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REVIEW ARTICLE

Surgical approach and geriatric evaluation for elderly patients with colorectal cancer

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Abstract

This review aims to define the most appropriate surgical approach and geriatric evaluation for elderly patients with colorectal cancer (CRC). Surgery represents the main treatment for CRC, but elderly cancer patients still represent a challenge for the surgeon due to frequent comorbidities such as cardiovascular and pulmonary diseases, which increase operative risk as well as the risk of postoperative morbidity and mortality. Cancer patients with comorbidities show lower survival rates and quality of life, together with higher healthcare costs. There is also evidence that patients with comorbidities sometimes receive modified treatment, compromising optimal care. To optimize treatment, the approach to elderly cancer patients needs a multidisciplinary team to assess preoperative conditions, prevent post-surgical complications and improve outcome, especially for frail patients. Laparoscopic surgery for CRC shows a number of advantages compared to conventional surgery such as less postoperative pain, rapid return to prior activities and a decrease in costs. Recent studies confirm that laparoscopic procedures could be performed safely on both older and younger patients with no difference compared with open surgery as regards morbidity or length of hospital stay.

Keywords Elderly · Colorectal cancer · Oncology · Cancer surgery

Introduction

The elderly population is increasing worldwide, mainly in developed countries, and about 50% of all cancers occur in this group, leading to death in 70% of cases [1]. The third most common neoplasm worldwide is colorectal cancer (CRC), with an incidence of 1.36 million/year; 50% of new diagnoses of CRC are made in subjects aged over 70 years [2], and 25% are aged over 80 years [3]. Surgical resection is still the main treatment for CRC. Despite improvements in surgical techniques, elderly cancer patients still represent a challenge for the surgeon [4], as older people often show comorbidities, such as cardiovascular and pulmonary diseases, which increase operative risk and the risk of postoperative morbidity and mortality [5]. Other factors contributing to poor outcome of surgery in the elderly are delayed presentation, more advanced disease [6] and emergency presentation [7]. Furthermore, this group of patients is significantly underrepresented in the randomized clinical trials because of careful selection, such as age restriction in study enrolment, good performance status and comorbidities [8]. The decision making to undergo surgery is not often preceded by an objective assessment of the patient's capacity to cope with the treatment, but it is based on the surgeon's experience, influenced by chronological patient age and by the well-known shorter life expectancies [9]. The aim of individual assessment is to tailor the best management to biological age, avoiding an under-treatment of fit elderly patients and an over-treatment of frail elderly patients [4]. As several studies have shown that age itself is not a direct risk factor of postoperative complications [10], elderly patients should have the chance of undergoing radical surgery. Moreover, many studies have demonstrated similar cancer-free survival rates in younger patients [10, 11]. Organ function decline, polypharmacy use, comorbidities, and nutritional status play important roles in quality of life and could be considered as predictors of the ability to tolerate cancer treatment [12–16]. The purpose of this review is to define

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the most appropriate surgical approach and geriatric evaluation for elderly patients with CRC.

Geriatric evaluation in elderly patients with CRC

The biggest challenge in the approach to cancer treatment in elderly patients is the wide range of their general health and functional capacity, as chronological age differs from biological age [17]. Furthermore, the cost/benefit ratio should be considered, otherwise cancer treatment could be detrimental to the quality of life or comorbidities may increase the risk of death, regardless of the presence of cancer [18]. One of the main goals of the patient is the maintenance of functional independence, thus, it is important to examine the possible predictors for long-term status maintenance [19]. In the preoperative stage, a geriatrician should be involved in the evaluation of elderly patients, indicating the conditions that could interfere in the cancer treatment or cause toxicity, and extend the time of postoperative rehabilitation. Therefore, the approach to elderly patients with cancer, frequently characterized by comorbidities and frailty, needs a multidisciplinary team to assess the preoperative conditions, prevent possible post-surgical complications and improve outcomes, especially for vulnerable patients [10]. The Comprehensive Geriatric Assessment (CGA) is a multidimensional assessment tool, frequently used in geriatric oncology settings; this tool involves many aspects of elderly life, such as depression and cognitive disorders, social isolation and economic status, balance, environment, comorbidities, frailty, geriatric syndromes, under-nutrition, and polypharmacy use [20, 21]. Some studies have demonstrated that abnormalities in preoperative geriatric assessment are related to the occurrence of adverse postoperative outcomes such as mortality, morbidity, prolonged length of hospitalization, and institutionalization [22]. Lee et al. have recently demonstrated that elderly patients with CRC, classified as high risk on the CGA, were associated with major postoperative complications [23]. The role of CGA and the selection of oncologic treatment was studied by Balducci, who divided patients into three groups depending on the severity of symptoms and signs [24]: Type I: functionally independent patients who would be candidates to receive onco-specific treatment; type II: functionally dependent patients who could benefit from a modified onco-specific treatment; and type III: partially dependent patients who would be candidates for symptom treatment (Table 1).

The use of CGA in daily surgical practice is not easy, as it is complex and time consuming. Surgeons need a fast screening tool in their clinical practice to evaluate patients for surgery and stratify those patients who can tolerate therapy. Preoperative Assessment of Cancer in the Elderly (PACE) is a composite of validated questionnaires for the evaluation of elderly cancer patients. It includes a number of instruments: the Mini-Mental State Examination (MMSE), activities of daily living (ADL), instrumental activities of daily living (IADL), Geriatric Depression Scale (GDS), Brief Fatigue Inventory (BFI), Eastern Cooperative Oncology Group performance status (ECOG), American Society of Anesthesiologists (ASA) score and Satariano's Index of Comorbidity (SIC). In patients with a low IADL score, abnormal performance status score or a moderate/severe BFI, there is a 50% increase in post-surgical complications and an increase in hospitalization time [25] (Table 2).

The Time Up and Go (TUG) test is another useful tool for preoperative evaluation. It is used to assess gait speed and mobility; a prolonged time is correlated with poor functional status, fall risk and cognitive impairment [27]. Robinson et al. showed that a slower TUG score could predict postoperative complications, 30-day hospital readmission, institutionalization and 1-year mortality in surgical patients [28]. Ugolini et al. evaluated the ability of 11 simplified screening tools to predict long-term mortality, although they have never been used in surgical practice. They concluded that high scores on TUG, Eastern Cooperative Group Performance Status (ECOG PS), Instrumental Activities of Daily Living (IADLs), and Vulnerable Elders Survey (VES-13) scoring systems were significantly associated with increased long-term mortality risk. All these tools could play a pivotal role in a comprehensive assessment of elderly patients who are candidates for surgical treatment [10, 27].

Table 1 CGA and oncological treatment [24]

Group	Comorbidities	Therapy
Type I	Functionally independent (without severe comorbidities)	Oncological-specific treatment in standard conditions
Type II	Functionally dependent (two or less comorbidities)	Modified oncological-specific treatment with standard intention
Type III	Partially dependent (three or more comorbidities or geriatric syndrome)	Palliative care

Table 2 Association of PACE items with morbidity (SIOG Proceedings, The Hague, 2–4 November, 2006) [26]

PACE item	Odds ratio	95% Confidence interval	Significance
Performance status			
0–1	1	1.49–5.74	**0.002**
2–4	2.92		
Mini-Mental State			
No deficit	1	0.92–2.54	0.140
Deficit	1.53		
ADL			
Independent	1	1.09–3.34	**0.024**
Dependent	1.91		
IADL			
Independent	1	1.38–3.25	**0.001**
Dependent	2.12		
GDS			
No depression	1	0.98–3.38	0.057
Depression	1.82		
BFI			
No fatigue	1	1.39–3.71	**0.001**
Fatigue	2.27		
ASA score			
1	1	0.65–2.03	0.636
2–4	1.15		
Number of comorbidities			
0	1	0.45–1.98	0.984
1	0.99	0.86–3.52	0.121
2	1.74	0.98–3.64	0.058
3 +	1.89		

Statistically significant values are in bold

Role of surgery in elderly patients with CRC

Surgery plays a pivotal role in the treatment of patients with CRC. Patients with stage I–III disease are candidates for surgical resection and surgery represents the first treatment option. In fact, most patients with stage I or II disease are treated by surgery alone. A selected group of patients with stage IV disease may also take advantage of a surgical approach. Guidelines from the National Comprehensive Cancer Network (NCCN) recommend that patients with stage IV CRC should undergo surgery only if they suffer from symptomatic diseases such as bleeding, obstruction, or perforation, or have potentially resectable metastases. A registry-based study of 6457 patients with colorectal cancer, diagnosed between 1985 and 1992 in hospitals linked to the Rotterdam Cancer Registry, underlined the disproportion in the treatment patterns between elderly and younger patients [29]. The results of the study showed that 87% of the patients underwent resection, but the resection rates were lower for patients > 89 years (67%) and for patients with rectal cancer (83%). The postoperative mortality rate was 1% for patients < 60 years of age and gradually increased with age. For subjects > 80 years of age, the operative risk was 10%. Independent prognostic factors were gender, age, subsite and disease stage [30]. Postoperative mortality has decreased over the last few years, thus leading to an improvement in CRC patient survival. Similarly, the resection of liver metastases in selected patients has contributed to improved survival [31–33]. Moreover, changes in survival rates are observed in different countries [34]. A study by De Liguori et al. analyzed data from 181 liver resections performed on 178 consecutive elderly patients. The overall survival rate at 5 years was 31.5% [35]. Nagano et al. observed similar results, with 34.1% 5-year survival in 202 elderly patients after surgery for CRC liver metastatic disease [36]. Adam et al. evaluated the outcome of liver surgery for colorectal metastases in 7764 patients over 70 years old in a large international multicenter study [37]. Three-year overall survival was 57.1% in the elderly and 60.2% in younger patients ($P < 0.001$), and was similar among patients aged 70–75, 75–80 or at least 80 years old (57.8, 55.3 and 54.1% respectively; $P = 0.160$). The authors concluded that liver resection for colorectal metastases in elderly patients can reach a reasonable 3-year survival rate, with an acceptable morbidity rate [38]. However, some studies showed that the improvement of surgical techniques led only to a smaller increase in the survival rate of elderly patients compared to younger patients [39]. Negative prognostic factors that influence survival include age, presence of comorbidities, emergency surgery, and malnutrition [40]. On the other hand, many studies pointed out that age itself should not be considered as a risk factor for the development of complications in patients about to undergo surgery for colorectal cancer. Therefore, therapeutic or palliative surgery should not be avoided in the elderly based exclusively on age [41]. A study by Van Steenbergen et al. demonstrated that the elderly with CRC who survived the 1st year show the same overall cancer-related survival as younger patients [42]. These data support the idea that the treatment of the elderly with CRC should focus on perioperative care and the 1st postoperative year [43]. Today, there is a high risk of under-treating elderly patients with CRC thus obtaining a worse outcome, or over-treating them, resulting in an increase of morbidity or mortality [44]. Individualized treatment is an absolute requirement for further improvements in the management of these patients. Papamichael et al. underlined the need for an explicit risk assessment to achieve safe and effective surgical treatment [26]. Elderly patients with CRC should be evaluated by a multidisciplinary team before starting any treatment [45]. The team should include a geriatrician able to conduct a geriatric assessment, or at least administer quick screening tools for frailty that can predict surgical outcome in elderly patients [26, 46]. An accurate surgical

management should also include the assessment of functional status, level of frailty, life expectancy and patients' requests [41].

Comorbidities and postoperative complications

In general, cancer patients with comorbidities show poorer survival, poorer quality of life, and higher healthcare costs. Moreover, there is evidence that some patients with comorbidities have potentially curative treatment unnecessarily modified, compromising optimal care [47]. Frequently observed comorbidities in elderly patients undergoing surgery for CRC include deficiency anemia, rheumatoid arthritis, congestive heart failure, chronic pulmonary disease coagulopathy, type 2 diabetes mellitus, hypertension, hypothyroidism, liver disease, obesity, peripheral vascular disorders, renal failure, weight loss, and hypoalbuminemia [48]. Elderly patients show a higher rate of postoperative complications, mostly after emergency surgery [49]. Common complications include myocardial infarction, pulmonary failure, acute renal failure, and sepsis. Anastomotic leakage is also common and is associated with postoperative mortality [50]. The endoscopic placement of stents represents a possible alternative to emergency surgery for acute left-sided colonic obstruction; however, current data on the efficacy of this procedure are controversial, mainly as regards morbidity and mortality in elderly patients [51]. Some studies suggested considering the construction of a diverting stoma or stenting in cases of intestinal obstruction, to reduce the rate of emergency surgery [52]. A study by Kurian et al. observed a postoperative 30-day mortality rate of 28% in emergency surgery compared to 5% in elective surgery [53]. Other studies found similar results [54] and Modini et al. noted that even if morbidity and mortality rates in older patients could be similar to those of younger patients, there would be a ninefold increase in cases of emergency surgery [55]. Perioperative mortality in elderly patients who underwent surgery for CRC has been reported to be higher compared to younger patients [56]. A possible reason could be the higher rate of emergency surgery in elderly patients receiving surgery for complications due to an undiagnosed CRC. Mortality may reach 38% in emergency settings [56], while elective surgery has lower rates of perioperative death, ranging between 7 and 18% [57]. Patients aged over 80 years show a 15% increase in postoperative all-cause 30-day mortality [58]. Mortality rates increase by 24% in patients with Charlson comorbidity scores > 3, while emergency surgery increases mortality rates by 14.9% [58, 59]. A study by Kornmann et al. analyzed whether a complicated postoperative course affects the 1-year survival in patients older than 75 years of age who underwent CRC surgery [60]. A total of 223 patients survived the perioperative period and were included in this study. The early mortality rate was 6.3% ($n = 15$). Twenty-two patients (9.9%) died during the 1st year of follow-up. Risk factors for 1-year mortality were stage IV disease ($P = 0.002$), primary surgery complications ($P = 0.016$), and comorbidities ($P = 0.050$) [60].

Outcomes of different treatments in the elderly with CRC

Many studies pointed out the importance of laparoscopic surgery for the treatment of CRC. However, there is a lack of scientific literature assessing risks and benefits of this procedure in the elderly. Overall, laparoscopy showed a number of advantages compared to conventional surgery, these include less postoperative pain, rapid return to prior activities and a decrease in costs [61]. Moreover, laparoscopic surgery reduces the risk of cardiovascular and pulmonary complications, reduces intraoperative bleeding and accelerates gastrointestinal recovery [62, 63]. The first study on laparoscopic surgery in elderly patients was conducted by Vara-Thorbeck et al. [64]. The results showed that laparoscopic surgery for CRC could be performed safely on both elderly and younger patients while maintaining the same principles of surgical technique, such as open colectomy [64]. These results were confirmed by more recent studies that did not observe any difference compared with open surgery as regards morbidity or length of hospitalization [65–67]. Antoniou et al, in a meta-analysis of 66,483 patients, reported lower mortality and other significant advantages for elderly patients undergoing laparoscopic surgery for CRC compared with open surgery [68]. A review by Janssen-Heijnen et al. pointed out that among patients with resected colorectal cancer, postoperative morbidity and mortality were higher among those undergoing emergency surgery, as well as among those with reduced pulmonary function, cardiovascular disease or neurological comorbidities [69]. Ng et al. carried out a study on patients older than 85 years with proven colorectal adenocarcinoma, who received different treatments: curative surgery (CS), other treatments (OT) or best supportive care (BSC). There was no difference in survival between the CS and OT groups at 2 years of treatment ($P = 0.12$). Moreover, OT patients had a very similar 5-year survival to those of the BSC group, at 13% versus 43% in CS patients ($P < 0.001$). These results suggested that, up to 2 years following treatment, the risks of resectional surgery for CRC may neutralize any benefit. However, patients who survive more than 2 years showed improvements [9]. Jafari et al. carried out a review of operative outcomes for colorectal cancer in the United States in a Nationwide Inpatient Sample for 10 years, from 2001 to 2010 [48]. Around 1,043,108 patients with colorectal cancer were sampled; 63.8% of the surgical procedures were

performed on those 65 years and older and 22.6% on patients 80 years and older. Patients 80 years and older were 1.7 times more likely to undergo urgent admission than those younger than 65 years. Forty-six percent of laparoscopic procedures were performed in patients younger than 65 years and 14.1% in patients 80 years and older. Mortality during the 10 year study diminished by a mean of 6.6%; the most notable decrease was observed in subjects 85 years and older (9.1%). However, the results of the study highlighted that even if most studies reported an improved mortality during the previous 10 years, the risk-adjusted mortality and morbidity of the elderly continue to be considerably higher compared to younger patients [48]. Recently, a number of studies showed that molecular testing and assessment of biomarkers could guide targeted and conventional treatments for patients with CRC [70].

Conclusions

The outcomes of CRC surgery in elderly patients could be generally similar to those in younger patients without increasing the postoperative morbidity and mortality rates, even if some studies reported controversial data. The management of elderly patients requires an optimal risk assessment in the preoperative stage; it is indispensable both to evaluate the exclusion of the patient from surgery, according to the presence of relevant comorbidities, and to delineate the level of needed care. In the perioperative stage, surgeons and anesthetists should cooperate to prevent, detect, and treat perioperative complications. Elderly patients with significant comorbidities should receive a multidisciplinary evaluation to optimize their preoperative condition and to prevent postoperative complications. There is growing evidence that age should not be considered a risk factor for the development of complications in CRC patients treated with surgery. Thus, decisions on therapeutic or palliative surgery in the elderly should not be based solely on chronological age.

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Compliance with ethical standards

Conflict of interest The authors report no conflicts of interest.

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