

## Sidedness Colorectal Cancer in Patients Sulaymaniyah Region

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### Abstract

**Background:** Globally, colorectal cancer is the third most commonly diagnosed cancer. Sidedness in colorectal (CRC) cancer has an impact on prognosis. Internationally cancer shifted to the right side, also outcome poorer at the right side in compared to left side. The risk of developing colorectal cancer is influenced by both environmental and genetic factors. The aim of the study was to find out the sidedness for colorectal cancer in Kurdistan region-Iraq and to determine the relevant characteristics of sidedness of patients with colorectal cancer in Sulaymaniyah region.

**Methods:** Cross-sectional study, started at January 2018 to January 2019. The data were collected from Hiwa hospital registries in Sulaymaniyah city which is the only cancer center in the city, all cases diagnosed and registered in the hospital for years 2017 and 2018 were included. The process of collection of relevant information done by a questionnaire designed for this issue, sidedness plus all relevant characteristic information's collected.

**Results:** One hundred ninety-eight patients with colorectal cancer were included in the study. Mean age of the patients were 57.4 years, mean of age in the right-sided tumor (59.6 years) in higher than left-sided tumor (55.9 years). The group of patients aged below 50 years represents 36.4% of all cases. Overweight and obesity more reported among left-sided tumors more than the right-sided tumor. Right-sided tumors occur in older age. Abdominal pain and anemia were statistically significantly associated with right-sided tumor (P-value=0.01 and 0.02) and lower GI bleeding statistically significantly associated with left-sided tumor (P-value=0.04). Staging of both left and right-side tumors reveals that both of them mainly present in stage (III and IV). Lymph nodes dissected in both right and left-sided tumors in two third of them were adequate. Both left-sided (99%) and right sided (95%) pathology reveal negative margin. Lymphovascular invasion is more reported for right-sided tumors (44%) when compared to left-sided tumors (38%). The mucinous type was more common with the right-sided tumor. Among stage (III) cases recurrence rates for distant metastasis equal to 60%, while it is 40% for local recurrence.

**Conclusion:** Right-sided tumors occur in older age group and were diagnosed in late stages (in more than half of the patients), due difficulties in endoscopic exploration, health education, health promotion (36.4% of cases occurred below the age of 50 years). Screening programs are the cornerstone in order to detect the tumor in the earlier stage, shifting of age groups toward younger ages require more epidemiological studies.

**Keywords:** Colorectal ca; sidedness; Sulaymaniyah; Right-side; Left-side

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## Introduction

Colorectal cancer (CRC) is a common and lethal disease. The risk of developing CRC is influenced by both environmental and genetic factors. Globally, CRC is the third most commonly diagnosed cancer in males and the second in females, Incidence rates in most western countries have been stable or increased slightly [1-3]. In contrast, CRC incidence rates have rapidly increased in several areas historically at low risk, including Spain, and a number of countries within Eastern Asia and Eastern Europe. United States cancer statistics shows rate of colorectal cancer was 39.4 per 100,000 men and women per year. While mortality rate was 14.5 per 100,000 men and women per year. In 2015, there were an estimated 1,332,085 people living with colorectal cancer in the United States, also gradual increase in the age specific incidence of CRC among under 50 years of age in study population was found: from 3.59/100,000 males in 1988 to 5.21/100,000 males in 2013, and from 3.15/100,000 females in 1988 to 4.45/100,000 females in 2013 in united states of America [3-5].

A gradual shift toward right-sided or proximal colon cancers has been observed both in the United States, Iran and internationally with the greatest relative increase in incidence in cecal primaries. This change in the anatomic distribution of CRCs may be, in part, related to improvements in diagnosis and treatment, and increased screening with removal of adenomatous polyps in the distal colon. Colonoscopy is more effective in preventing left-sided than right-sided CRCs, which could also contribute to a shift in distribution of cancers in the colon. Although all of these issues may contribute to a shift toward right- rather than left-sided cancers, there also appears to be a true increase in the incidence of ascending colon and cecal cancers [6-8]. The effects of sidedness of the colorectal tumor on patient survival and response to treatment lines has been shown in large clinical trials. There is a difference in regard origin and blood supply between right colon, the left colon and rectum embryologically [9-11]. In 1990, Bufill was the first to propose that colorectal cancer found in the distal and proximal location of the colon may follow different biological pathways. Subsequently suggested that there are differences in epidemiology, perioperative course, pathology and prognosis between patients with cancers in the right side and the left side of the colon [10,11]. Reviews showed that tumors from left side carry better prognosis in comparison with right sided one. Overall survival was found with a 20% reduced risk of death for cancers arising on the left side [10,12].

According to available data from records of HIWA hospital, colorectal cancer is the third most common cancer in Sulaymaniyah HIWA hospital, furthermore Latest information internationally shows that the cancer shifted to right side and even the outcome poorer in right side. Up to researcher's knowledge no previous studies done to find out sidedness of colorectal cancer patients generally in Kurdistan region and specifically in Sulaymaniyah. So, this study was conducted to determine the sidedness of colorectal cancer in patients those registered in 2017 and 2018 in Sulaymaniyah city and exploring relative characteristic features of sidedness.

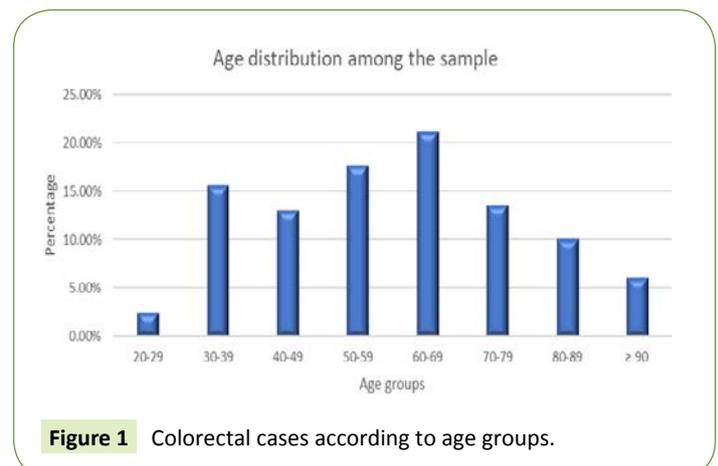
Objectives of this study was to find out the sidedness for colorectal cancer in Sulaymaniyah city. To determine the relevant characteristics of sidedness of patients with colorectal cancer in Sulaymaniyah region.

## Materials and Methods

A cross-sectional study, started at January 2017 to January 2019. The data collected from registries and documents kept by the patients in Hiwa hospital in Sulaymaniyah city which is the only cancer center in the city, all cases registered in the hospital for years 2017 and 2018 were taken. Thereafter the collection of relevant information performed by a questionnaire designed for this study, in addition to sidedness of colorectal cancer, relative characteristics of the sidedness were taken. Inclusion criteria: include, colorectal cancer cases aged 18 years and above, diagnosed and registered in Hiwa hospital (as colorectal cancer) serving Sulaymaniyah region, all cases registered for years 2017 and 2018 in Hiwa hospital were taken. Data collection performed by looking through hospital registries and documents kept by the patients (if needed). Exclusion criteria: any patient without histopathological confirmation. Ethical considerations for this study was approved by Kurdistan Board for Medical Specialties. A verbal consent was obtained from patients and controls before asking documents from patients and official permission was taken from the directorate of health and HIWA hospital. In regard statistical analysis, the data was entered into computer, data analysis performed by applying SPSS version 21. Descriptive statistics by calculating percentage, mean, standard deviation, tables and graphs. Association between categorical variables tested by Chi-square test. Level of significance of  $\leq 0.05$  was considered. Lastly a well-organized questionnaire prepared through discussion with scientific personnel in the field plus reviewing questionnaires from published articles.

## Results

One hundred and ninety-eight patients included in this study with mean of age equal to 57.4 years, age ranging 21-90 years (**Figure 1**). Males compose 55.6% of cases, with mean of age equal to 57.8 years, while females were 88 (44.4%) with mean of age equal to 56.9 years. Nearly 60% of the cases were left sided tumor, while approximately 40% were right sided tumor. In left



sided tumors (117 patients), mean of age is 55.9 years, while in right sided tumor (81 patients), mean of age is 59.6 years. Male represent (56%) more than female (44%). Abdominal pain more common in right sided tumor (P-value=0.01), same with anemia more common in right sided tumor (P-value=0.02) while lower GI bleeding more common left sided tumor (P-value=0.04). Nearly 41% of left sided tumor were in stage III followed by nearly 23% in stage IV. While nearly 46% of right sided tumor were in stage III followed by 22.5% were in stage I (**Table 1**). Left sided tumor statistically associated with stage IV (P-value=0.04). Our results demonstrate that 77.2% of left sided tumor is adequate in regard adequacy number of lymph nodes. While nearly 86% of right sided tumor is adequate (**Table 2**). Only 1% of left sided cases were positive to margin involvement, while 5.1% of right sided tumors positive. Nearly 56% of patients who got lymphovascular invasion were left sided tumor, while nearly 44% of the cases were from right sided one. Our study demonstrate that nearly 61.8% of left sided tumor had perineural invasion, while 38.2% of right sided had no perineural invasion. Among those who were overweight and obese, 61.1% of the cases were from left sided tumor while 38.9% were from right sided tumor (**Figure 2**).

Among stage III patients who got recurrence, 60% of them got distant metastasis while 40% of them got local recurrence.

## Discussion

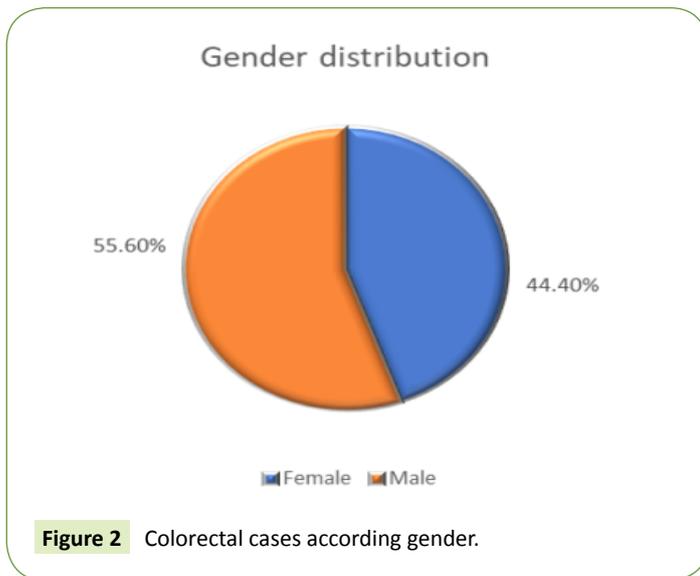
Colorectal cancer is a common lethal disease; it is also occupying the position of third most common cancer according to Hiwa hospital. Sidedness in colorectal cancer has impact on prognosis. The mean of age in both male (57.4 years) and female (56.9 years) are slightly different (slightly higher in male patients), which is supported by a study performed in Erbil, Kurdistan-Iraq(13) also same age groups supported by a study done in Iran [5] and Kingdom of Saudi Arabia [13,14]. While in regard sidedness the mean of age in right sided tumor (59.6 years) in higher than left sided tumor (55.9 years). Which may be due to difficulty in diagnosis by endoscopy and difficulty in detection due to anatomical location of the tumor, result supported by a study done in Iran [8] while it is opposite to finding to results of a study in Kingdom of Saudi Arabia [15]. Also, it is important to notice that age of below 50 years of age represent nearly 36.4% of all cases which is support that colorectal cancer increase in young age group, this finding supported by what is a study performed in United states of America (USA) [4,16] and not supported by a study done in Saudi [15] which may be due to variation in culture and life style change. Nearly 56% of the cases composed from male, while nearly 44% were from female, the gender composition is contrast to what is found in a study done

**Table 1** Inclusion and exclusion criteria.

| Symptoms              | Site of the tumor |      |       |            |      |       | Total |       | P-value |
|-----------------------|-------------------|------|-------|------------|------|-------|-------|-------|---------|
|                       | Left side         |      |       | Right side |      |       | No.   | C%    |         |
|                       | No.               | R%   | C%    | No.        | R%   | C%    |       |       |         |
| Abdominal pain        | 34                | 47.2 | 28.8  | 38         | 52.8 | 47.5  | 72    | 36.4  | 0.01    |
| Anemia                | 2                 | 22.2 | 1.7   | 7          | 77.8 | 8.6   | 9     | 4.5   | 0.02    |
| Change in bowel habit | 40                | 67.8 | 33.9  | 19         | 32.2 | 23.8  | 59    | 29.8  | 0.12    |
| Lower GI bleeding     | 34                | 72.3 | 28.8  | 13         | 27.7 | 16.3  | 47    | 23.7  | 0.04    |
| Melena                | 8                 | 72.7 | 6.8   | 3          | 27.3 | 3.8   | 11    | 5.6   | 0.36    |
| <b>Total</b>          | 118               | 59.6 | 100.0 | 80         | 40.4 | 100.0 | 198   | 100.0 |         |

**Table 2** Baseline characteristics of patients.

| Categories            | Site of the tumor |       |       |            |      |       | Total |       | P-value |
|-----------------------|-------------------|-------|-------|------------|------|-------|-------|-------|---------|
|                       | Left side         |       |       | Right side |      |       | No.   | C%    |         |
|                       | No.               | R%    | C%    | No.        | R%   | C%    |       |       |         |
| <b>Staging</b>        |                   |       |       |            |      |       |       |       |         |
| Stage I               | 20                | 52.6  | 16.9  | 18         | 47.4 | 22.5  | 38    | 19.2  | 0.33    |
| Stage II              | 22                | 57.9  | 18.6  | 16         | 42.1 | 20.0  | 38    | 19.2  | 0.81    |
| Stage III             | 47                | 55.3  | 40.2  | 38         | 44.7 | 46.9  | 85    | 42.9  | 0.44    |
| Stage IV              | 27                | 75.0  | 23.1  | 9          | 25.0 | 11.1  | 36    | 18.2  | 0.04    |
| Unknown               | 1                 | 100.0 | 0.8   | 0          | 0.0  | 0.0   | 1     | 0.5   | 0.41    |
| <b>Total</b>          | 117               | 59.1  | 100.0 | 81         | 40.9 | 100.0 | 198   | 100.0 |         |
| <b>Margin</b>         |                   |       |       |            |      |       |       |       |         |
| Positive              | 1                 | 20.0  | 1.0   | 4          | 80.0 | 5.1   | 5     | 2.8   | 0.09    |
| Negative              | 101               | 57.7  | 99.0  | 74         | 42.3 | 94.9  | 175   | 97.2  |         |
| <b>Total</b>          | 102               | 56.7  | 100.0 | 78         | 43.3 | 100.0 | 180   | 100.0 |         |
| <b>BMI categories</b> |                   |       |       |            |      |       |       |       |         |
| Underweight           | 2                 | 50.0  | 2.1   | 2          | 50.0 | 3.2   | 4     | 2.5   | 0.68    |
| Normal weight         | 48                | 59.3  | 51.1  | 33         | 40.7 | 52.4  | 81    | 51.6  | 0.77    |
| Overweight & obesity  | 44                | 61.1  | 46.8  | 28         | 38.9 | 44.4  | 72    | 45.9  | 0.77    |
| <b>Total</b>          | 94                | 59.9  | 100.0 | 63         | 40.1 | 100.0 | 157   | 100.0 |         |



in, Erbil, Kurdistan-Iraq and USA this difference may be due to cultural variation between the communities, health awareness of the two populations [13,16].

Left sided tumor made more than half of the cases (59.21%) which is supported by a study done in Erbil, Kurdistan-Iraq showed that 77.12% of the cases were left sided [13].

Most of the studies show variability in characteristic features of right versus left sided colon tumors. Our study shows that in left sided tumor nearly 34% of the cases present with change in bowel habit, followed by lower GI bleeding and abdominal pain. While in right sided tumor nearly half (47.5%) of the cases present with abdominal pain followed by change in the bowel habit and lower GI bleeding. Abdominal pain and anemia statistically associated with right sided tumor (P-value=0.01 and 0.02) and lower GI bleeding statistically associated with left sided tumor (P-value=0.04) [17]. The difference in presentation of left versus right sidedness may indicate the difference type or stage of the cancer. Also the results show variation with other studies, which may be due to variation in embryological region or biological differences [6,17-19].

Staging of both left and right side tumors reveals that both of them mainly present in late stages (nearly 40% of each), while in contrast to what is known more right sided cases detected in stage one which indicate that the absent of health education programs, screening programs that cannot be replaced by chaotic individual physician's decision, which followed now due

to absence of screening program in our country that is why most of our cases presents in late stages [17,19-25].

Lymph nodes removed during surgery in both right and left sided tumors were nearly more than two third of them were adequate and both left sided (99%) and right sided (nearly 95%) were negative for margin involvement. Which refer to efficient surgical techniques and skills used during surgery [17-20].

Mucinous type is made majority (89.5%) of histopathological presentation in regard right sided tumor. Marginal involvement also more commonly noticed among right sided tumors (5.1%), which also same for lymphovascular invasion which was also more commonly noticed among right sided tumor and perineural invasion in contrast more reported among left sided tumors [6,26,27].

Overweight and obesity more reported among left sided tumors (61.1%) when compared to right sided tumor (38.9%), it reveals the importance of risk factors which can be modified, among 3,799 CRC patients included in a study done in USA, there were 36% overweight, and 33% obese patients based on the international classification of BMI [28-31].

Adjuvant chemotherapy given in stage III of cancer (stage three P-value:  $\leq 0.001$ ), while adjuvant chemotherapy given in stage 2 based on the following risk factors: bowel preformation (or obstruction), poor histopathological differentiation, lymphovascular invasion and perineural invasion, elevated tumor markers, absence of microsatellite instability and less than 12 lymph nodes resected [32,33].

Among stage III cases recurrence rates for distant metastasis equal to 60%, while it is 40% for local metastasis [34,35].

## Conclusion

Right sided tumors occur in older age group and were diagnosed in late stages (in more than half of the patients), due difficulties in endoscopic exploration, health education, health promotion (36.4% of cases occurred below age of 50 years) which is may be return back to anatomical location.

Screening programs is the corner stone in order to detect the tumor in earlier stage, shifting of age groups toward younger ages require more epidemiological studies. We recommend more studies in regard sidedness and their characteristics required. Enhancement of primary healthcare system, screening programs will improve the detection of CRC at early stages. Community education about the risk factors required.

## References

- 1 New Global Cancer Data: GLOBOCAN 2018. UICC [Internet]. [cited 2019 Feb 12]. Available from: <https://www.uicc.org/new-global-cancer-data-globocan-2018>.
- 2 USCS Data Visualizations. [Internet]. [cited 2019 Feb 12]. Available from: <https://gis.cdc.gov/grasp/USCS/DataViz.html>.
- 3 Cronin KA, Lake AJ, Scott S, Sherman RL, Noone A-M, et al. (2018) Annual Report to the Nation on the Status of Cancer, part I: National cancer statistics. *Cancer* 124: 2785-2800.
- 4 Wang W, Chen W, Lin J, Shen Q, Zhou X, et al. (2019) Incidence and characteristics of young-onset colorectal cancer in the United States: An analysis of SEER data collected from 1988 to 2013. *Clin Res Hepatol Gastroenterol* 43: 208-215.
- 5 Rafiemanesh H, Pakzad R, Abedi M, Kor Y, Moludi J, et al. (2016) Colorectal cancer in Iran: Epidemiology and morphology trends. *EXCLI J* 28: 738-744.

- 6 Hussain M, Waqas O, Hassan U, Loya A, Akhtar N, et al. (2016) Right-Sided and Left-Sided Colon Cancers are Two Distinct Disease Entities: an Analysis of 200 Cases in Pakistan. *Asian Pac J Cancer Prev* 17:2545-2548.
- 7 Caldarella A, Crocetti E, Messerini L, Paci E (2013) Trends in colorectal incidence by anatomic subsite from 1985 to 2005: a population-based study. *Int J Colorectal Dis* 28: 637-641.
- 8 Kashfi SMH, Nazemalhosseini Mojarad E, Pourhoseingholi MA, Asadzadeh Aghdai H, Anaraki F, Zali MR (2015) Evaluation of the left-to-right shift of colon tumors in Iran: Is the trend changing? *J Res Med Sci Off J Isfahan Univ Med Sci* 20: 978-986.
- 9 Salem ME, Weinberg BA, Xiu J, El-Deiry WS, Hwang JJ, et al. (2017) Comparative molecular analyses of left-sided colon, right-sided colon, and rectal cancers. *Oncotarget* 8: 86356-86368.
- 10 Boeckx N, Janssens K, Van Camp G, Rasschaert M, Papadimitriou K, et al. (2017) Left-Sided vs Right-Sided Colon Cancer: A Systematic Review and Meta-analysis. *JAMA Oncol* 3: 211.
- 11 Hansen IO, Jess P (2012) Possible better long-term survival in left versus right-sided colon cancer - a systematic review. *Dan Med J* 59: A4444.
- 12 Petrelli F, Tomasello G, Borgonovo K, Ghidini M, Turati L, et al. (2017) Prognostic Survival Associated With Left-Sided vs Right-Sided Colon Cancer: A Systematic Review and Meta-analysis. *JAMA Oncol* 3: 211-219.
- 13 Hamza HT, Rasul KI (2018) The epidemiology of colorectal cancer in Erbil. *Adv Mod Oncol Res* 4: 286.
- 14 Alsanea N, Abduljabbar AS, Alhomoud S, Ashari LH, Hibbert D, et al. (2015) Colorectal cancer in Saudi Arabia: Incidence, survival, demographics and implications for national policies. *Ann Saudi Med* 35: 196-202.
- 15 Omer A (2017) The Clinical and Pathological Features of Colorectal Cancer in Tabuk Region, Saudi Arabia: Trends in the Young and Elderly Patients. *Int J Surg Surg Proced* 6: 2.
- 16 Matsuda T, Sumi Y, Yamashita K, Hasegawa H, Yamamoto M et al. (2017) Anatomy of the Transverse Mesocolon Based on Embryology for Laparoscopic Complete Mesocolic Excision of Right-Sided Colon Cancer. *Ann Surg Oncol* 24: 3673.
- 17 Warschkow R, Sulz MC, Marti L, Tarantino I, Schmied BM, Cerny T, et al. (2016) Better survival in right-sided versus left-sided stage I - III colon cancer patients. *BMC Cancer*.
- 18 Warschkow R, Sulz MC, Marti L, Tarantino I, Schmied BM, et al. (2016) Better survival in right-sided versus left-sided stage I - III colon cancer patients. *BMC Cancer* 16: 554.
- 19 Moreno CC, Mittal PK, Sullivan PS, Rutherford R, Staley CA, et al. (2016) Colorectal Cancer Initial Diagnosis: Screening Colonoscopy, Diagnostic Colonoscopy, or Emergent Surgery, and Tumor Stage and Size at Initial Presentation. *Clin Colorectal Cancer* 15: 67-73.
- 20 Matsuda T, Sumi Y, Yamashita K, Hasegawa H, Yamamoto M, et al. (2017) Anatomy of the Transverse Mesocolon Based on Embryology for Laparoscopic Complete Mesocolic Excision of Right-Sided Colon Cancer. *Ann Surg Oncol* 24: 3673-3673.
- 21 Aykan NF, Yalcin S, Turhal NS, Ozdogan M, Demir G, et al. (2015) Epidemiology of colorectal cancer in Turkey: A cross-sectional disease registry study (A Turkish Oncology Group trial). *Turk J Gastroenterol* 26: 145-153.
- 22 Baran B, Mert Ozupek N, Yerli Tetik N, Acar E, Bekcioglu O, et al. (2018) Difference Between Left-Sided and Right-Sided Colorectal Cancer: A Focused Review of Literature. *Gastroenterol Res* 11: 264-273.
- 23 Lee L, Erkan A, Alhassan N, Kelly JJ, Nassif GJ, et al. (2018) Lower survival after right-sided versus left-sided colon cancers: Is an extended lymphadenectomy the answer? *Surg Oncol* 27: 449-455.
- 24 Yang L, Xiong Z, Xie Q, He W, Liu S, et al. (2018) Prognostic value of total number of lymph nodes retrieved differs between left-sided colon cancer and right-sided colon cancer in stage III patients with colon cancer. *BMC Cancer* 18: 558.
- 25 Yamaoka Y, Kinugasa Y, Shiomi A, Yamaguchi T, Kagawa H, et al. (2017) The distribution of lymph node metastases and their size in colon cancer. *Langenbecks Arch Surg* 402: 1213-1221.
- 26 Ben-Aharon I, Goshen-Lago T, Sternschuss M, Morgenstern S, Geva R, et al. (2019) Sidedness Matters: Surrogate Biomarkers Prognosticate Colorectal Cancer upon Anatomic Location. *Oncologist* 201: 0351.
- 27 Kim K, Kim Y-W, Shim H, Kim B-R, Kwon HY (2018) Differences in clinical features and oncologic outcomes between metastatic right and left colon cancer. *J BUON* 23: 11-18.
- 28 Aparicio T, Ducreux M, Faroux R, Barbier E, Manfredi S, et al. (2018) Overweight is associated to a better prognosis in metastatic colorectal cancer: A pooled analysis of FFCD trials. *Eur J Cancer* 98: 1-9.
- 29 Shi JW, MacInnis RJ, Boyle T, Vallance JK, Winkler EAH, et al. (2017) Physical Activity and Sedentary Behavior in Breast and Colon Cancer Survivors Relative to Adults Without Cancer. *Mayo Clin Proc* 92: 391-398.
- 30 Park SW, Lee HL, Doo EY, Lee KN, Jun DW, et al. (2015) Visceral Obesity Predicts Fewer Lymph Node Metastases and Better Overall Survival in Colon Cancer. *J Gastrointest Surg Off J Soc Surg Aliment Tract* 19: 1513-1521.
- 31 Shahjehan F, Merchea A, Cochuyt JJ, Li Z, Colibaseanu DT, et al. (2018) Body Mass Index and Long-Term Outcomes in Patients With Colorectal Cancer. *Front Oncol* 17: 620.
- 32 Hara K, Yamada T, Koizumi M, Shinji S, Yokoyama Y, et al. (2018) P-235Adjuvant chemotherapy for colorectal cancer using oxaliplatin induced irreversible sinusoidal obstruction syndrome. *Ann Oncol* 29: 235.
- 33 Kannarkatt J, Joseph J, Kurniali PC, Al-Janadi A, Hrinchenko B (2017) Adjuvant Chemotherapy for Stage II Colon Cancer: A Clinical Dilemma. *J Oncol Pract* 13: 233-241.
- 34 Treasure T, Monson K, Fiorentino F, Russell C (2014) The CEA Second-Look Trial: a randomised controlled trial of carcinoembryonic antigen prompted reoperation for recurrent colorectal cancer. *BMJ Open* 4: e004385.
- 35 You YN, Rustin RB, Sullivan JD (2015) Oncotype DX(®) colon cancer assay for prediction of recurrence risk in patients with stage II and III colon cancer: A review of the evidence. *Surg Oncol* 24: 61-66.