Emergency surgery for colon carcinoma in the elderly: audit of a 13-yr experience

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Summary. *Aim:* The incidence of colon carcinoma progressively increases with age. The initial presentation may be a surgical emergency associated with increased morbidity and mortality in up to 15% of cases. The aim of this study was to perform a retrospective audit of our experience with emergency surgery for colon carcinoma in the elderly in the last 13 years. *Materials and methods:* From January 2000 to December 2012 we performed 879 emergency operations, of which 123 addressed colon diseases (14%), 41 colon carcinoma (1/3 of colon cases, 4.6% of the total number) on an emergency basis. Patients (pt's) were divided into 2 age groups: A ≥75 years and B ≤74. Fourteen factors were investigated: age, gender, pre-operative ASA score, clinical presentation, types of operation, associated procedures, distribution among surgeons, tumor location, TNM stage, Hinchey stage when applicable, associated pathology, post-operative length of stay, complications, mortality. Data were recorded on a Microsoft Access 2007 database. *Results:* Distribution among sexes was even. A prevalent ASA III score occurred in group B. Resection was mostly performed in both groups. No differences were recorded regarding location, indication, type of operation, post-operative stay. An association was noticed between age and the following items: TNM stage, i.e. group B showed more advanced stages, complications, i.e. more complications in group A and mortality which was higher in group A. *Conclusions:* Age should not be an absolute indicator to decide on a possibly life-saving emergency procedure for colon carcinoma but worse outcomes may be expected in older pt's.

Key words: colon cancer, emergency surgery, elderly, audit

«CHIRURGIA IN URGENZA PER CARCINOMA DEL COLON NEGLI ANZIANI: AUDIT DI UN'ESPERIENZA DI 13 ANNI»
Riassunto. *Scopo dello studio:* L'incidenza del carcinoma del colon aumenta progressivamente con l'età. La presentazione iniziale può costituire un'urgenza chirurgica con maggiore morbilità e mortalità fino al 15% dei casi. Lo scopo di questo studio era eseguire un audit retrospettivo della nostra esperienza sulla chirurgia d'urgenza per carcinoma del colon negli anziani negli ultimi 13 anni. *Materiali e metodi:* Dal gennaio 2000 al dicembre 2012 abbiamo eseguito in totale 879 interventi in urgenza di cui 123 riguardavano patologie coliche (14%), 41 il carcinoma del colon, (1/3 dei casi colici, 4,6% di tutti i casi). I pazienti sono stati suddivisi in due gruppi d'età: A ≥75 anni e B ≤74. Sono stati esaminati 14 fattori: età, sesso, classe ASA pre-operatoria, tipi d'intervento, procedure associate, distribuzione tra i chirurghi, sede della neoplasia, stadio TNM, stadio Hinchey quando possibile, patologie associate, degenza post-operatoria, complicanze, mortalità. I dati sono stati registrati in un database di Microsoft Access 2007. *Risultati*: La distribuzione tra i sessi è stata equa. La classe ASA III ha prevalso nel gruppo B. Una resezione è stata praticata più frequentemente in entrambi i gruppi. Non sono state registrate differenze riguardanti la sede, l'indicazione, il tipo d'intervento, la degenza post-operatoria. È stata notata un'associazione tra l'età ed i seguenti fattori: stadio TNM, i. e. il

gruppo B aveva stadi più avanzati, complicanze, i.e. più complicanze nel gruppo A, e mortalità che era più alta nel gruppo A. *Conclusioni:* L'età non dovrebbe essere un indicatore assoluto per decidere su un intervento urgente possibilmente salva-vita per carcinoma del colon ma negli anziani sono previsti risultati peggiori.

Parole chiave: carcinoma del colon, chirurgia d'urgenza, anziani, audit

Introduction

Carcinoma of the colon and rectum is one of the most common malignancies worldwide and represents one of the leading causes of cancer death. It is obviously a major public health problem with which all physicians must be familiar and one in which surgical resection remains the primary form of therapy for most patients (1). Moreover, it has been demonstrated that the incidence increases from the second through the eighth decades of life (2). In up to 15% of cases an acute presentation occurs, which requires that such a severe disease needs to be quickly addressed, on a highly contaminated bowel and abdominal cavity, when pre-operative correction of associated diseases might represent a dangerous and useless waste of time. The most common surgical emergencies of colon cancer are obstruction and peritonitis. Sometimes these clinical scenarios are associated with perforation and/or colon trauma. The common surgical procedures widely range from "simple" ostomy to limited or wide resections, such as total colectomy, and must be tailored to the specific patient (pt), i.e. his medical status, tumor characteristics, associated diseases. Emergent surgery is considered a major risk factor for bad outcomes (3-12). In the last decades the role of age in determining outcomes has been controversial but mostly regarded as a specific risk factor for higher rates of complications and death after surgery for colo-rectal cancer. Moreover, the medical literature has not reached a universal consensus on the specific cut-off age yet (3, 4, 13-20). This study deals with 41 cases addressed over a 13-year period in an intermediate level hospital aiming to define the outcomes of elderly vs. non elderly pt's.

Materials and methods

Our general surgery unit is located in a 160-bed town hospital in Bisceglie, an Apulian town with some 55,000 inhabitants on the Adriatic Sea. Surgery was considered emergent if the operation was done within 24 hours of hospital admission, rarely within 48 hours. The clinical presentation was defined obstructive, when the clinical exam and imaging work-up revealed bowel obstruction from colon cancer, and non obstructive when the dominant picture was peritonitis. The location of the tumor was regarded as in the right colon, when it was evidenced at or proximal to the splenic flexure, and in the left colon if located distal to the splenic flexure and proximal to the rectum. The choice of operation depended on the cancer topography, the diameter and appearance of the remaining colon in terms of vascular flow, thickness and/or edema of the bowel wall, presence of pus and/or feces in the abdomen, the patient's general condition. TNM stage was defined as early for node-negative cases, i.e. stages I and II, advanced or node-positive, i.e. stages III and IV. The post-operative period was defined during the first 30 days after surgery. Complications were defined as major when lethal or causing prolonged post-operative stay. From January 2000 to December 2012 we performed 879 emergency operations, of which 123 addressed colon diseases (14%), 41 colon cancer (1/3 of colon cases, 4.6% of the total number) on an emergency basis. Pt's were divided into two age groups: A ≥75 years 21 pt's, B ≤74 20 pt's. Fourteen factors were investigated with reference to the pt's variables (age, gender, pre-operative ASA E score, clinical presentation), the operation related variables (types of operation, associated procedures, distribution among surgeons), the tumor

related variables (location, AJCC TNM stage, Hinchey stage when applicable, associated pathology), outcome measures (post-operative length of stay, complications, mortality). The resulting data were recorded on a Microsoft Access 2007 database.

Results

The study population consisted of 20 men and 21 women, evenly distributed in both groups: A 10 males and 11 females, B 10 males and 10 females. Indication for surgery, i.e. obstructive vs. non obstructive from perforation or appendicitis-like presentation, was not different in both groups: A 17 vs. 4 (81% vs. 19%), B 16 vs. 4 (80% vs. 20%) (Table 1). The ASA scores recorded in group A were IIE 6 pt's, IIIE 7 pt's, IVE 6 pt's, VE 2 pt's; in group B IE 1 pt, IIE 3 pt's, IIIE 14 pt's, IVE 2 pt's (Figure 1). A similar pattern of operations was observed: in group A 8 Hartmann's procedures, 3 colostomies, 3 subtotal colectomies, 4 total colectomies, 2 right hemicolectomies, 2 left hemicolectomies, 1 ileo-colic bypass; in group B 6 Hartmann's procedures, 3 colostomies, 3 subtotal colectomies, 2 total colectomies, 3 right hemicolec-tomies, 1 left hemicolectomy, 1 ileo-cecal resection, 1 ileo-colic resection on a previous right hemicolectomy. Associated procedures were 6 in group A, 4 in group

B (Table 2). The procedures distribution among surgeons was overall heterogeneous, with 2 prevalent surgeons operating on 26 cases each, but was actually homogeneous for all across the 2 age groups (Figure 2). An equal location of the tumor was registered in both groups: A 15 left vs. 6 right (72% vs. 28%), B 14 left vs. 6 right (70% vs. 30%), of which 1 pt in each group showed 2 synchronous tumors in the left colon (Table 1). Stratification by the TNM staging showed a prevalence of early stages in group A vs. group B, 13

Table 1. Indication, location, associated pathologies

	Group A	Group B
Obstructive	17 (81%)	16 (80%)
Non obstructive	4 (19%)	4 (20%)
Left colon	14 (67%)	13 (65%)
Left colon synchronous	1 (5%)	1 (5%)
Right colon	6 (28%)	6 (30%)
Incarcerated recurrent right inguinal hernia	1	
Colonic ischemia	1	
Adhesions d/t carcinomatosis	1	
Suspected ileal lesion	1	
Diverticulitis		1
Sizable megacolon		1
Adhesions d/t hysterectomy		1
Suspected ileal and right adnexal involvement		1
Hinchey stage 4	3	3
Hinchey stage 3	2	1
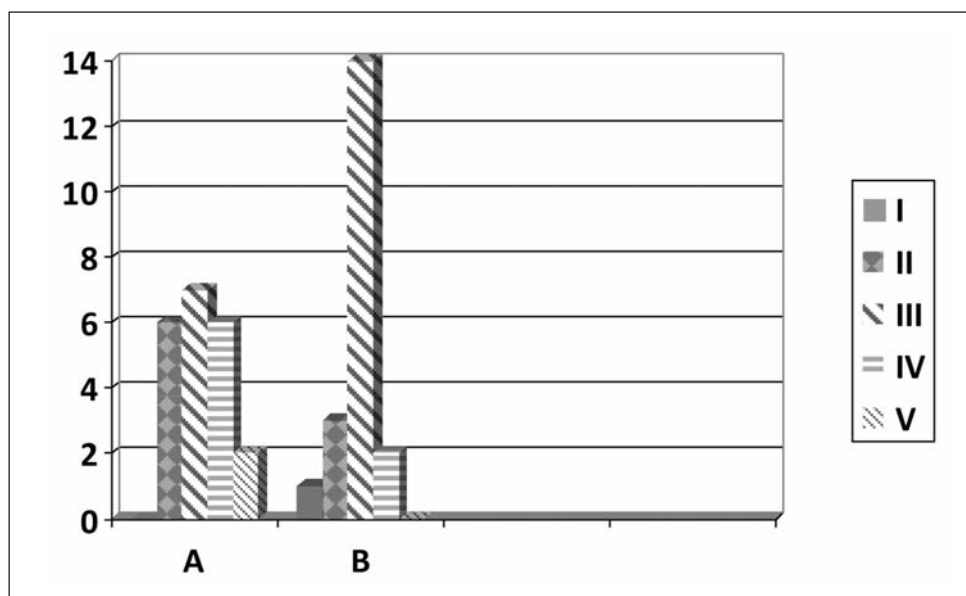
Figure 1. ASA score

Table 2. Procedures

	Group A	Group B
Hartmann's	7 (33%)	4 (20%)
Colostomy	3 (14%)	3 (15%)
Subtotal colectomy	3 (14%)	3 (15%)
Right hemicolectomy	/	3 (15%)
Left hemicolectomy	2 (9%)	1 (5%)
Total colectomy + ileal resection + adhesiolysis	/	2 (10%)
Total colectomy	1 (5%)	/
Total colectomy + ileostomy	1 (5%)	/
Hartmann's + ileal resection + right adnexectomy	1 (5%)	/
Hartmann's + bladder repair + right adnexectomy	/	1 (5%)
Hartmann's + ileal resection	/	1 (5%)
Right hemicolectomy + hepatic metastasectomy	1 (5%)	
Right hemicolectomy + right nefrectomy	1 (5%)	/
Ileo-colic bypass + adhesiolysis	1 (5%)	/
Ileo-ceco-colic resection	/	1 (5%)
Ileo-colic resection	/	1 (5%)

Figure 2. Surgeon distribution

vs. 8 (65% vs. 38%), an equal distribution of advanced stages in both groups, 8 vs. 8 (38% vs. 40%) (Figure 3). Associated pathology in group A consisted in 1 recurrent right inguinal hernia incarcerated as a consequence of the obstructing neoplasm, 1 sigmoid ischemi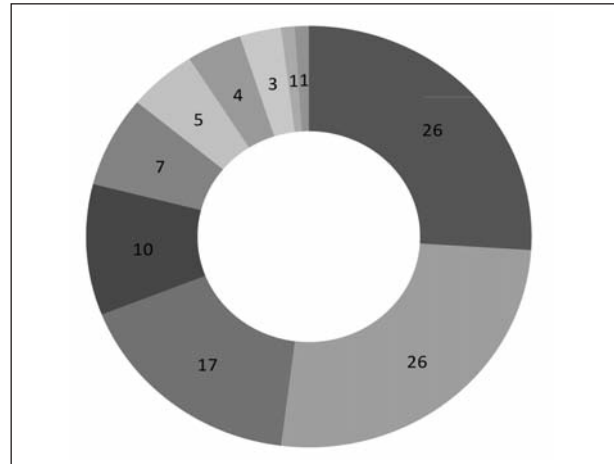a, 1 adhesive syndrome from carcinomatosis, 1 suspected ileal tumor not confirmed at pathology; in group B 1 left colon diverticulitis, 1 adhesive syndrome from previous hysterectomy, 1 suspected involvement of ileum and left adnexa, 1 sizable megacolon (Table 1). Hinchey stage (H) could be calculated on 9 patients: group A H4 3 pt's, H3 2 pt's, group B H4 3 pt's, H3 1 pt (Table 1). Post-operative stay in group A ranged between 1 and 30 days, mean 14±8.4, whereas in group B, having ruled out one significant outlier (89 days due to fecal contamination of the laparotomy wound by a detached left colostomy) it
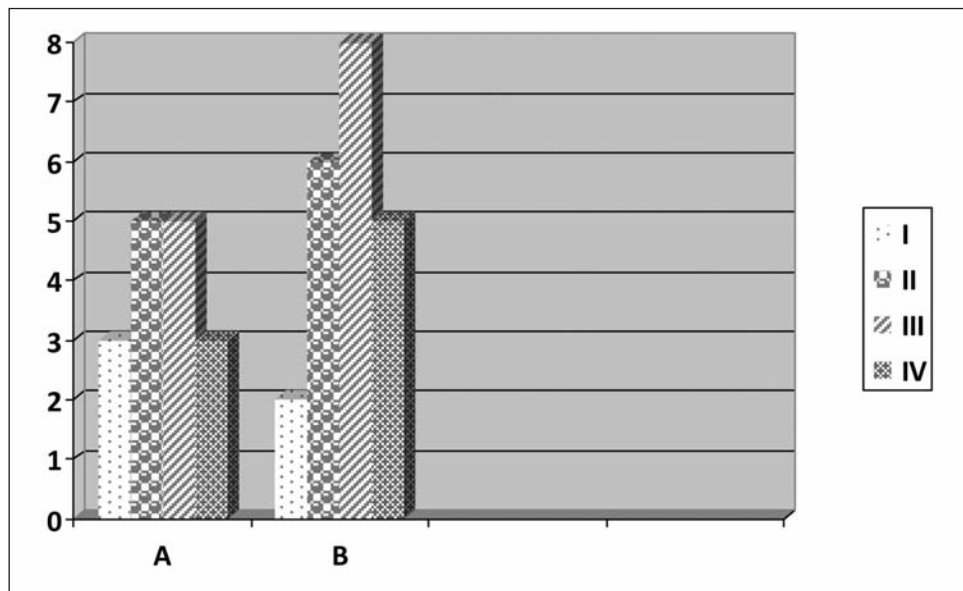

Figure 3. AJCC TNM

Table 3. Post-operative stay, complications, mortality

	Group A	Group B
Post-operative days mean (range)	14±8.4 (10-30)	14.7±8.8 (0-38)
Mortality	5 (23.8%)	3 (15%)
Shock	1	0
Cardiac failure	2	0
Acute pulmonary edema	0	1
COPD exacerbation	1	0
Right basal pneumonitis	0	1
Ostomy detachment	0	1
Pleural effusion	1	1
Premature ventricular contractions	1	0
Urinary retention	1	0
Left hemi larynx transient paresis	1	0
Wound liponecrosis	3	0
Wound pus collection	1	2
Wound bleeding	0	1

ranged between 0 and 38, mean 14.7±8.8. A total number of 12 complications were recorded in group A: 4 major, i.e. cardiac failure in 2 pt's, non-cardiac shock in 1, COPD exacerbation in 1, and 8 minor, i.e. wound liponecrosis in 3 pt's, wound pus collection in 1, pleural effusion in 1, premature ventricular contractions in 1, urinary retention in 1, left hemi larynx transient paresis. In group B 7 complications were recorded, of which 3 major, i.e. acute pulmonary edema in 1 pt, right basal pneumonitis in 1, left colostomy detachment in 1, and 4 minor, i.e. wound pus collection in 2 pt's, pleural effusion in 1, wound bleeding in 1. Death occurred in 5 vs. 3 pt's respectively in group A vs. B (24% vs. 15%) (Table 3).

Discussion

It is known and well established that in Italy the elderly subset of the overall population is steadily increasing. On January 1, 2011 144.5 elderly persons for every young person were present, placing our country in the second position on the aging index rankings among the 25 European countries (21). It has also been demonstrated that the incidence of colorectal cancer gets higher from the second through the eighth decades of life (2). In 2012 colorectal tumor remained the most frequently diagnosed tumor with some 51.500 expected new diagnoses in Italy (22). In 2020 and in 2030 respectively 57.100 and 65.600 new cases are expected. Elderly people may be more easily affected by poor medical general and local conditions and are also expected to absorb an increasingly higher amount of medical resources in the near future. Therefore, careful evaluation of surgical outcomes of elderly patients has been getting more and more attention. The specific contribution of elderly age to the outcome of emergency surgery for colon cancer is still under scrutiny, especially with regards to its cut-off value. Up to 15% of colorectal cancer cases present acutely and require emergent surgery. Addressing colon cancer on an emergency basis, a highly contaminated bowel and abdominal cavity, when correction of associated diseases might represent a dangerous and useless waste of time, represents an undoubted risk factor. Nonetheless an emergent operation truly is a life saving procedure in most cases. The most common emergency presentations requiring surgery are severe obstruction and peritonitis, at times associated with perforation and/or colon trauma. Required surgical procedures widely range from "simple" ostomy to limited and ample resections, such as total colectomy or colon resection plus removal of adjacent organs, and must be tailored to the specific patient, i.e. his medical status, tumor location and characteristics, quality of remaining colon in terms of size, vascular supply and tension, as well as associated diseases. The least attractive option is the historic 3-stage procedure, involving initial bowel decompression by a colostomy/ileostomy, subsequent resection of the offending pathology with anastomosis in stage 2, and takedown of the stoma in stage 3. Cumulative operative morbidity and mortality, length of hospitalization, and expenses incurred make this option not attractive. A single stage procedure involving segmental colectomy, subtotal or total colectomy followed by primary anastomosis shows obvious advantages over staged approaches. However the operation may be technically more demanding, the anastomosis may be high risk and the procedure may be lengthy and laden with heat loss and interference with coagulation. A 2-stage procedure, involving segmental resection of affected bowel followed by either Hartmann's closure of the

distal bowel, or exteriorization of the stump as a mucous fistula with proximal bowel exteriorized as an end stoma, is popular because it is quick, does not risk anastomosis leakage, and is less demanding than a single stage operation. The main disadvantages are that up to 60% of stomas never get reversed, the expense and morbidity of the takedown procedure are significant, and pt's have to make physical and psychological adjustments to live with a stoma. Primary resection and anastomosis with a proximal diverting stoma is an alternative 2-stage procedure adoptable in high risk anastomoses. The stoma is closed 8-12 weeks after confirmation of satisfactory anastomotic healing (11).

Emergency surgery for colon cancer provides de facto evidence of inadequate screening, which mostly affects just the elderly population, and certainly represents a significant risk factor. L. Smothers *et al.* proved that overall morbidity and surgical mortality were five and seven times more likely in pt's undergoing emergency surgery than in age-matched and stage-matched pt's undergoing elective surgery (3). A substantial research on the predictive factors of in-hospital mortality in colon and rectal surgery was undertaken by Dr. H. Masoomi and colleagues from the Department of Surgery of the University of California Irvine School of Medicine using the U.S. Nationwide Inpatient Sample last year. Such database regards approximately 1,000 hospitals, contains information from nearly 8 million hospital stays each year and brings about a sampling frame that represents approximately 95% of all hospital discharges in the U.S. A total of 975,825 pt's underwent colon or rectal resections from 2006 through 2008. Emergent surgery was the strongest risk factor for post-operative mortality (4).

Advanced age and advanced cancer have been shown to be risks factors for enhanced morbidity and mortality (5-7, 9, 10, 12). In Dr. Masoomi's paper emergent surgery, age older than 65 years, liver disease and total colectomy were the 4 most potent predictors of in-hospital mortality (4). The Dutch Surgical Colorectal Audit on 6,161 pt's undergoing a colon cancer resection in 2010 in the Netherlands identified 1,172 non elective pt's. For both elective and non elective cases mortality risk increased in the elderly pt's,

i.e. over 80 years of age (18). Since high rates of complications and mortality were detected after emergency operations for colon cancer in a Norwegian retrospective review on 1,129 pt's involved, surgeons even recommend that immediate surgery should be avoided if possible (19). On the basis of a retrospective study on 99 pt's with colon carcinoma older than 70 years undergoing emergency surgery between 1986 and 1995 Dr. Koperna and colleagues state that initial minimal surgery followed by staged resection is a feasible alternative to treat aged pt's with a higher comorbidity and an intraoperatively established greater spread of tumor (20).

A few papers found that age in itself does not represent a significant risk factor, in fact perioperative morbidity, mortality and survival rate were acceptable when compared with younger pt's. This led to the suggestion that the decision to operate should not be based on age alone (13-17).

Our study deals with 41 colon cancer patients who underwent emergency surgery in a 13 year period, representing 1/3 of all colon emergencies and 4.6% of all emergency operations. Emergency surgery was considered as necessary within 24 hours from admission in the presence of severe obstruction in 32 cases, spontaneous free perforation in 7, perforation from accidental fall in 1 sigmoid poorly differentiated cancer case, suspected appendicitis in a 27-yr old male. Resection and primary anastomosis was performed in a total number of 10 pt's, 4 in group A and 6 in group B, in which pt's the right colon was involved or the left colon involved was judged optimal and the pt low risk. In 10 pt's, equally distributed in both groups, the remaining colon was considered suboptimal due to significant dilation, poor vascular supply and undue tension in the planned anastomosis therefore an extended resection was performed, such as total or subtotal colectomy. Palliative procedures such as stomas or a bypass were chosen on 7 pt's, 4 in group A and 3 in group B, regarded as high risk or with advanced metastatic tumors; 8 pt's in group A and 6 in group B underwent a Hartmann's procedure in order to remove the colon affected by an obvious or suspected cancer, which was confirmed on pathology. A primary anastomosis was deemed unwise due to poor general or local abdominal condition. Resection

of the affected segment and adjacent organs if needed was always accomplished after high ligation of feeding vessels unless contraindicated by severely altered anatomy. Subdivision of the above said population into two age groups was obtained considering 75 years as the cut-off value. Estimation of the ASA score placed 8 pt's in each group in the low-risk classes I and II, but was significantly different for the other classes, since the number of pt's ≤74 years was higher in stages III and IV. This probably reflects a referral bias stemming from a natural selection of the worst pt's, presumably prevalent in the advanced age of the general population, that didn't receive surgical treatment. An association was observed between age and TNM stages, as advanced stages, i.e. node-positive tumors, affecting mostly pt's under 74 years, which is also attributable to the above said natural bias. Complications and deaths were associated with age too, since pt's older than 75 experienced more of them.

Conclusions

Our study certainly shows limitations due to its retrospective nature and small number of observations, but we believe that some reasonable conclusions may be drawn especially regarding the numerous intermediate level hospitals sharing the same pattern of emergency surgery cases in Italy. After splitting the emergency surgery population into 2 equivalent age groups considering 75 years as the cut-off value between elderly and non-elderly patients, we detected a prevalent presence of patients with severe systemic disease, or ASA III score, in the younger group. The procedures' distribution among surgeons was homogeneous. No differences were detected pertaining to location of cancer, indication for surgery, operations performed, post-operative length of stay. An association was observed between age and the TNM stage, since the younger group had more advanced classes. Finally, complications and mortality were also associated with age since they were higher in the elderly group. In conclusion, in our experience an age of 75 years and over should not be an absolute indicator to decide on a possibly life-saving emergency procedure

for colon cancer but one should probably expect worse outcomes than in younger pt's.

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