

Colorectal surgery in the elderly population

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A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
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F – Literature Search
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ABSTRACT:

Introduction: With the rising number of elderly patients and increasing incidence of colorectal cancer, management of geriatric patients has become the forefront of colorectal surgery.

Objectives: This study aimed to investigate the short-term surgical outcomes that follow colorectal resection in elderly patients.

Materials and methods: A total of 464 patients who underwent surgical resection for colorectal tumor between 2013 and 2017 were included. The patients were divided into a group of the elderly (≥ 75 years) and the young (< 75 years). Clinicopathological data of the patients were reviewed retrospectively.

Results: The elderly group constituted 30% of the study population. A greater number of patients in the elderly group underwent Hartmann's procedure ($p = 0.02$) and right hemicolectomy ($p = 0.029$), and younger patients more often received low anterior resection ($p = 0.027$). The duration of the surgical procedure was shorter in the elderly group ($p < 0.01$) but they stayed in the hospital one day longer ($p = 0.023$). Postoperative complications and mortality tended to be higher in seniors ($p = 0.088$). The younger patients showed a tendency towards a higher rate of distant metastases ($p = 0.053$). Seniors received fewer preoperative chemoradiation in comparison to the young group ($p = 0.014$).

Conclusion: Older persons constitute one-third of patients treated electively in colorectal departments. Colorectal surgery in geriatric patients is associated with a prolonged hospital stay and a higher potential for complications and mortality.

KEYWORDS:

elderly, colorectal surgery, colorectal cancer

INTRODUCTION

Colorectal cancer (CRC) is the second most common cancer in Europe with more than 470,000 new cases diagnosed every year. Annually, the disease kills more than 200,000 European citizens (Globocan 2012) [1]. The lowest survival rates are reported in Central and Eastern Europe. In Poland, 16,000 new cases of CRC are diagnosed yearly [2].

Low birth rates and higher life expectancy are transforming the European population at an unprecedented rate [3]. In 2016, persons aged 65 or older constituted 19.2% of the European population and this number is still growing. This demographic change has a considerable impact on the healthcare system. The number of elderly individuals diagnosed with colorectal cancer is expected to increase significantly in the coming years.

It has been noted that seniors with CRC undergoing surgical resection had a higher rate of morbidity and mortality in comparison to young patients [4]. Although age is not a limiting factor per se, caring for older patients is often difficult due to comorbidities and poor overall health status [5]. In this study, we reviewed clinical and pathological data of patients who underwent surgery for a colorectal tumor in a single surgical department in Poland in order to investigate the impact of old age on perioperative and short-term surgical outcome.

PATIENTS AND METHODS

All consecutive patients undergoing curative resection of colon-

ic and rectal tumors at the Department of Surgical Oncology of Wrocław Regional Hospital between January 2013 and August 2017 were enrolled in the study. Patients who were subject to a palliative procedure or had no operation were excluded. For further comparison, patients were divided into two groups: elderly (≥ 75 years) and young (< 75 years).

Patients' demographic data, comorbidities, 30-day perioperative outcomes and pathology results were prospectively recorded in the departmental database. Patients' comorbidities were classified using the Charlson Comorbidity Index (CCI) [6]. Non-age-adjusted CCI was applied as age was a factor of interest in our study. Postoperative complications were evaluated according to Clavien-Dindo classification (CD) [7]. When a patient had two or more complications, the highest grade among them was used for analyses.

Routine preoperative workup included colonoscopy and computed tomography of the abdomen and pelvis for colon cancer. In the case of rectal cancer, pelvic MRI and optionally endorectal ultrasound were utilized to assess the disease's local stage. A standard pathway was applied to all patients in the study. Every patient received intravenous antibiotic prophylaxis prior to incision. Mechanical bowel preparation was routinely applied only for left-sided and rectal tumors. Since year 2016, regional anesthesia (Transversus abdominis plane block) was routinely applied prior to surgery. All surgical procedures were performed by one of four consultant surgeons with formal training in general surgery and surgical oncology. Our surgical technique has been described elsewhere [8].

Oral liquids were administered on the first postoperative day, proceeding to liquid or solid diet on postoperative day 2, if toler-

Tab. I. Patient characteristics.

	<75 YRS (N=325)	≥75 YRS (N=139)	P VALUE
Age , median (95%CI) [yrs]	64 (63–65)	80 (79–82)	<0,001 ^M
Gender , F/M ratio	152/173	54/85	0,127 ^F
BMI , median (95%CI)†	26.5 (25.6–27.5)	26,1 (25–27,1)	0,073 ^M
Charlson index , median (95%CI)	2 (2–2)	2 (2–3)	0.437 ^M
Pathology , n (%)			1 ^F
adenocarcinoma	312	133	
other	13	6	
Type of surgery , n (%):			0.174 ^F
elective	316 (97.2)	131 (94.2)	
urgent	9 (2.8)	8 (5.8)	
Neoadjuvant therapy , n (%)			0.041 ^{x2}
no	281 (86.5)	130 (93.5)*	(p = 0.030)
5 x 5 Gy radiation	17 (5.2)	6 (4.3)	
chemoradiation	27 (8.3)	3 (2.2)*	(p = 0.014)
Surgical approach , n (%)			p = 0.120 ^{x2}
laparoscopy	83 (25.6)	26 (18.7)	
open	199 (61.2)	99 (71.2)	
robotic	43 (13.2)	14 (10.1)	
Location of tumor , n (%)			0.067 ^{x2}
sigmoid	46 (14.2)	18 (13)	
other	5 (1.5)	2 (1.4)	
cecum	29 (8.9)	14 (10.1)	
rectum	92 (28.3)	28 (20.1)	
transverse colon	10 (3.1)	9 (6.5)	
ascending colon	31 (9.6)	17 (12.2)	
hepatic flexure	13 (4)	14 (10.1)*	(p = 0.010)
recto-sigmoid	67 (20.6)	25 (18)	
splenic flexure	15 (4.6)	2 (1.4)	
descending colon	17 (5.2)	10 (7.2)	

^F, Fisher's exact test; ^M, Mann-Whitney U test; ^{x2}- chi-squared test; †, data available for 308 of 325 (94.8%) „young” and 131 of 139 „elderly” (94.2%) patients.

ated. Nasogastric tubes were not inserted; surgical closed drains and Foley catheters were removed on postoperative day 1. The criteria for discharge included tolerance of a soft diet with no complaints or reported complications from the patients' side. The Medical Ethics Committees of the Regional Specialist Hospital approved the study protocol.

STATISTICAL ANALYSIS

Data normality was tested using the Kolmogorov-Smirnov test with Lilliefors significance correction. Homogeneity of variation was tested using Levene's test. Continuous data are presented as means or medians with a 95% confidence interval (CI) and analyzed with the use of, respectively, a t-test for independent samples with the Welch correction or Mann-Whitney U test. Fisher's exact test (2 × 2) or χ^2 test were used to conduct a frequency analysis. All calculated probabilities were two-tailed and p-values ≤ 0.05 were considered statistically significant. The analyses were conducted using MedCalc Statistical Software version 17.9.6 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2017).

RESULTS

The study population consisted of 464 patients divided into two age groups: patients under the age of 75, a young group [YG] (n=325) and patients at the age of and above 75 years (n=139). The elderly group [EG] constituted 29.96% of the study population.

The indication for surgery involved colorectal adenocarcinoma in 445 patients. The remaining 19 cases were diagnosed with other neoplastic entities (adenomas, gastrointestinal tumors, neuroendocrine, and squamous cancer).

There was no significant difference in sex, BMI and the Charlson Comorbidity Index between the groups as listed in Table 1. The majority of surgical procedures was performed in elective settings (94–97%).

The proportion of patients who received preoperative chemoradiation was significantly lower in the elderly group (p=0.014).

There was no significant difference in the use of a minimally in-

Tab. II. Perioperative outcomes and pathology.

	<75 YRS (N=325)	≥75 YRS (N=139)	P VALUE
Type of resection, n (%)			0.004 ^{x2}
APR	21 (6.5)	5 (3.6)	
En bloc resection	9 (2.8)	0 (0)	
Hartmann procedure	16 (4.9)	15 (10.8) [*]	(p=0.020)
LAR	121 (37.2)	37 (26.6) [*]	(p=0.027)
Left hemicolectomy	39 (12)	15 (10.8)	
Right hemicolectomy	80 (24.6)	48 (34.5) [*]	(p=0.029)
Sigmoid resection	33 (10.2)	12 (8.6)	
Other	6 (1.8)	7 (5)	(p=0.054)
Surgical anastomosis, n (%)			0.545 ^{x2}
double-stapled	126 (38.8)	44 (31.7)	
end-to-end hand sewn	105 (32.3)	49 (35.2)	
no	43 (13.2)	18 (13)	
other	10 (3.1)	7 (5)	
stapled side-to-side	41 (12.6)	21 (15.1)	
Stoma, n (%)			0.098 ^{x2}
colostomy	76 (23.4)	41 (29.5)	
ileostomy	12 (3.7)	1 (0.7)	
no	237 (72.9)	97 (69.8)	
Time of surgery, median (95%CI), [min]	180 (170-180)	150 (137-160)	<0.001 ^M
Length of stay, mean (95%CI) [days]	6.4 (6.1-6.7)	7.2 (6.6-7.9)	0.023 ^W
Complications, n (%)			0.088 ^F
No/Minor [Clavien-Dindo 1-2]	286 (88)	112 (80.6)	(p=0.037)
Major [Clavien-Dindo 3-4]	34 (10.5)	22 (15.8)	
Mortality [Clavien-Dindo 5]	5 (1.5)	5 (3.6)	
Readmission, n (%)			0.829 ^F
no	305 (93.8)	132 (95)	
yes	20 (6.2)	7 (5)	
Reoperacje, n (%)			0.087 ^F
no	292 (89.8)	117 (84.2)	
yes	33 (10.2)	22 (15.8)	
T stage, n (%)^E			0.702 ^{x2}
Tis	13 (4.1)	4 (2.9)	
T1	11 (3.5)	5 (3.7)	
T2	33 (10.5)	7 (6.6)	
T3	166 (52.9)	76 (55.9)	
T4	91 (29)	42 (30.9)	
Lymph nodes harvest, median (95%CI)/range	16 (15-17)/0-52	15 (14-17)/5-63/	0.142 ^M
No. of positive lymph nodes, median (95%CI)/range	1 (0-1)/0-25/	0 (0-1)/0-23/	0.146 ^M
Distant metastases, n (%)			0.053 ^F
no	266 (81.8)	124 (89.2)	
yes	59 (18.2)	15 (10.8)	

^W, t-test for independent samples with Welch correction; ^F, Fisher exact test; ^M, Mann-Whitney U test; ^{x2}- Chi squared test; ^E, analysis on 450 patients (314 of 325 (96.6%) young and 136 of 139 (97.8%) elderly).

vasive (laparoscopic or robotic) approach between the groups. More patients in EG underwent Hartmann's procedure (p=0.02) and right hemicolectomy (p=0.029), and younger patients more often received low anterior resection (p=0.027) (Table II). The surgical procedure took less time in EG (p<0.01), however seniors re-

mained in hospital almost one day longer (p=0.023). Postoperative complication and mortality tended to be higher in EG (p=0.088). Similarly, reoperations were more common in EG, but it was not significant (p=0.087). A total of 10 patients died within 30 days following surgery (2,12%), 5 in each group. The local stage of the

disease (T stage and number of positive lymph nodes) and the extent of lymph node dissection were comparable in both groups. The younger patients showed a trend towards a higher rate of distant metastases ($p=0.053$).

DISCUSSION

With the rising number of elderly patients and increased incidence of CRC, management of senior patients has become the forefront of colorectal surgery. In the USA in 2002–2006, the median age of CRC diagnosis was 71 and almost 40% of new CRC cases were detected at the age of 75 and above [9]. Likewise, in Germany in 1998–2014, the median age of diagnosis of CRC approximated to 70 and 74 for males and females, respectively. Among new cases of CRC, 38% were diagnosed at the age 75 and more [10].

The recommendations of the International Society of Geriatric Oncology suggest, that elderly patients with CRC should receive management as similar as possible to the young population, with the goal of maximizing survival and minimizing adverse effects [11].

Indeed, today, thanks to advances in surgical technique, anesthesia, and perioperative care, elderly patients can routinely undergo colorectal resection with acceptable postoperative mortality [9]. Nevertheless, surgical treatment of elders is often associated with a less favorable outcome [4,12,13].

The current demographic changes in the Central European population closely reflect the trends that have been noted in western countries over the last decade. Poland has one of the youngest populations in Europe, however the number of persons aged 65 and above is estimated to rise from 15.8% up to 21.7% in the next ten years [14].

As shown in our study, the elderly already make up 30% of colorectal patients and these numbers are expected to rise in the future. The unique features of the elderly population with CRC are well reported in literature [4, 12,15]. Elderly patients have a higher number of comorbidities and a higher American Society of Anesthesiology (ASA) score. They have more tumors located in the right colon and distant metastases are less frequent.

Geriatric patients most commonly undergo a right hemicolectomy and have fewer low anterior resections and APRs than their younger counterparts. Finally, the use of chemotherapy and radiation therapy decreases with age. Most of our findings correspond well with these observations. Surprisingly, in this study, the frequency of comorbidities expressed as a non-age-adjusted Charlson Comorbidity Index was similar in both groups, possibly indicating the careful selection of patients undergoing elective surgery. Also, it is shown, that Charlson Comorbidity Index is not perfect for assessing elderly patients.

The age-related site migration of colorectal cancer with more right colonic cancers in the elderly was not confirmed in our study. Right hemicolectomy was, however, the most common procedure performed in EG. Comparable lymph node harvest and similar adoption of minimally invasive techniques in both groups, confirm that a strong attempt has been made to provide the same quality of treatment for all patients.

We found that older patients spend a significantly shorter time in the operating theatres and this correlates well with previous reports. [12] Possibly, the complex and lengthy procedures were more commonly undertaken in younger individuals. In fact, the decision to create a rectal anastomosis was less common in EG, resulting in fewer low anterior resections in this group. To be exact, one out of ten elderly patients in our study was subject to Hartmann's procedure. In recent literature, the role of Hartmann's procedure was frequently undervalued. This is probably due to an underrepresentation of palliative procedures and frail, elderly patients in randomized, prospective studies. Based on data from these studies, Hartmann's procedure is currently recommended only in emergency settings, palliative situations and for seriously comorbid patients. [16] Quite in contrast, in the recently released Dutch Colorectal Audit, that analyzed rectal cancers treated in Dutch hospitals in the year 2011, low Hartmann's procedures were carried out in 402 of 2102 cases (19.2%). [17] These were mainly frail elderly patients who often had locally advanced or metastasized tumors. These results correspond well with our findings and other reports and confirm that in practice, Hartmann's procedure is still a simple yet effective option for patients in a feeble condition. [18]

Elderly patients with CRC form a varied group ranging from individuals with very good health status to those with limited life expectancy. In a large observational study conducted in the USA, senior patients with CRC experienced high rates of major complications (up to 23%), longer hospital stays and high 30-day mortality in almost 6%. [4] In addition, 27% - 29% of patients aged above 80, required readmission within 90 days after index surgery. [15] The differences in outcome between young and elderly patients in our study were not that obvious. When compared to YG, the elderly group showed a clear tendency towards higher morbidity and mortality.

The relatively low morbidity and mortality in EG may be due to the fact that 95% of procedures were performed in elective settings. The data comes from our department of surgical oncology, which does not have emergency admission service. As reported previously, the likelihood of emergency CRC surgery increases with age and 18%–27% of geriatric patients with this disease are treated in acute settings [13, 19]. Our results, therefore, may be significantly confounded by lack of emergency cases. It needs to be pointed out that even in this elective cohort, elderly patients suffered a 16% rate of major complications and a 3.6% death rate. This shows that a better understanding of surgical risks is necessary to optimize the treatment of the elderly population.

Nowadays, when surgeons are confronted with a growing number of senior patients, preoperative assessment still relies heavily on ASA scores, CCI and the surgeon's experience or prejudice [20]. All aforementioned methods are unreliable for predicting surgical outcome. Therefore, there is an urgent need for better prognostic tools to stratify elderly patients. One of them is Comprehensive Geriatric Assessment (CGA), an instrument derived from geriatric care [21]. It evaluates physical functioning, comorbidity, polypharmacy, nutrition, cognition, and emotional status. Several studies confirmed that CGA reliably predicted complications in elderly patients undergoing elective colorectal surgery [22, 23]. Some elements of CGA were recently included in the preoperative assessment guidelines of geriatric populations, recommended by the American College of Surgeons [24].

Unfortunately, only a few surgeons use geriatric assessment tools in their routine practices [20].

The present study is not free of certain limitations. The major drawback is its retrospective nature; however, data were collected prospectively and all patients treated in our department within our study's timeframe were included. Another limitation is a potential selection bias. As mentioned earlier, our department does not provide emergency service, therefore, the number of acute cases in our cohort is not representative for the Polish population as a whole. Another limitation is the age cut-off score chosen in this study. Traditionally, in surgical literature, an elderly person is defined as a person above 70, 75 or 80 years of age and the cut-off value of 75 years was chosen arbitrarily as the baseline of our study.

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SUMMARY

In conclusion, the results of our study emphasize the challenge posed by the demographic changes of our population. Older persons already constitute one-third of patients treated in colorectal departments and this number will continue to increase. The most common procedure performed in this group is right hemicolectomy. Elderly patients have fewer low anterior resections and more Hartmann's procedures than their younger counterparts. Elective surgery in geriatric patients with colorectal tumors is associated with a prolonged stay and a higher potential for major complications and mortality. This knowledge is important for surgeons and other caregivers. Surgeons must be prepared for increased morbidity and mortality when operating on seniors.

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