot more technically tough procedures, but patient characteristics such as age, sex, and also height, in addition to the postoperative death as well as morbidity rates, were similar. The writers end that laparoscopic colorectal surgical procedure is technically requiring, but can be performed by those with good training, with low rates of morbidity and death. It must be emphasized that the knowing curve for such treatments is longer than for other laparoscopic operations, as well as is additionally longer than for the equal open operations [15]. In another research, the cut-off point for early as well as late experience was evaluated 30 instances [16]. In a comparison between even more experienced and also less knowledgeable surgeons, it was shown that more males were operated on by the experienced group, and there were trends toward decreasing rates of

intraoperative problems as well as of conversion to open surgical treatment. The typical operating time and also hospital stay differed significantly in favor of the skilled group.

An important medical concern is the necessity for converting a laparoscopic procedure to open surgery. Schlachta et al. focused on this question, and developed a scoring system based upon experience in 367 laparoscopic colorectal resections [17]. Three elements were found to be predictive of the threat of conversion to open surgical procedure: a diagnosis of malignancy, experience of 50 situations or fewer for the surgeon, and also the patient's weight. This info could be used by much less skilled laparoscopic cosmetic surgeons to leave out such people throughout the very early training stage. One more interesting research was released by the exact same group, contrasting the end result with laparoscopic overall abdominal colectomy and proctocolectomy in comparison with the comparable open treatments. Thirty-seven laparoscopic procedures were compared with 36 open approaches. The operating time with the laparoscopic strategy was substantially much longer, however the hospital remain was significantly much shorter (6 vs. 9 days; $P < 0.001$). There were fewer injury complications and cases of postoperative pneumonia in the laparoscopic group. These findings support the view that a trained cosmetic surgeon can execute laparoscopic colorectal surgical treatment with a reduced complication rate, and that people can benefit from this method [18].

The indications can also be increased to consist of minimally invasive strategies for Crohn's disease [19]. Another intriguing facet is the combination of versatile endoscopy and also laparoscopy assisted colonoscopic polypectomy, which opens future perspectives for collaboration between surgeons as well as gastroenterologists [19]. Colonoscopic polypectomy can be assisted in by activating different locations of the colon laparoscopically; this helps in presenting the locations in which polyps are located, along with allowing straight repair of potential polypectomy sites that remain in threat of opening.

- **Single-Incision Laparoscopic Surgery**

The decrease of the number of access ports as opposed to conventional laparoscopy (CL) brought about the development of single-port laparoscopic surgical procedure. It was originated by Pelosi that initially reported on SILS hysterectomy in 1992 [20]. The initial colorectal operations which were accomplished using this technique were the treatment of appendicitis and also sigmoid diverticulitis [21]. In today's practice, those methods remain to increase but still have restrictions [21]. By direct contrast to multi-port laparoscopy, the complying with drawbacks need to be pointed out: lack of triangulation; different, sometimes uneasy setting for the surgeon; no ergonomic position for the assistant; restricted variety of working instruments; restricted external functioning area; demand for added unique equipment, which subsequently expands running time as well as lengthens the finding out curve [22]. New operative tools were essential to boost this technique, e.g. long scope with 5-mm diameter, curved laparoscopic instruments, verbalized instruments and so on. The selection of tools available on the market for single-port technique rapidly boosted in 2012 [23]. Today, both techniques, i.e. CL and also SILS, are also successfully made use of in oncological colon surgery. It needs to be noted that because its growth, SILS revealed only modest expanding dynamics. The complexity of oncological techniques resulted in minimally intrusive operations being special and also really tough.

- **Robot-assisted Laparoscopic Surgery**

Although laparoscopic surgery for colorectal cancer has been extensively studied, mini-invasive surgery for colorectal cancer cells is still underused [25]. An essential reason for this is the steep discovering contour of this strategy [25]. In addition, a few other constraints that hinder the growth of laparoscopic surgery include tremor, 2-dimensional vision, poor ergonomics, the demand of an experienced assistant, and also the limited degrees of liberty of the instruments [26]. Robotic surgery is believed to be able to get rid of these constraints by offering 3-dimensional vision, 7 degrees of freedom of the tools, improved ergonomics, tremor filtration, and superior dexterity [7]. These advantages of robot surgical treatment make it exceptionally ideal for pelvic dissection, especially for individuals with a slim pelvis and/or local advanced disease. Nevertheless, the limited intracorporeal range of motion prevents its usage in colon cancer [24]. Moreover, when compared to laparoscopic colectomy, robotic surgical treatment shows no substantial benefits and also is associated with greater expense and also longer operation time [24]. Robot systems could be utilized for complex procedures, such as the dissection of lymph nodes around significant vessels because of its shake filtering as well as premium dexterity [7].

- **Natural Orifice Specimen Extraction**

In conventional laparoscopic surgery, a short-length incision is required to remove the medical specimen as well as perform the anastomosis, which may trigger some additional complications contrasted to a

totally laparoscopic treatment [21]. To prevent an incision in the abdominal wall surface, one remedy is to remove the specimen through a natural orifice, such as the vagina or anus. This strategy is described NOSE and is believed to be a bridge to NOTES. Transanal extraction is suitable for left-sided colectomy and also rectal surgical procedure, whereas transvaginal extraction is suitable for all colorectal treatments, especially for right-sided colectomy as well as large specimens. Several studies found that NOSE was risk-free and also feasible for chosen people [21]. Park et al. carried out a case-control research study that compared the clinical outcomes of transvaginal sampling removal with those of traditional laparoscopic colectomy for the medical therapy of colon cancer cells [27]. The medical morbidity was lower in the NOSE group compared to the conventional group although the distinction was not significant (4/34 vs. 9/34, P = 0.119). Both the transvaginal access site recurrence rate and also posterior colpotomy-related difficulty rate were 0% (0/34) after a median follow-up of 23 months. Moreover, NOSE was associated with a lower pain score, much shorter hospital keep, and much better cosmetic outcomes. Franklin et al. reported the outcomes of 303 patients that undertook laparoscopic colon treatments with NOSE (27 transanal as well as 26 transvaginal) for specimen extraction [28]. The results showed that NOSE was a secure and viable technique for selected patients, as well as the rate of postoperative issues was as low as 3.6%.

- **Natural Orifice Transluminal Endoscopic Surgery**

The final objective of mini-invasive surgical treatment is the so-called "scarless" surgery. NOTES, which produces a visceral incision instead of skin incision to get right into the peritoneal cavity, fulfills the requirements of scarless surgical procedure [29]. The prospective advantages of NOTES include improved cosmesis, faster recovery time, lowered pain, and also avoidance of incision-related complications. Because of these benefits, NOTES is thought to be the following step in the development of mini-invasive surgical treatment [29].

Currently, most NOTES treatments in colorectal cancer cells patients are experimental and use crossbreed techniques that incorporate NOTES with traditional laparoscopy. Furthermore, the majority of the studies are from single institutions with small sample sizes. To date, no prospective, randomized medical tests of NOTES for colorectal cancer cells have been released. Whiteford et al. first reported transanal NOTES sigmoidectomy in human cadavers in 2007 [30]. Since then, a number of research studies have shown the feasibility and safety of NOTES colectomy or TME making use of hybrid strategies in human patients [30]. Lacy et al. reported their effective transvaginal minilaparoscopy-assisted NOTES radical sigmoidectomy in a 78-year-old female with a sigmoid adenocarcinoma [31]. de Lacy et al. reported 20 people with rectal cancer that efficiently went through transanal minilaparoscopy-assisted NOTES TME with excellent short-term end results [32]. Recently, Leroy et al. were the first to report a pure transanal NOTES TME in a 56-year-old female with a midrectal neoplasia [33].

CONCLUSION:

The main goal of minimally invasive surgery is to lower intraoperative injury. Mini-invasive surgical procedure has actually been shown to be secure and feasible for colon cancer and also caused boosted short-term end results as well as equal oncologic end results when compared to open surgical procedure. Mini-invasive surgery for rectal cancer cells has actually not been definitively identified, however the results of recurring, multicenter, randomized, controlled tests will offer us conclusive responses. As laparoscopic surgery gains appeal, some developments that will conquer the current laparoscopic surgical procedure restrictions or additional decline abdominal wall surface trauma are underway. Although these advancements are currently experimental, they hold terrific promise and also represent the evolution of mini-invasive surgery.

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