



Evaluation of Short Term Outcome of Elective and Emergency Surgery for Colorectal Cancer: A Single Institute Experience

Short term outcomes after elective and emergency colorectal cancer surgery

Maitreyi S Patel¹, Rajeev R Satoskar¹, Monty Khajanchi¹

¹Department of General Surgery, Seth G.S Medical College and King Edward Memorial Hospital, Mumbai, India

Dr Maitreyi S Patel (MSP), Dr R R Satoskar (RRS), Dr Monty Khajanchi (MK)

Corresponding Author: Dr Maitreyi S Patel (MSP), Department of General Surgery, Seth G.S Medical College and King Edward Memorial Hospital, Mumbai, India

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Introduction

Background: Emergency surgery for colorectal cancer is associated with increased likelihood of postoperative morbidity and mortality. The primary purpose of this prospective study was to identify factors associated with short term postoperative morbidity, mortality and recurrence at the end of one year in patients with colorectal adenocarcinoma undergoing elective and emergency surgery.

Methods: This was a prospective observational study which included patients with colorectal adenocarcinoma who underwent surgery between September – November 2013 at a single tertiary care center .These patients were followed up for 1 year. Data

on patient age, gender, operation type, intraoperative results, length of hospital stay, co-morbidities, postoperative complications and pathological results were evaluated and compared. Multiple regression analysis was used to identify independent risk factors for postoperative complications.

Results: 70 patients with colorectal cancer underwent surgery, 24 patients presented in emergency. There was no

statistical difference between groups in terms of age and gender. The difference between the groups in terms of co morbidities, intraoperative findings, adequacy of resection and pathological stage was statistically significant. Morbidity and mortality rates in emergency and electively operated patients were not statistically significant . Age and stage was independently associated with seven day postoperative mortality and overall mortality respectively($p<0.05$).

Conclusion: Emergency surgery for colorectal cancer is not associated with increased short term postoperative morbidity and mortality. Radical resection of tumor in emergency setting can result in outcomes similar to those operated electively.

Introduction

Adenocarcinoma of the colon and rectum is the third most common site of new cancer cases and deaths in men (following prostate and lung or bronchus cancer) and women (following breast and lung or bronchus cancer) in the United States but it is relatively uncommon in the Indian subcontinent. There has been a significant increase in 5-year survival rates over the last 30 years. [1]

Overall approximately 6-34% of patients with colorectal cancer will present as an emergency with an associated poorer prognosis.[2]

Emergency surgery for colorectal carcinoma is associated with higher rates of morbidity and mortality. Other factors that influence the outcome in emergency are advanced stage of presentation, old age and poor condition at presentation. The identification of risk factors and optimized preoperative care might improve the early postoperative outcomes. There is a scarcity of outcome data from the South Asian countries.

The aim of this study was to identify factors associated with short term postoperative morbidity, mortality and recurrence rates at the end of one year in patients with colorectal adenocarcinoma undergoing elective and emergency surgery at a single tertiary care center.

Materials and Methods

Patients with colorectal adenocarcinoma who underwent surgery from September 2013 to November 2014 at a single tertiary care center were included in the study. As per convenience sampling, 70 patients were included in this study. The data which included clinical and preoperative diagnostic examinations, operative reports by the surgeons, histopathology and follow-up was collected. An emergency surgery was defined as a surgery performed for obstruction, perforation, acute per rectal bleeding of the colon or rectum. The histopathology report included: tumor extent (T), extent of spread to lymph nodes (N), tumor differentiation, resection margin involvement and lymphovascular invasion. Adequacy of resection was determined by presence of free margins on the histopathology report and minimum 12 lymph node resection.

Patients were followed up every three months, up to one year. Information on their condition was obtained by phone contact and available outpatient records. At the

time of each follow up the investigations which the patient underwent were noted. For those who had died, the date of death or the latest date when the patient's status was known were used as the end of follow-up. Cause of death was determined by interviewing first degree relatives and the available records.

Statistical analysis of data distribution was done using tests like mean and studying percentage. Thereafter, each variable was correlated with outcome. For categorical data Fisher test was used. For numerical data passing the test of normality parametric tests were used. For numerical data not passing the test of normality non-parametric tests like Mann Whitney test was used. The p value of less than 0.05 was considered significant. All statistical analysis was performed using Statistical Package for the Social Sciences version 21 (SPSS 21.0).

Approval was obtained from Institutional Research Ethics Committee.

Results

70 patients underwent surgery in our study period for colorectal cancer.

Patients presenting in emergency (n=24) had a mean age of 56 years while those undergoing elective surgery (n=46) had a mean age of 52 years. 25 (54.3%) patients of the elective group were >50 years of age, while 9 (37.5%) of those in emergency group were more than 50 years of age. There was no significant difference in the age of presentation between the two groups.

Males formed the maximum number of patients in both groups. There was no significant difference in the gender distribution between the two groups.

There was a statistically significant difference between the two groups in terms of co morbidities (p<0.05). Twenty-one (88%) patients undergoing emergency surgery had co morbidity. The most common co morbidity in both groups was hypertension.

Tumor location and type of surgery of patients undergoing elective and emergent operation is summarized in table 2.

Most common location of tumor in electively operated patients was rectum (n= 23). In those undergoing emergency surgery most common location of tumor was in sigmoid colon (n= 8).

63 patients underwent radical resection of the primary tumor. Radical resection was performed for 45(95.6%) electively operated, and for 18(75%) patients operated in emergency. Electively operated patients had a significantly higher rate of radical resection as compared to those undergoing emergency surgery (p<0.05).

Hartmann's surgery and loop colostomy was significantly more in the patients undergoing emergency surgery (p< 0.01). Nine (37.5%) patients operated in emergency underwent Hartmann's procedure while no electively operated patient had it. Six (25%) of emergency patients and one (2.17%) of the patients operated electively underwent loop colostomy. Anterior resection was significantly higher in the elective group n=23(43.4%) as compared to emergency group n=0 (p<0.001).

Intraoperative findings (table 3) showed that tumor mass alone, without serosal involvement was significantly higher in the elective group (18 i.e 39.13% versus 0) (p<0.001). Peritoneal metastasis was present in 3(12.5%) of patients operated in emergency, was significantly higher than the electively operated patients(p<0.05).

Moderately differentiated adenocarcinoma was the most common. There was no statistically significant difference between the two groups in terms of differentiation of tumor of free resection margins, positive metastatic lymph nodes and lympho vascular invasion. Margins free of tumor and adequate lymph node resection was significantly higher in the electively operated patients (46.67%) as compared to those operated in emergency(5.56%) (p<0.005)

As per the TNM staging Stage IIA was the most common stage (28.2%) in the electively operated patients (p<0.05) and Stage IVA was most common in those undergoing emergent operation(20.8%). Majority of the patients in our study were at an advanced stage (III and IV) at presentation(n=43).(Table 4)

The postoperative course is summarized in table 5.

The mean duration of hospital stay in our study was 13 days in elective group and 12 days in the emergency group.

The most common postoperative complication was respiratory infection (24.29%). Stoma related complication occurred in one patient. Nine patients in the elective group underwent reoperation while 4 among those operated in emergency underwent reoperation.

There was no significant difference in hospital stay, stoma related complications, respiratory complications and reoperation between the two groups. None of the patients developed deep vein thrombosis or pulmonary embolism.

In our study, mortality was observed in 50% patients undergoing emergency surgery. There was no significant difference in mortality between the two groups.

Multiple regression analysis disclosed that stage of cancer was independently associated with overall mortality while the age of patient was independently related to the seven day post-operative mortality. (Table 6)

Conclusion

Emergency presentation of patients with colorectal cancer is expected to be a poor prognostic factor as the presenting symptoms are usually attributable to advanced disease. These group of patiens represent the highest potential for improvement to achieve comparable outcomes with those operated electively.

In our study 34.29% (24) emergency surgeries were performed and 65.71% (46) surgeries were elective. These findings were similar to the findings in the Romanian

hospital where, in 2001, 34.78% emergency operations were performed and 65.21% elective surgeries were done. In 2011, 30.98% were emergency surgeries and 69.01% were elective surgeries.[3]

Age has an important association with colorectal cancer, its prevalence increases with age. The mean age of diagnosis of patients in our study was 54 years and was similar to that in the study by Elzouki AN et al (57.14 years). [4] Most of the patients in this study were of older age group. The mean age of presentation in elective group was 52 years and 56 years for emergency group. We found that the age at presentation of colorectal cancer in our study group (54 years) was a decade earlier compared to non-African Americans in the USA (70.5 years).[5] CRC in Asian and African countries occurs one decade earlier than in the Western population.[6] These age related findings may help in the development of a screening program.

Males formed 68.57% and females formed 31.42% patients in our study. This difference may be attributed to the possibility that women in our study are more likely to experience longer time to diagnosis than men. These results probably are related to gender differences in coping with symptoms and help-seeking behaviour.

Presence of comorbidities has been shown as independent risk factor for postoperative morbidity and mortality.[7] There was a statistically significant difference between the two groups in terms of co morbidities ($p < 0.05$). Twenty-one (88%) of patients undergoing emergency surgery had at least one co-morbidity. The most common co morbidity in both groups was hypertension. In our study however, there was no significant co relation between presence of co morbidities and morbidity and mortality.

Most common complications in colorectal cancer patients is bowel obstruction, followed by perforation and bleeding.[8][9] In our study, indications for emergency

surgery were obstruction (70.8%), perforation (8.3%) and acute per rectal bleeding (12.5%).

Sixty-three electively operated patients underwent radical resection of the primary tumor whereas it was done in 18 (75%) patients operated in emergency. Electively operated patients had a significantly higher rate of radical resection as compared to those undergoing emergency surgery ($p < 0.05$). McArdle & Hole in their study reported that principles of oncologic resection can be met for colorectal cancer patients operated in emergency. [10] In our study the large number of emergency operated patients undergoing radical surgery reflects the above.

The type of surgery done for colorectal cancer patients presenting in emergency depends upon the location of tumor. A significant number of studies accepted the common one step resection and primary anastomosis in all colorectal cancer patients with elective or emergency surgical management for right colon tumor for obstruction except for those with poor general condition.[11] The results of resection anastomosis for obstruction of left colon cancer and Hartmann's surgery were similar in terms of postoperative mortality and complications as stated by Capasso et al [12]. It is generally recommended to do a step wise surgery for left colon cancer because resection anastomosis under emergency circumstances has a risk of anastomotic leak.[13] In our study the most common surgery for left sided colonic tumors presenting in emergency was Hartmann's procedure nine (37.5%). Six (25%) of emergency patients and one (2.17%) of the patients operated electively underwent loop colostomy. Patients undergoing Hartmann's surgery and loop colostomy were significantly more in those undergoing emergency surgery ($p < 0.01$). Hartmann's procedure does have the advantage of resecting the tumor, thereby providing curative resection, while avoiding the risk of anastomotic leak. We believe that for patients with left

colonic tumors presenting in emergency, the surgical treatment be decided on the basis of patient condition and surgeon experience.

Peritoneal carcinomatosis is detected more in emergency cases and the associated risk factors for its development include right colon cancer, advanced T and N stage and poor differentiation of the tumor.[14] Peritoneal metastasis was significantly higher in the emergency group of patients ($p<0.05$). This is in concordance with the above study.[14] Tumor mass alone, without serosal involvement was significantly higher in the electively operated patients ($p<0.001$)(Table 3). Most patients in our study in the elective group belonged to Stage IIA.

Many studies have evaluated the positive correlation between degree of differentiation and histologic grade of tumor with prognosis.[15] Moderately differentiated adenocarcinoma was the most common among the study group (Table 5). There was no significant correlation between the tumor differentiation and postoperative outcome of the patients.

A key factor in adequate oncologic resection is the number of lymph nodes harvested and the margins of the tumour. Owing to technical difficulty or instability of the patient, inadequate lymph node harvest may occur, resulting in pathologically under staged or indeterminate staging of the patient. [16] The American Joint Committee on Cancer has deemed that a minimum of 12 lymph nodes need to be examined for adequate staging.[17]

The mean number of lymph nodes resected in the elective group (12.87) was significantly higher than that in the emergency group (7.1). Adequacy of resection was significantly higher in the electively operated patients ($p<0.005$). This might be due to better planned mapping of the lymph nodes involved in the elective surgery group. Results of surgical intervention might be improved if emergency colorectal operations were

undertaken by surgeons with more experience of this type of surgery.

There was a statistically significant difference between the two groups in terms of stage. As per the TNM staging, Stage IIA was the most common stage (28.2%) in the electively operated patients ($p<0.05$) and Stage IVA was most common in those undergoing emergent operation (20.8%). This is in concordance with study by Ghazi et al.[18] Majority of the patients in our study were at an advanced stage at presentation ($n=43$). One of the reasons for late presentation of patients to our centre is the absence of screening programme and of awareness of the significance of symptoms, thereby patients seeking medical aid at a late stage.

Morbidity and mortality rates in emergency CRC surgery has been 15-50% and 6-15% respectively in several studies. These rates were 4-14% and 1-7% in elective CRC.[20][21] In our study the morbidity and mortality rates in emergency surgery were 45.8% and 50% respectively; while those for elective group being 43.5% and 28.26% respectively. This high percentage in emergency group could be due to higher number of patients with comorbidities as well as presence of surgical risks such as electrolyte imbalance, dehydration and surgery on a dilated and dirty colon.

The mean duration of hospital stay in patients undergoing emergent as well as elective surgery was 13 days. The mean duration of stay in emergency patients was 24 days and that of non-emergency patients was 11 days in the study by Hwang H.[22] The duration of hospital stay of emergency patients in our study was lower while that in the non-emergency patients was similar to that reported in above study.

Patients who undergo surgery for CRC are at a high risk of DVT and PE, than those undergoing major surgery and in older age. If prophylaxis is not applied in these cases,

then the risks of DVT and PE can be upto 40% and 3% respectively.[23] The absence of deep venous thrombosis and pulmonary thromboembolism in our study could be attributed to prophylaxis as well as early ambulation of patients and physiotherapy which is a routine practice at our center. This practice is recommended to avoid complications of deep vein thrombosis and pulmonary embolism.

There was no significant difference in hospital stay, stoma related complications, respiratory complications and reoperation in patients operated electively or in emergency.

Similar to literature data,[24][11] in our study mortality rate was higher in patients undergoing emergency surgery as compared to those operated electively(50% and 28.26% respectively). However, this difference was not statistically significant. Age of patient was independently associated with seven day postoperative mortality, while stage of cancer was associated with overall mortality in both the groups.

In our study the respiratory infection, were seen in 25% emergency patients and 23.91% of non-emergency patients. Among the patients operated in emergency there were two deaths in the same hospital admission, one due to cardiac arrest, the other due to respiratory complications. The death in the patient operated electively was due to respiratory complication. Hence, pre-operative respiratory optimization of patients is an important part of pre-operative preparation , to prevent death. This however, may not be feasible in an emergency. Hence post-operative dedicated chest physiotherapy should be given to these patients.

Emergency surgery was not an independent predictor of postoperative morbidity or mortality in our study. Hence, wherever feasible following oncologic principle of radical

resection, in emergency patients, can result in outcomes similar to electively operated patients.

More than 60% colorectal cancer recurrences occur in the first two years following potentially curative resection.[25]Intensive follow up during this period at 3-6 months interval is reasonable. Ultrasonography and Computed Tomography were the most common investigations used on follow up, in our study group. These investigations have been used inconsistently as is reflected by the low number of patients undergoing ultrasonography and CT on follow up.

At 12 months follow up, 43 patients underwent computed tomography. Of these 43 patients 9(20.93%) patients showed presence of local recurrence. Among these 43 patients, 33 were operated on elective basis and the rest, in emergency. The recurrence rates were comparable in emergency and electively operated patients.

The most common site of tumor in the patients showing local recurrence was rectum, followed by sigmoid colon. This is similar to other studies.[26] Most of the patients who showed recurrence on follow up, belonged to stage III. Recurrence following resection is a substantial problem. Follow up is of particular importance. CT scan appears effective in diagnosing recurrence. Presence of tumor mass was seen in 3 cases at 6 months and 7 cases at 12 months. We recommend follow up CT scan at 6 monthly intervals post operatively.

Further prospective studies with a larger sample size should be carried out for a more detailed risk score analysis for better outcomes in patients undergoing emergency surgery for colorectal cancer. The limitations of this study are that it is a single centre study with a relatively small sample size and a short follow up period.

Abbreviations

CRC- Colorectal cancer

GI – Gastrointestinal

CT- Computed Tomography

HPR- Histopathology Report

IO- Intraoperative

HS- Hospital stay

DVT/PE- Deep vein Thrombosis/ Pulmonary

Thromboembolism

LN Resected- Lymph nodes resected

TNM-Primary Tumor, Regional Lymph Nodes, Distant Metastasis

Table 1: Age , Gender And Co Morbidity Of Patients Operated In Elective And Emergency For Colorectal Cancer.

	Elective (N=46)	Emergency (N=24)	
Age	52.28	56.54	
Gender			
Male	35(76.1%)	13(54.17%)	
Female	11(23.9%)	11(45.83%)	
Comorbidity present	26(56.5%)	21(87.5%)	P <0.05

Table 2: Location of tumor type of surgery of patients operated in elective and emergency for colorectal cancer.

	Elective(N=46)	Emergency (N=24)	
Radical	45(95.6%)	18(75%)	P<0.05
Palliative	1(2.17%)	6(25%)	
Right Hemicolectomy	11(23.9%)	7(29.17%)	
Segmental Colon Resection	7(15.2%)	2(8.3%)	
Left Hemicolectomy	3(6.5%)	0	
Anterior Resection	20(43.4%)	0	P<0.001
Low	3(6.5%)	0	

Anterior Resection			
Abdominopereitoneal Resection	2(4.3%)	0	
Hartmanns Procedure	0	9(37.5%)	P<0.01
Loop Colostomy	1(2.17%)	6(25%)	P<0.01
Resection Of Tumor (N=60)	Elective (N=45)	Emergency (N=18)	
Adequate Resection	21(46.67%)	1(5.56%)	P<0.01

Table 3: Intraoperative Findings Of Patients Operated In Elective And Emergency For Colorectal Cancer.

	Elective (N=46)	Emergency (N=24)	
Mass Alone Without Serosal Involvement	18(39.13%)	0	P<0.001
Mass With Serosal Involvement	26(56.52%)	17(70.8%)	
Mass With Liver Metastasis	2(4.34%)	0	
Tumor Perforation	0	2(8.3%)	
Local Invasion	14(30.43%)	8(33.33%)	
Peritoneal Metastasis	0	3(12.5%)	P<0.05

Table 4: Histopathology and stage of tumor in patients with colorectal cancer with elective and emergency surgery.

	Elective (N=46)	Emergency(N=24)	
Well differentiated	8(17.4%)	3(12.5%)	
Moderately differentiated	22(47.8%)	10(41.6%)	
Poorly differentiated	13(28.3%)	5(20.8%)	
Mucinous adenocarcinoma	3(6.5%)	4(16.6%)	
Signet cell carcinoma	0	2(8.3%)	
Free margins	42(91.3%)	19(79.17%)	
Positive lymph node	26(56.5%)	11(45.8%)	
Lymphovascular invasion	17(36.9%)	10(41.6%)	
STAGE			
I	3(6.52%)	4(16.6%)	
IIA	13(28.26%)	1(4.2%)	P<0.05
IIB	3(6.52%)	2(8.3%)	
IIC	1(2.17%)	0	
IIIA	4(8.7%)	2(8.3%)	
IIIB	11(23.9%)	6(2.5%)	
IIIC	4(8.7%)	3(12.5%)	
IVA	6(13.04%)	5(20.8%)	
IVB	1(2.2%)	1(4.2%)	

Table 5: Post operative course in patients with colorectal cancer with elective and emergency surgery.

	Elective (N=46)	Emergency (N=24)
Stomal complication present	0	1 (4.67%)

DVT/PE	0	0
Chest complication present	11 (23.91%)	6 (25%)
Reoperation due to surgical complication	2(4.34%)	2(8.33%)
Reoperation due to recurrence	7(15.21%)	2(8.33%)
Hospital stay (days)	13± 6.75	12.91± 4.66
Mortality (postoperative death within 7 days)	1(2.17%)	2(8.33%)
Mortality before first follow up	2(4.34%)	2(8.33%)
Mortality after first follow up	10(21.7%)	8(33.33%)
Local recurrence(at 1 year follow up CT)	7 (n=33)	2 (n=10)

Table 6: Variables Associated With Postoperative Morbidity, Mortality And Local Recurrence In Patients Operated In Elective And Emergency.

Elective Patients						
	Hospital Stay	Respiratory Complications	Mortality Within 7 Days Post Op	Mortality Between 7 To 30 Days Post Op	Overall Mortality	Local Recurrence
Age	0.59	0.58	0.01	0.95	0.98	0.58
Gender	0.91	0.81	0.18	0.35	0.34	0.48
Co Morbidity	0.93	0.15	0.20	0.91	0.21	0.35
Location Of Tumor	0.38	0.34	0.07	0.21	0.23	0.99
Radical/ Palliative Surgery	0.57	0.35	0.20	0.38	0.22	0.15
Adequacy Of Resection	0.35	0.88	0.20	0.72	0.40	0.74
Pathological Differentiation	0.97	0.77	0.97	0.88	0.3	0.66
Stage	0.83	0.64	0.21	0.44	0.02	0.11
Emergency Patient						
	0.64	0.71	0.01	0.98	0.80	0.65
Gender	0.88	0.69	0.22	0.33	0.46	0.55
Co Morbidity	0.91	0.17	0.19	0.93	0.23	0.38
Location Of Tumor	0.39	0.35	0.07	0.21	0.22	0.99
Radical/ Palliative Surgery	0.58	0.34	0.20	0.39	0.23	0.16
Adequacy Of Resection	0.34	0.75	0.25	0.07	0.31	0.68
Pathological Differentiation	0.96	0.74	0.95	0.90	0.33	0.65
Stage	0.60	0.60	0.20	0.43	0.02	0.11

References

1. Society AC. Cancer Facts and Figures 2014. Atlanta, Ga. Am Cancer Soc 2014. 2014;

2. Sjo OH, Larsen S LO and NA. Short term outcome after emergency and elective surgery for colon cancer. Colorectal Disease. :2009;11,(7): 733–9.

3. Leşe M, Szasz A ,Lese I. Emergency surgery in colorectal cancer: Experience of a county hospital at a 10-year interval. Comparison of immediate postoperative results. Chirurgia (Bucur). 2014;109(3):335–41.

4. Elzouki AN, Habel S, Alsoaeiti S, Abosedra A KF. Epidemiology and clinical findings of colorectal carcinoma in two tertiary care hospitals in Benghazi, Libya. *Avicenna J Med.* 2014;4(4):94–8.
5. Ahuja N, Chang D GS. Disparities in colon cancer presentation and in-hospital mortality in Maryland: a ten-year review. *Ann Surg Oncol.* 2007;14:411–6.
6. Boytchev H, Marcovic S OG. The characteristics of large bowel cancer in the low-risk black population of the Witwatersrand. *J R Coll Surg Edinb.* 1999;44:366–70.
7. Ihedioha U, Gravante G, Lloyd G, Sangal S, Sorge R, Singh B et al. Curative colorectal resections in patients aged 80 years and older: Clinical characteristics, morbidity, mortality and risk factors. *Int J Color Dis.* 2013;28:941–7.
8. Kronborg O, Backer O SM. Acute obstruction in cancer of the colon and rectum. *Kronborg O, Backer O, Sprechler M.* 1975;(18):22–7.
9. Mandava N, Kumar S, Pizzi WF AI. Perforated colorectal carcinomas. *Am J Surg.* 1996;(172):236–8.
10. McArdle CS, Hole DJ. Emergency presentation of colorectal cancer is associated with poor 5-year survival. *Br J Surg.* 2004; (91):605–9.
11. Smothers L, Hynan L, Fleming J, Turnage R, Simmang C AT. Emergency surgery for colon carcinoma. *Dis Colon Rectum.* Jan 2003;46(1):24–30.
12. Capasso L, D'Ambrosio R, Sgueglia S, Carfora E, Casale LS DP, V et al. Emergency surgery for neoplastic left colon obstruction: resection and primary anastomosis (RPA) versus Hartmann resection (HR). *Ann Ital Chir.* 2004;(75):465–70.
13. Ören D ÖG. Kolorektal kanserlerde güncel acil tedavi. *Türkiye Klinikleri. J Gen Surg-Special Top.* 2009;(2):127–33.
14. Klaver YL, Lemmens V, Nienhuijs SW, Luyer MD de Hingh IH. Peritoneal carcinomatosis of colorectal origin: Incidence, prognosis and treatment options. *World J Gastroenterol.* 2012;18(39):5489–94.
15. Mäkelä J, Kiviniemi H LS. Prognostic factors after surgery in patients younger than 50 years old with colorectal adenocarcinoma. *Hepatology.* 2002;49:971–5.
16. Gill S, Loprinzi CL, Sargent DJ et al. Pooled analysis of fluorouracil- based adjuvant therapy for stage II and III colon cancer: Who bene - fits and by how much? *J Clin Oncol.* 2004;22:1797–806.
17. Swanson RS, Compton CC, Stewart AK et al. The prognosis of T3N0 colon cancer is dependent on the number of lymph nodes examined. *Ann Surg Oncol* 10. 2003;(Jan-Feb):65–71.
18. Ghazi S, Berg E, Lindblom A LU. Low-Risk Colorectal Cancer Study Group. Clinicopathological analysis of colorectal cancer: a comparison between emergency and elective surgical cases. *World J Surg Oncol.* 2013;11:133.
19. Vegard S. Ellensen Jolande Elshove-Bolk and GB. Morbidity and Mortality after Emergency and Urgent Colorectal Surgery for Malignant and Benign Disease. *Open Color Cancer J.* 2009;2:1–6.
20. Tekkis PP, Kinsman R, Thompson MR SJ. The Association of Coloproctology of Great Britain and Ireland study of large bowel obstruction caused by colorectal cancer. *Ann Surg.* 2004;(204):76–81.
21. Gürlich R, Maruna P, Kalvach Z, Peskova M, Cermak J FR. Colon resection in elderly patients: comparison of data of a single surgical department with collective data from the Czech Republic. *Arch Gerontol Geriatr.* 2005;41:183–90.
22. H Hwang. Emergency presentation of colorectal cancer at a regional hospital: An alarming trend? *BCM J* 2012 March. 2012;(54(2)):83–7.
23. Stahl TJ, Gregorcyk SG, Hyman NH BW. Practice parameters for the prevention of venous thrombosis. *Dis Colon Rectum.* 2006;(49):1477–83.
24. Sharma A, Walker LG ,Monson JRT . Baseline quality of life factors predict long term survival after elective resection for colorectal cancer. *International Journal of Surgical Oncology.* 2013;2013:269510.
25. Andreola S, Leo E, Belli F , Gallino G, Sirizzotti G SG. Adenocarcinoma of lower third of rectum metastasis in lymph nodes less than 5 mm and occult micrometastases: preliminary results on early tumor recurrence. *Ann Surg Oncol.* 2001;8:413–7.

26. Galandiuk S, Wienand HS, Moertel CG, Cha SS, Fitzgibbons RJ PJ. Patterns of recurrence after cuative resection of carcinoma of colon and rectum. *Surg Gynaecol Obs.* 1992;174(2):27–32.