

Colorectal Cancer Epidemiology and Surgical Management

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Abstract

Background: Colorectal cancer (CRC) is the third most common diagnosed and second deadliest cancer in both males and females. 80% of colorectal cancer patients undergo surgery for hope of cure but surgery outcomes mostly depend on the surgeon. Previous studies have found considerable variability between outcomes achieved depending on the surgeon.

Aim: In this review, we will look into the epidemiology, risk factors and surgical management of colorectal cancer.

Conclusion: Pre-operative care, surgical management, and adjuvant therapy has improved the outcomes for patients with colon cancer. Follow-up should be more intensive 2 years after surgical treatment. Continued oriented assessment of treatment strategies would be essential to drive the implementation of these evidence-based services for colorectal patients.

Keywords: Colorectal Cancer; Colon Tumor; Rectal Tumor; Surgical Management of Colorectal Cancer

Introduction

Colorectal cancer (CRC) is the third most common diagnosed and second deadliest cancer in both males and females [1]. Colorectal cancer denotes 9.4% of all men cancer cases and 10.1% in women. However, is not regularly common throughout the world as there is a geographic difference in distribution of colorectal cancer cases. It is approximated that 394,000 colorectal cancer deaths worldwide happen every year [2].

Risk factors of colorectal cancer include adenomatous polyps and polyps, family or personal history of colorectal cancer which increase risk for synchronous or metachronous colorectal primary cancer for up to 3 - 5% at five years [3]. Epidemiological previous findings suggest significant environmental and dietary correlations with colorectal cancer. Obesity, red meat, processed foods, smoking, and androgen deprivation treatment all has been linked with elevated risk of colon cancer without an increased risk of rectal cancer [4].

Transformation of the rectal epithelium into a dysplastic lesion and ultimately an invasive carcinoma involves a mixture of genetic mutations, either acquired or inherited over 10 to 15 year span [5]. Change in bowel habit, rectal bleeding, abdominal pain, and anemia are the most common presenting symptoms of colorectal cancer [6]. Pathological period is the most important prognostic factor in diagnosis of patients with colorectal cancer. Analysis of lymph nodes may suggest a less complete surgical procedure or an incomplete analysis of the pathological specimen, lead to an inaccurate "understatement" of the tumor and a potential absence of beneficial adjuvant therapy [7].

Several recommendations for the classification of colorectal diseases are available, as well as diagnostic criteria for the related lesions in the CRC community screening programs [8]. CRC classification is traditionally performed according to the histological subtypes as defined by WHO. Adenocarcinoma not otherwise specified is the most common subtype accounts for 85% of CRC cases worldwide followed by mucinous carcinoma which is characterized by the presence of mucinous lakes in at least 50% of the tumor area and accounts for 5 - 20% of CRC cases worldwide [9,10].

History taking and physical examination, including a digital rectal exam are the key points for diagnosis of CRC. Endoscopic inspection with rigid sigmoidoscopy is required for measuring distance between the lesion and the anal verge and for tissue biopsy to confirm rectal cancer. After rectal cancer is confirmed pathologically, an MRI or trans-rectal ultrasound is used to determine local tumor extension and node status accurately [11]. Ultrasound, computed tomography (CT), immune scintigraphy, and magnetic resonance imaging (MRI) can all provide evidence on cancer stage but none of them seems is very accurate [12].

80% of colorectal cancer patients undergo surgery for hope of cure but surgery outcomes mostly depend on the surgeon. Previous studies have found considerable variability between outcomes achieved depending on the surgeon. This is partially explained by accident variance, but exists until variations in the patient combination and the degree of the surgeon are taken into consideration [13,14].

Also, survival from colorectal cancer is greatly reliant on cancer stage at diagnosis which usually ranges from a 90% 5-year survival rate (in localized stage), 70% (regional stage), and 10% (for metastatic cancer) [15]. Previous study reported 70% total survival rate in many countries in North America and Western Europe during 5-year for patients diagnosed between 2010 and 2014, 60% or less for others, less than 50% in several countries in Africa, Asia, Eastern Europe, and South America and 40% in some of these countries [16]. In this review, we will look into the epidemiology, risk factors and surgical management of colorectal cancer.

Epidemiology

Dramatic increase in cases of colorectal cancer has been reported in elderly aged over 75 in the last 20 years. Colorectal cancer prevalence rates vary largely worldwide with the lowest prevalence in Africa and Asia and highest in Europe, North America, and Australasia. In UK; incidence of colorectal cancer among people at average risk is 5% and the age standardized incidence rate is 44.3 per 100 000 population [17]. The nations with the largest occurrence rates are Australia, New Zealand, Canada, the United States (incidence of colorectal cancer in the US in 2017 was 135,430 and deaths from colorectal cancer was 50,260) and parts of Europe. While countries like China, India and portions of Africa and South America are at the lowest risk [18,19]. The worldwide age-standardized incidence rate for CRC in 2018 was 23.1 per 100 000 in men and 15.7 per 100 000 in women as were an estimated 475 000 deaths from CRC in men and 387 000 in women [20]. New cases and deaths of colorectal cancer in US in 2020 are estimated as 104,610 (colon new cases cancer only), new cases of rectal cancer: 43,340, deaths: 53,200 (colon and rectal cancers combined) [21]. The prevalence rates for colon and rectal cancers are expected to rise by 90.0 percent and 124.2 percent, respectively, for patients between 20 and 34 years of age by 2030 [22].

Risk factors

Age is the most prevalent defined risk factor for colorectal cancer as 99% of cases aged more than 40 and 85% of the cases aged more than 60 [23]. The prevalence rate of people aged 60 to 79 years is more than 50 times higher than in those younger than 40 years [24,25]. Family history is the most common risk factor for colorectal cancer after age. Family adenomatous polyposis and inherited non-polyposis colorectal cancer are by far the most prevalent of family cancer syndromes accounting for 5 % or less of cases [26]. About 5 to 10% of colorectal cancers are the result of known genetic disorders [27]. However, 20% of those patients with colorectal cancer have other family members who have been affected by colorectal cancer. Clinical history of colorectal cancer or inflammatory bowel disease (IBD) elevate risk of colorectal by 3.7% in patients with ulcerative colitis and 2.5% for patients with Crohn's disease of contracting colorectal cancer

[28]. The risk of colorectal cancer in patients with inflammatory bowel disease has been estimated between 4- to 20-fold [29]. Almost 95% of colorectal cancers arise from these adenomas. Individuals with a history of adenomas are at greater risk of developing colorectal cancer than others with no history of adenomas [30,31].

Any other lifestyle-related risk factors may be minimized by adopting small lifestyle improvements in eating and physical activity patterns [32]. Diet has a strong impact on the risk of colorectal cancer, and improvements in dietary patterns could reduce up to 70% of this cancer burden. Fat high diet especially animal fat, are a major risk factor for colorectal cancer [33]. Large meat intake was also involved in the growth of colorectal cancer. A meta-analysis of sixty trials recently showed that intake of processed meat raised the total risk to the CRC with 1.12%, and 1.15% for refined meat consumption [29]. High temperature cooked meats result in the production of heterocyclic amines and polycyclic aromatic hydrocarbons which both of have carcinogenic properties. Dietary fiber intake might have been responsible for the geographic differences in the colorectal incidence rates [34].

A poor diet is also linked to obesity, which is another defined significant risk factor for colorectal cancer. However, the elevated risk associated with overweight and obesity does not seem to be simply a result of increased energy intake; it may indicate variations in metabolic effectiveness [35]. Several biological associations between overweight or obese and colorectal cancer have been reported as increased circulating estrogens and reduced insulin sensitivity, are thought to influence cancer risk, and are associated with excess abdominal adiposity independent of total body adiposity [36].

There is also much evidence that physical activity level is interrelated with risk of colorectal cancer, (higher physical activity leads to lower risk of developing colorectal cancer) [37]. Biological explanation for the relation between decreased physical activity and colorectal cancer is starting to be understood. Physical exercise increases the metabolic rate and increases the maximum oxygen absorption [38].

Tobacco cigarette smoking is extremely harmful to the colon and rectum as it has been reported that 12% of colorectal cancer deaths are attributed to smoking [39].

Diagnosis

Most CRC cases present with suspicious signs and symptoms (80%), asymptomatic, found by routine screening (11%), or incidental finding at an acute abdomen emergent admission (7%). Diagnosis with routine cancer screening is usually done during early stage compared to advanced disease of incidental surgical findings. Obstruction (57%), peritonitis (25%) and perforation (18%) are the most common symptoms of emerging surgery [40]. Regarding physical examination; colorectal cancer is associated with spectrum of symptoms, including blood in stools, change in bowel habits, abdominal pain, fatigue, anemia symptoms such as pale appearance and shortness of breath, and weight loss.

Tumor marker levels elevation such as Carcinoembryonic antigen (CEA) are not diagnostic of CRC. Colonoscopy is known to be the method of choice to diagnose colorectal cancer. Before starting any treatment, CT imaging of chest, abdomen and pelvis with contrast is needed for colorectal cancer staging which is usually done by using Primary Tumor size (T), regional lymph Node (N) and distant Metastasis (M) - TNM classification system [41].

Pathologists are responsible for the correct evaluation of clinical staging, search for prognostic criteria that are not used in staging, such as lympho-vascular and perineural invasions, evaluation of therapeutic results in patients undergoing neo-adjuvant treatment, analyzing histologic features of the tumors that are suggestive of microsatellite instability (MSI), selecting appropriate tissue sections for MSI testing and interpreting the results of these important therapeutic and prognostic tests [42].

Regarding histopathologic diagnosis of colorectal carcinoma; more than 90% of colorectal carcinomas are adenocarcinomas originating from epithelial cells of the colorectal mucosa [43]. Neuroendocrine, squamous cell, adenosquamous, spindle cell and undifferentiated

carcinomas are other rare types of colorectal carcinoma. Glandular formation characterizes conventional adenocarcinoma, which is the basis for histologic tumor grading. More than 95% of the tumor is gland forming in case of well differentiated adenocarcinoma. 50 - 95% gland formation is shown in moderately differentiated adenocarcinoma. Almost 70% of colorectal adenocarcinomas are diagnosed as moderately differentiated. Poorly differentiated adenocarcinoma is mostly solid with < 50% gland formation [44].

Surgical management overview

Surgery is the most common Management for all stages of rectal cancer. It is the backbone beneficial treatment for patients with non-metastasized colorectal cancer. Surgery of colon cancer includes the removal of a portion of the intestine and the supply of proximal and distal blood vessels to the lesion [45].

Several factors should be considered before directing a patient for surgery, such as age, fitness, tumor staging, and type of surgery and quality assurance. It is important to be informed about the whole colon to rule out synchronous cancers before surgery which occur in some 4% of patients [46]. Some cases may require perioperative placement of a stoma to divert feces into a bag on the outside of the body. Preoperative MRI imaging of the pelvis is recommended for pre-operative planning and to distinguish the tumor in relation to the mesorectal fascia, and to assess T stage in case of rectal cancer [47].

Circumferential surgical resection margins should gain special attention. Radiation therapy and/or chemotherapy is called neoadjuvant therapy and may be given before surgery to decrease tumor size to be removed easily and help with bowel control after surgery [48].

Resection provides the only chance of treatment in patients with colorectal cancer and is the safest method of palliation in most patients with incurable disease [49]. It is necessary to remove the rectum with cancer and nearby healthy tissue if the cancer has spread into the wall of the rectum and sometimes the tissue between the rectum and the abdominal wall is also removed [50]. It has been reported that the length of ileum does not influence the local recurrence rate in right-sided tumors [51]. Tumors in the cecum, the ascending colon, the hepatic flexion and the proximal transverse colon, the right branch of the middle colic artery are grouped with the right colic and the ileocolic arteries. Attention should be given to extending the resection of the colon only to the distal third of the transverse colon if the middle colic artery is bound at its root, a in order to ensure that the intestine is viable for anastomosis [52]. Tumors in the transverse colon may involve transverse colectomy or, at times, prolonged right colectomy where the cecum, the ascending colon, the hepatic flexion, the transverse colon, the splenic flexion, and the upper descending colon are removed along with the lymphatic drainage [53].

Appropriate resection of the lymph nodes is necessary for the proper staging and choice of adjuvant therapy. Whether a wide resection or prolonged resection is required is still contentious [54]. The lymph nodes near the rectum are removed and checked under a microscope for signs of cancer. Circumferential/radial margin must be bigger than 1 mm [55]. The basics of oncological ablation are the central vascular ligation of the main artery and the full mesocolic resection of the colonic segment concerned. Oncological resection involves the detachment of 12 or more lymph nodes [56].

Obstruction or perforation associated with colorectal cancer has an adverse effect on survival. The incidence of intestinal obstruction in the right colon has been associated with a slightly decreased disease-free survival, while obstruction in the left colon has had no such effect [57]. It has been hypothesized that the late stage of diagnosis rather than mechanical obstruction is that patients have a poorer prognosis, since cancers in the right colon will expand to a greater size and thus be present longer before they cause signs of obstruction [58]. Perforation and obstruction can also lead to electrolyte imbalance, dehydration, and infection, which add on to a surgical procedure, performed under emergent conditions [59].

Procedures used for obstructing cancers usually are two or three steps procedure. Resection of the obstructing lesion is done with a proximal ostomy [60]. The first step to be done is diverting stoma, resection is the second stage, and stoma takedown is the third stage. Choice of procedure must be adapted depending on the condition of the patient, experience of the surgeon, and comorbid conditions [61].

Colorectal tumors connected to nearby organs are not rare. Adhesions to the abdominal wall, duodenum, liver, small intestine, urethra, urinary bladder, uterus, and ovaries are more frequent in colon cancer [62]. Rectal tumors most often involve the uterus and the vagina, the urinary bladder, and the sacrum or coccyx. Surgery for these tumors must be carefully prepared so that tumors can be remedied even without disrupting the adhesion [63]. Also, when surgery involves anal sphincter removal, the patient is left with a stoma which can impair the quality of life. 60 to 80% of recurrences after curative surgery for colorectal cancer occur within the first 2-years of therapy. Postoperative chemotherapy increase survival rate after resection of stage two and some patients of stage three while preoperative chemo-radiotherapy improves survival compared with surgery alone for rectal cancer [64].

Conclusion

Pre-operative care, surgical management, and adjuvant therapy has improved the outcomes for patients with colon cancer. Follow-up should be more intensive 2 years after surgical treatment. Continued oriented assessment of treatment strategies would be essential to drive the implementation of these evidence-based services for colorectal patients.

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