

MARTA STRUTYŃSKA-KARPIŃSKA¹, PIOTR SZELACHOWSKI¹, LIDIA USNARSKA-ZUBKIEWICZ²,
BARBARA ŚLIWA¹

Cancer of the Upper and Lower Gastrointestinal Tract – Analysis of Resective Treatment

Rak bliższego i dalszego odcinka przewodu pokarmowego – analiza resekcyjności

¹ Department of Gastrointestinal and General Surgery, Wrocław Medical University, Poland

² Department of Hematology, Blood Neoplasms, and Bone Marrow Transplantation, Wrocław Medical University, Poland

Abstract

Background. Surgical excision is the best therapeutic option for esophageal, gastric, and colorectal cancer. Many authors believe that the low percentage of resections in patients with cancer of the proximal gastrointestinal tract is primarily attributable to delayed diagnosis.

Objectives. The aim of this study was to compare resective treatment for esophageal, gastric, and colorectal cancer with cancer staging on admission to the surgical unit. Stage of disease was evaluated using the TNM system.

Material and Methods. The analysis involved 323 patients with esophageal cancer (158), gastric cancer (98), and colorectal cancer (67) referred for surgical treatment in 2005–2006.

Results. The majority of the patients were male (76.5%), with significantly more males in the groups with esophageal and gastric cancer ($p < 0.001$). There were no gender-related differences among patients with colorectal cancer ($p < 0.0001$). The stage of disease differed for the different cancers. In the group with esophageal cancer, 0.6, 3.8, 1.3, and 94.3% of the patients were qualified to stages 1, 2, 3, and 4 of the TNM system, respectively. In the gastric cancer group, stages 1, 2A/2B, 3, and 4 involved 0, 7.1, 4.1, and 88.8% of the patients, respectively. In the colorectal cancer group, the majority of patients (94%) had stages 1, 2, and 3. Resection surgery was the therapeutic modality in 5.7% of the esophageal, 11.2% of the gastric cancers, and 94% of the colorectal cancers. The difference in the percentage of resection surgery for esophageal cancer compared with gastric cancer was on the borderline of statistical significance ($p = 0.1$). There was a statistically significant difference in the numbers of resections for upper digestive tract and colorectal cancer ($p < 0.001$).

Conclusions. The authors suggest that the popularization of screening examinations for esophageal and gastric cancer may have a positive effect on the early diagnosis of cancer in the upper gastrointestinal tract (*Adv Clin Exp Med* 2010, 19, 1, 105–111).

Key words: esophageal cancer, gastric cancer, colorectal cancer, percentage of resection surgeries.

Streszczenie

Wprowadzenie. Zasadniczym sposobem leczenia raka przełyku, żołądka oraz jelita grubego jest leczenie chirurgiczne. W opinii wielu autorów mały odsetek resekcyjności w nowotworach bliższego odcinka przewodu pokarmowego należy łączyć przede wszystkim z opóźnieniem diagnozy.

Cel pracy. Porównawcza ocena resekcyjności raka przełyku, żołądka oraz jelita grubego na podstawie oceny stopnia zaawansowania choroby nowotworowej w chwili przyjęcia na oddział. Stopień zaawansowania raka oparto na ocenie cech TNM.

Materiał i metody. Analizie poddano 323 chorych na raka przełyku (158), żołądka (98) i jelita grubego (67) skierowanych do leczenia operacyjnego na oddziale w okresie 2005–2006.

Wyniki. W analizowanej grupie chorych większość stanowili mężczyźni (76,5%). Przewaga mężczyzn była istotna statystycznie w grupie chorych na raka przełyku i raka żołądka ($p < 0,001$). Nie wykazano różnic zależnych od płci w grupie chorych na raka jelita grubego ($p < 0,0001$). Stopień zaawansowania raka dla poszczególnych umiejscowień był różny. W grupie chorych na raka przełyku 0,6; 3,8; 1,3 i 94,3% zakwalifikowano odpowiednio do 1,

2, 3 i 4 stopnia w skali TNM. W grupie chorych na raka żołądka w stopniu 1, 2A/2B, 3 i 4 było odpowiednio: 0; 7,1; 4,1 i 88,8%. Wśród chorych na raka jelita grubego natomiast zdecydowana większość (94%) miała 1, 2 i 3 stopień zaawansowania w skali TNM. Resekcyjność w raku przełyku wynosiła 5,7%, żołądka – 11,2%, a w raku jelita grubego – 94%. Różnica w odsetku resekcyjności w raku przełyku w porównaniu z rakiem żołądka była na granicy istotności statystycznej ($p = 0,1$). Stwierdzono istotnie statystyczną różnicę w resekcyjności raka górnego odcinka przewodu pokarmowego w porównaniu z rakiem jelita grubego ($p < 0,001$).

Wnioski. Autorzy sugerują, że wprowadzenie badań przesiewowych w kierunku raka przełyku i raka żołądka może mieć pozytywny wpływ na wykrywalność wczesnych raków górnego odcinka przewodu pokarmowego (*Adv Clin Exp Med* 2010, 19, 1, 105–111).

Słowa kluczowe: rak przełyku, rak żołądka, rak jelita grubego, odsetek resekcyjności.

The recently observed increase in the number of patients suffering from malignant tumors has led to a situation in which many of them are treated not only in oncological surgery wards, but are diagnosed and treated in general surgery wards as well. Patients with tumors in the upper and lower gastrointestinal tract, i.e. with esophageal, gastric, and colorectal cancer, constitute a significant group of them.

International data for 2002 on the incidence of malignant tumors indicate that people with gastrointestinal malignancies constitute one third of the 10 million patients suffering from cancer worldwide [1]. According to epidemiological estimates, colorectal carcinoma is the second most common malignant cancer in both women and men [2, 3]. Gastric cancer is the second cause of mortality in males and the fourth in females [2, 4, 5]. Moreover, esophageal carcinoma, which is the eighth most common malignant tumor, is among the gastrointestinal cancers with the poorest prognosis [6].

In Poland, as in the majority of countries, squamous cell carcinoma is the predominant histological form of esophageal cancer, while adenocarcinoma predominates in West Europe and the USA [7–11]. An alarming increase in the incidence of this type of esophageal carcinoma is becoming a major public health problem and will require increasing attention in the future [9, 11]. Adenocarcinoma is the predominating histological type among gastric and colorectal cancers and this trend has been constant for many years [4].

The management of digestive tract cancers is based mainly on surgical treatment. Selection of the appropriate modality is strictly correlated with stage of the tumor [12–14]. The best outcomes of treatment are achieved in colorectal cancer, while those of upper gastrointestinal cancers occupy a more distant place and are associated with much poorer prognosis [15, 16]. This significant disproportion in the outcomes of treatment of upper and lower gastrointestinal carcinomas prompted the present authors to analyze resection surgeries performed for upper and lower gastrointestinal cancers in their surgical unit.

The aim of the study was to analyze the incidence of gastrointestinal cancers on the basis of patients treated in the authors' clinic in a two-year period and to compare the resectability of cancers in the upper gastrointestinal tract and those in the lower in relation to the stage of the disease on admission to the surgical unit.

Material and Methods

From January 2005 to December 2006, 3101 patients were treated in the Clinic of Gastrointestinal Surgery, Wrocław Medical University. Of these patients, 323 had cancer in the upper or lower gastrointestinal tract, which constituted 10.4% of the total number. These were 247 men (M) aged 41–85 (median: 57.3) and 66 women (F) aged 41–82 (median: 61.4) years. In the patients with upper gastrointestinal cancer the clinical stage of the disease was determined on the basis of esophagogastroscope associated with the collection of samples for histopathological evaluation, X-ray picture of the gastrointestinal tract, ultrasound examination of the neck and abdomen, as well as CT of the chest and abdomen. Patients with cancer in the lower part of the gastrointestinal tract underwent preoperative evaluation which included colonoscopy with biopsy collection, contrast media infusion, ultrasound examination of the abdomen, and, in some patients, abdominal CT. Statistical analysis included the Student's *t*, Fisher's exact, and chi-squared tests.

Results

Of the 323 patients with gastrointestinal carcinoma, men predominated and constituted 76.5% of all the patients. Patients with esophageal cancer were 64.1/63.2 (M/F) years of age, while patients with gastric and colorectal cancer were younger (56.3/57.4 and 57.8/59.7 years, respectively). The differences were statistically insignificant. There was a significant gender-related difference in the incidence of the tumor regarding location

(esophagus, stomach, and colon, Tab. 1). The M/F ratio was highest in the case of esophageal cancer (4.85:1), in patients with gastric cancer it was 3.6:1, and in colorectal cancer it was lowest (1.39:1). The incidence of esophageal and gastric cancer was highest in men ($p < 0.001$) and there were no gender-related difference in the incidence of colorectal cancer. Gastrointestinal cancers were significantly more common in men ($p < 0.0001$) regardless of their location.

Of the 158 patients with esophageal cancer, 0.6%, 3.8%, 1.3%, and 94.3% were classified as TNM stage 1, 2, 3, and 4 respectively (Tab. 2). The predominant histological type in this group of patients was squamous cell carcinoma (90%). Half of the patients had well-differentiated tumors, while the remaining cases were medium or poorly differentiated.

Of the 98 patients with gastric cancer, the tumor was located in the proximal portion in 78 (79.6%) and in the distal portion of the stomach in the remaining 20 (20.4%) (Tab. 3). Adenocarcinoma was the prevailing histological form (90%). The tumors located in the cardiac region belonged to the diffused type, while those in the region of the fundus and more distal portion of the stomach were classified as the intestinal type according to the Lauren classification. 88.8% of the patients developed stage 4 of the disease and the remaining were TNM stages 2A, 2B, and 3 (Tab. 4).

In the group of 67 patients with colorectal cancer the tumors were most commonly located on the left side, and the difference was statistically significant ($p < 0.02$) (Tab. 5). Macroscopically, the tumors located within the right part of the colon were characterized by nodular growth, some with

Table 1. The patients according to gender and tumor location

Tabela 1. Charakterystyka chorych zależnie od płci i umiejscowienia guza

	Esophageal cancer n (%) (Rak przełyku)	Gastric cancer n (%) (Rak żołądka)	Colorectal cancer n (%) (Rak jelita grubego)	Total n (%) (Suma)
Females (Kobiety)	27 (17.1)	21 (21.4)	28 (41.8)	76 (23.5)
Males (Mężczyźni)	131 (82.9)	77 (78.6)	39 (58.2)	247 (76.5)
F/M ratio (Wskaźnik K/M)	1 : 4.85	1 : 3.66	1 : 1.39	1 : 3.25

Table 2. TNM cancer stage of the 158 patients with esophageal carcinoma*

Tabela 2. Zaawansowanie nowotworu w skali TNM w grupie 158 chorych na raka przełyku*

TM stage (Zaawansowanie nowotworowe wg TM)	n (%)
1	1 (0.6)
2A	6 (3.8)
2B	0
3	2 (1.3)
4	149 (94.3)

* Histological type: squamous cell carcinoma – 90%.

* Typ histologiczny: rak płaskonabłonkowy – 90%.

Table 3. Location of gastric cancer in 98 patients

Tabela 3. Umiejscowienie nowotworu w grupie 98 chorych na raka żołądka

Location (Umiejscowienie)	Number of patients (%) (Liczba pacjentów)
Cardia	59 (60.2)*
Fundus	19 (19.4)*
Body	20 (20.4)

* Diffuse type according to Lauren classification.

* Typ rozlany wg klasyfikacji Laurena.

Table 4. TNM cancer stage in the 98 patients with gastric cancer

Tabela 4. Zaawansowanie nowotworu w skali TNM w grupie 98 chorych na raka żołądka

TM stage (Zaawansowanie nowotworowe wg TM)	Number of patients (%) (Liczba pacjentów)
1	0 (0%)
2A/2B	7 (7.1)
3	4 (4.1)
4	87 (88.8)

Table 5. Location of colorectal cancer in 67 patients

Tabela 5. Umiejscowienie nowotworu w grupie 67 chorych na raka jelita grubego

Location (Umiejscowienie)	Number of patients (%) (Liczba pacjentów)
Cecum	12 (17.9)
Ascending colon	11 (16.4)
Hepatic flexure	0
Transverse colon	4 (6.0)
Splenic flexure	5 (7.4)
Descending colon	4 (6.0)
Sigmoid colon	16 (23.8)
Sigmoid-rectal flexure	15 (22.4)

an ulcerative surface, and the left-sided tumors infiltrated the lumen of the colon, resulting in its narrowing. Microscopically, the tumors were adenocarcinomas in various stages of differentiation. The majority of the patients (94%) had TNM stages 1, 2, and 3 (Tab. 6).

Table 6. TNM cancer stage in the 67 patients with colorectal cancer

Tabela 6. Zaawansowanie nowotworu w skali TNM w grupie 67 chorych na raka jelita grubego

TNM stage (Zaawansowanie nowotworowe wg TM)	Number of patients (%) (Liczba pacjentów)
1	2 (3.0)
2	40 (59.7)
3	21 (31.3)
4	4 (6.0)

The qualification of patients for surgical treatment or palliative therapy was based on the cancer stage. Patients who were TNM stage 3 or lower were qualified for radical surgery (Tab. 7). In the case of esophageal cancer, radical resective surgery could be performed in 9 of the 158 cases (5.7%). There were 11 radical resections in the group of 98 patients with gastric cancer (11.2%), including 8 total gastrectomies in patients with proximal tumors and 3 Billroth II resections in distal tumors. In the patients with colorectal cancer, radical resection was possible in 63/67 (94%) patients. The difference in the numbers of resection surgeries for esophageal cancer and for gastric cancer was on the border of statistical significance ($p = 0.1$). On the other hand, the number of resection surgeries for upper gastrointestinal cancers, i.e. esophageal and gastric cancers, revealed statistically significant disproportions compared with lower gastrointestinal cancer ($p < 0.001$).

Table 7. Resectability for esophageal, gastric, and colorectal cancer

Tabela 7. Resekcyjność w raku przełyku, raku żołądka i raku jelita grubego

	Esophageal cancer (Rak przełyku)	Gastric cancer (Rak żołądka)	Colorectal cancer (Rak jelita grubego)
	I	II	III
Number of patients treated surgically (Liczba pacjentów leczonych chirurgicznie)	9	11	63
Number of patients treated palliatively (Liczba pacjentów leczonych paliatywnie)	149	87	4
Percent resectability – % (Odsetek resekcyjności)	5.7	11.2	94

p (I:II) = ns., p (I:III) < 0.001, p (II:III) < 0.001.

Discussion

The treatment of patients with malignant tumors has recently become a major public health problem, which is evidenced by alarming international statistical data and publications devoted to the issue [2, 11, 17]. In the present study, patients with cancer in the upper or lower gastrointestinal tract constituted 10.4% of the total number of individuals referred for treatment to the general surgery unit. Of these, 76.5% were males. The predominance of men was statistically significant among the patients with esophageal cancer and gastric cancer. There were no statistically significant gender-related differences among the patients with colorectal cancer. In general, it was found that gastrointestinal cancer was significantly more common in men ($p < 0.0001$). Similar findings concerning the predominance of men among patients with upper gastrointestinal cancer were presented especially by authors from Eastern Europe, Central and South America, Korea, Japan, and East Asia [2, 4, 5, 9, 17]. The same applies to the histological type of esophageal cancer. In the presented material, squamous cell carcinoma was the predominant histological type (90%), similarly to the majority of countries around the world but in contrast to the USA and some West European countries, where the number of patients with esophageal adenocarcinoma has increased dramatically in the past 10 years [10, 11, 18, 19]. A study by Lapage [9] showed that the risk of esophageal adenocarcinoma is tenfold higher in men and fivefold higher in women in England and Wales. The findings presented by Holmes [17] from the USA demonstrate that in the past 30 years there was a 30% decrease in the incidence of squamous cell carcinoma, especially in black males, and a fourfold increase in the incidence of adenocarcinoma, with a nearly fivefold increase in white males.

As far as colorectal cancer is concerned, the observed lack of significant differences in the incidence among women and men in the present study is consistent with the findings of other authors. They are also comparable with regard to the left-sided location of colorectal tumors and to the prevalence of early, i.e. resectable, tumors [20–22]. Interesting observations on the location, gender, incidence, and stage of colorectal cancer in relation to socioeconomic status (county-level poverty) were presented by Wu [23], according to whom an increased incidence of tumors in the proximal portion of the colon is observed among white males and females in low-poverty counties than in high-poverty counties and an increased incidence of advanced stages is observed in high-poverty than in low-poverty counties and it involves the distal, not proximal, segment of the colon.

In the material presented here, the percentage of resective surgeries for colorectal cancer was 94%. Much worse findings were revealed in the analysis of the percentage of resection surgeries for cancers in the upper gastrointestinal tract. Only 9 of the 158 (5.7%) cases of esophageal cancer could be treated with radical resection. Similarly, there were only 11 resective surgeries performed in the group of 98 patients with gastric cancer (11.2%). This high disproportion in the resectability of cancer in the upper and lower gastrointestinal tract ($p < 0.001$) may result from the fact that 94.3% of the esophageal and 88.8% of the gastric cancer patients had stage 4 of the disease on admission. According to data from the literature, the outcomes of treatment for esophageal and gastric cancer are not very optimistic, mainly because the majority of patients has an advanced stage on admission for diagnosis [5, 24–26]. Roukos [27] points out that in the majority of West European countries, as in the present study, over 80% of patients with gastric cancer are patients in advanced stage, with poor prognosis. According to Roukos, the better results achieved in Japan and Korea are primarily due to early detection of the disease.

The data obtained in the present study show that patients with colorectal cancer have the best chance from radical surgical treatment. The possibility of radical surgery drops dramatically for tumors located in the proximal part of the gastrointestinal tract. Similar results concerning differ-

ences in resectability of the upper and lower segments of the gastrointestinal tract were presented by, among others, Sweed [28]. When investigating the possible reasons for this situation, it should be emphasized that the symptoms of early esophageal cancer are not characteristic and do not arouse alertness of the patient or of the first-contact doctor. Dysphagia, which is a characteristic symptom of esophageal cancer, occurs only when the lumen has been significantly narrowed and evidences marked progression of the disease [29]. The symptoms of early gastric cancer are also not specific and often mimic mild forms of peptic ulcer, such as epigastric pain, dyspepsia, a slight loss of weight which cannot be explained by decreased appetite, and anemia. Underestimation of the above symptoms, especially by patients, contributes, among others, to delayed diagnosis [30, 31]. Lack of screening examinations in high-risk groups is another reason for the low detectibility of esophageal and gastric cancer. As a result of wide-scale screening examinations in Japan, the detectibility of early forms of esophageal and gastric cancer has increased significantly [32–35].

On the other hand, colorectal cancer is characterized by a different clinical course. The symptoms occur much earlier. Abdominal pains, anemia, altered bowel movement habits, or pipe-stem stools arouse the patient's alertness and contribute to an early implementation of diagnostic examinations [36, 37]. An enormous role in the early diagnosis of colorectal cancer is attributed to screening examinations, primarily based on colonoscopy [38]. The present authors support the opinion of Ponz de Leon [39, 40] that despite the increased prevalence of colorectal cancer, the detectibility of early forms has increased and the outcomes of treatment have improved, which should be attributed to the broad use of colonoscopy, a better awareness of patients, and an increased sensitivity of doctors to symptoms of the disease.

The authors concluded that it should be stressed that the introduction of screening examinations in the diagnosis of colorectal cancer has contributed to significant improvement in the outcomes of treatment of this diseases, which emphasizes the necessity for implementing screening examination (gastroscopy) for the early diagnosis of cancers in the upper gastrointestinal tract.

References

- [1] **Lambert R:** An overview of the epidemiology and prevention of digestive cancer. *World Gastroenterology News* 2003, 8(2), 21–25.
- [2] **Ferlay J, Autier P, Boniol M, Heanue M, Colombet M, Boyle P:** Estimates of cancer incidence and mortality in Europe in 2006. *Ann Oncol* 2007, 18(3), 581–592.
- [3] **Mäkinen MJ:** Colorectal serrated adenocarcinoma. *Histopathology* 2007, 50(1), 131–150.
- [4] **Crew KD, Neugut AI:** Epidemiology of gastric cancer. *World J Gastroenterol* 2006, 12(3), 354–362.

- [5] Brenner H, Rothenbacher D, Arndt V: Epidemiology of stomach cancer. *Methods Mol Biol* 2009, 472, 467–477.
- [6] Vizcaino AP, Moreno V, Lambert R, Parkin M: Time trends incidence of both major types of esophageal carcinomas in selected countries, 1973–1995. *Int J Cancer* 2002, 99(6), 860–868.
- [7] Szumilo J: Epidemiology and risk factors of the esophageal squamous cell carcinoma. *Pol Merk Lek* 2009, 26(151), 82–85.
- [8] Usnarska-Zubkiewicz L, Strutyńska-Karpinska M, Podolak-Dawidziak M, Nienartowicz M, Grabowski K, Prajs I, Kulickowski K: Epithelial bone marrow cells in patients with advanced esophageal squamous cell carcinoma. *Neoplasma* 2009, 56(3), 245–251.
- [9] Lepage C, Rachet B, Jooste V, Faivre J, Coleman MP: Continuing rapid increase in esophageal adenocarcinoma in England and Wales. *Am J Gastroenterol* 2008, 103(11), 2694–2699.
- [10] Trivers KF, Sabatino SA, Stewart SL: Trends in esophageal cancer incidence by histology, United States, 1998–2003. *Int J Cancer* 2008, 123(6), 1422–1428.
- [11] Eslick GD: Epidemiology of esophageal cancer. *Gastroenterol Clin North Am* 2009, 38(1), 17–25.
- [12] Lerut T, Coosemans W, Deckert G, De Leyn P, Moons J, Nafteux P, Van Raemdonck D: Extended surgery for cancer of the esophagus and gastroesophageal junction. *J Surg Res* 2004, 117(1), 58–63.
- [13] Khosravi Shahi P, Diaz Munoz de la Espada VM, Garcia Alfonso P, Encina Garcia S, Izarzugaza Peron Y, Arranz Cozar JL, Hernandez Marin B, Perez Manga G: Management of gastric adenocarcinoma. *Clin Transl Oncol* 2007, 9(7), 438–442.
- [14] Wilkinson N, Scott-Conner CE: Surgical therapy for colorectal adenocarcinoma. *Gastroenterol Clin North Am* 2008, 37(1), 253–267.
- [15] Mariette C, Piessen G, Triboulet JP: Therapeutic strategies in oesophageal carcinoma: role of surgery and other modalities. *Lancet Oncol* 2007, 8(6), 545–553.
- [16] Diaz de Liano A, Yarnoz C, Artieda C, Aguilar R, Viana S, Artajona A, Ortiz H: Results of R0 surgery with D2 lymphadenectomy for the treatment of localised gastric cancer. *Clin Transl Oncol* 2009, 11(3), 178–182.
- [17] Holmes RS, Vaughan TL: Epidemiology and pathogenesis of esophageal cancer. *Semin Radiat Oncol* 2007, 17(1), 2–9.
- [18] Kitagawa Y: Therapeutic strategies for advanced resectable esophageal cancer. *Nippon Geka Gakkai Zasshi* 2008, 109(6), 333–337.
- [19] Takubo K, Aida J, Sawabe M, Kurosumi M, Arima M, Fujishiro M, Arai T: Early squamous cell carcinoma of the oesophagus: the Japanese viewpoint. *Histopathology* 2007, 51(6), 733–742.
- [20] Gao RN, Neutel CI, Wai E: Gender differences in colorectal cancer incidence, mortality, hospitalizations and surgical procedures in Canada. *J Public Health (Oxf)* 2008, 30(2), 194–201.
- [21] Cheng X, Chen VW, Steele B, Ruiz B, Fulton J, Liu L, Carozza SE, Greenlee R: Subsite-specific incidence rate and stage of disease in colorectal cancer by race, gender, and age group in the United States, 1992–1997. *Cancer* 2001, 92(10), 2547–2554.
- [22] Ponz de Leon M, Marino M, Rossi G, Menigatti M, Pedroni M, Gregorio C, Losi L, Borghi F, Scarselli A, Ponti G, Roncari B, Zangardi G, Abbati G, Ascari E, Roncucci L: Trend of incidence, subsite distribution and staging of colorectal neoplasms in 15-year experience of a specialised cancer registry. *Ann Oncol* 2004, 15(6), 940–946.
- [23] Wu X, Cokkinides V, Chen VW, Nadel M, Ren Y, Martin J, Ellison GL: Associations of subsite-specific colorectal cancer incidence rates and stage of disease at diagnosis with county-level poverty, by race and sex. *Cancer* 2006, 107, 5, Suppl, 1121–1127.
- [24] Greenstein AJ, Litle VR, Swanson SJ, Divino CM, Packer S, McGinn TG, Wisnivesky JP: Racial disparities in esophageal cancer treatment and outcomes. *Ann Surg Oncol* 2008, 15(3), 881–888.
- [25] Paulson EC, Ra J, Armstrong K, Wirtalla C, Spitz F, Kelz RR: Underuse of esophagectomy as treatment for resectable esophageal cancer. *Arch Surg* 2008, 143(12), 1198–1203.
- [26] Heemskerk VH, Lentze F, Hulsewe KW, Hoofwijk TG: Gastric carcinoma: review of the results of treatment in a community teaching hospital. *World J Surg Oncol* 2007, 5:81. doi: 10.1186/1477-78-19-5-81.
- [27] Reukos DH: Current status and future perspectives in gastric cancer management. *Cancer Treat Rev* 2000, 26(4), 243–255.
- [28] Sweed MR, Edmonson D, Cohem SJ: Tumors of the esophagus, gastroesophageal junction, and stomach. *Semin Oncol Nurs* 2009, 25(1), 61–75.
- [29] Jones R, Latinovic R, Charlton J, Gulliford MC: Alarm symptoms in early diagnosis of cancer in primary care: cohort study using General practice research Database. *BMJ* 2007, 334(7602), 1040. doi: 10.1136/bmj.39171.637106.AE.
- [30] Vrba R, Neoral C, Aujesky R, Maly T, Lovecek M: Gastric carcinoma outcomes during 2004–2008. *Rozhl Chir* 2009, 88, 2, 50–54.
- [31] Dittmar Y, Voigt R, Heise M, Rabsch A, Jandt K, Settmacher U: Indication and results of palliative gastric resection in advanced gastric carcinoma. *Zentralbl Chir* 2009, 134(1), 77–82.
- [32] Yokoyama A, Ohmori T, Makuuchi H, Maruyama K, Okuyama K, Takahashi H, Yokoyama T, Yoshino K, Hayashida M, Ishii H: Successful screening for early esophageal cancer in alcoholics using endoscopy and mucosa iodine staining. *Cancer* 1995, 76(6), 928–934.
- [33] Ban S, Toyonaga A, Harada H, Ikejiri N, Tanikawa K: Iodine staining for early endoscopic detection of esophageal cancer in alcoholics. *Endoscopy* 1998, 30(3), 253–257.
- [34] Shimizu Y, Tukagoshi H, Fujita M, Hosokawa M, Kato M, Asaka M: Endoscopic screening for early esophageal cancer by iodine staining in patients with other current or prior primary cancers. *Gastrointest Endosc* 2001, 53, 1, 1–5.

- [35] **Kuraoka K, Hoshino E, Tsuchida T, Fujisaki J, Takahashi H, Fujita R:** Early esophageal cancer can be detected by screening endoscopy assisted with narrow-band imaging (NBI). *Hepatogastroenterology* 2009, 56(89), 63–66.
- [36] **Thompson MR, Perera R, Senapati A, Dodds S:** Predictive value of common symptom combinations in diagnosing colorectal cancer. *Br J Surg* 2007, 94(10), 1260–1265.
- [37] **Hamilton W, Lancashire R, Sharp D, Peters TJ, Cheng K, Marshall T:** The risk of colorectal cancer with symptoms at different ages and between the sexes: a case-control study. *BMC Med* 2009, 7, 17. doi: 10.1186/1741-7015-7-17.
- [38] **Seifert B, Zavoral M, Fric P, Bencko V:** The role of primary care in colorectal cancer screening: Experience from Czech Republic. *Neoplasma* 2008, 55(1), 74–80.
- [39] **Ponz de Leon M, Benatti P, DI Gregorio C, Fante R, Rossi G, Losi L, Pedroni M, Percesepe A, Roncucci L:** Staging and survival of colorectal cancer: are we making progress? The 14-year experience of Specialized cancer Registry. *Dig Liver Dis* 2000, 32(4), 312–317.
- [40] **Ponz de Leon M, Rossi G, DI Gregorio C, Gaetani C, Rossi F, Ponti G, Pecone L, Pedroni M, Roncucci L, Pezzi A, Benatti P:** Epidemiology of colorectal cancer: the 21 year experience of specialised registry. *Intern Emerg Med* 2007, 2(4), 269–279.

Address for correspondence:

Marta Strutyńska-Karpińska
Department of Gastrointestinal and General Surgery
Wrocław Medical University
Marii Skłodowskiej-Curie 66
50-369 Wrocław
Poland
E-mail: mstrutynska@wp.pl

Conflict of interest: None declared

Received: 11.11.2009

Revised: 7.01.2010

Accepted: 1.02.2010