

Acute and complicated diverticulitis: are there significant differences between young and elderly patients?



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Acute and complicated diverticulitis: are there significant differences between young and elderly patients?

AIM: *The aim of our study was to assess if there were any differences in clinical presentation, management, and outcome, between younger and elderly patients with acute diverticulitis (AD).*

MATERIAL OF STUDY: *279 patients with diagnosis of AD treated at the General Surgery Department of Trieste from January 2007 to December 2015 were retrospectively examined and then followed for a minimum of 4 years. We divided patients in two categories: young ≤ 50 years and elderly > 50 . Gender, American Society of Anesthesiologists status (ASA score), Hinchey's stage, type and timing of surgery, morbidity, length of hospital stay, recurrence, and overall mortality were retrospectively analyzed.*

RESULTS: *There were 279 patients, 64 (22,9 %) were young and 215 (77,1%) were elderly. Female gender was more frequent in elderly cohort (150 pts 69,7 % F vs 65 pts 30,3 % M) than in the young (16 pts, 25% F vs 48 pts, 75% M), ($p < 0,001$). Higher ASA scores were registered in elderly patients with statistically significant correlation with Hinchey's stage. 229 patients (82,07 %) received as initial treatment antibiotic therapy (conservative treatment), 50 (17,93 %) pts underwent EM-S, and 11 underwent to DEL-S.*

DISCUSSION: *In our experience, none significant differences were recorded about Hinchey's stage, timing of surgery, morbidity, length of hospital stay, and recurrence; whereas, regarding the type of surgery (resection-anastomosis (R-A), Hartmann's procedures, and Lavage/Drainage) there were a significant difference ($p = 0,04$).*

CONCLUSIONS: *Hartmann's procedures have been effectuated more frequently in the elderly than in the young with recanalization in less than half of elderly. These data seems to confirm that there is no significant difference in incidence or the natural course of acute and complicated colonic diverticulitis among the young or the elderly. The best surgical treatment, with the least morbidity, may be resection with primary anastomosis.*

KEY WORDS: Diverticular Disease, Elderly Patients, Sigmoidectomy, Young Patients

Introduction

The incidence of diverticulosis is 33-66% among the overall population. The prevalence of diverticula in colon

increases substantially with age. Prevalence increases to 50 to 66% in patients older than age 80 years. Approximately 10 to 25% of patients with diverticulosis will develop acute diverticulitis (AD). Of these patients, about 10-25% will develop an episode of AD¹⁻⁴ that recurs in more than one third of cases⁵. When medical treatment is done, delayed surgery (DEL-S) is needed in about 10% of cases⁶ and this leads to a postoperative mortality exceeding 40 % of cases in the setting of generalized peritonitis⁷. While surgery is mandatory for patients with complications associated with diverticular inflammatory disease such as colic perforation, fistulae and stricture formation, on the other hand, elec-

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tive surgery (EL-S) for patients with recurrent AD should be decided on a "case-by case basis"^{1,8,9}. The data about natural history and incidence of diverticular disease are conflicting. While some studies report a more severe course of disease in elderly patients¹⁻³, others studies do not find differences in natural history between young and elderly patients¹⁰⁻¹¹.

Aim of our study is to compare young and elderly patients with AD with regards to incidence, clinical presentation, natural course, surgical strategy.

Materials and Methods

Among the 424 patients admitted for abdominal pain and diverticular disease from January 2007 to December 2015, 279 (65.8%) patients with acute and complicated colonic diverticulitis were selected and retrospectively analyzed. 145 patients (34,2 %) were excluded.

Particularly: 111 for lower gastrointestinal bleeding, 27 for colonic stenosis, and 7 patients for right colonic diverticulitis.

Data and clinical information were recorded from patient charts, radiology and pathology reports. The Hinchey's classification¹² was used to grade the severity of abscess formation and peritonitis.

Inclusion criteria for the study was first made on the basis of clinical symptoms, physical examination, blood tests (leukocytosis), and Abdominal Computed Tomography (CT) that confirmed the diagnosis. Patients were divided by age in two cohorts: young (≤ 50 years old) and elderly (> 50)¹³.

Initial treatment depended on the stage of the diverticulitis and on the severity of clinical symptoms.

Conservative treatment consisted of parenteral fluid therapy and electrolytes, hospitalization for as long as symptoms persisted and broad-spectrum intravenous antibiotics (where indicated) until an oral diet was tolerated. Antibiotics then were continued orally for 21 days. All patients managed conservatively were further investigated by colonoscopy to confirm the diagnosis of diverticular disease once the acute episode had subsided in an average time of one month after discharge.

Patients with intra-abdominal abscess due to AD were treated conservatively if the abscess was pericolic and less than 5 cm in diameter. A distant abscess (Hinchey II) or one with a diameter > 5 cm was treated by CT-guided percutaneous drainage where possible. Emergency surgery (EM-S) was performed in patients with diffuse peritonitis, free air, septic shock (Hinchey III and IV). DEL-S was performed in patients presenting an unfavorable clinical course after 48-72 hrs of conservative treatment. When surgery was performed, the procedure of choice, when possible, was resection with primary anastomosis^{8,9,14}. Patients with fecal peritonitis, preoperative multiorgan failure, immunosuppression and ASA status IV received a Hartmann's procedure¹⁴⁻¹⁶.

The timing of surgery was: emergency surgery (in-hospital surgery) at the first admission, delayed surgery because of failure of conservative (medical) treatment during the first hospitalization, and elective surgery after discharge.

The decision for elective colectomy was based on individual circumstances such as the number of episodes of AD (more than two in a short period and recurrence of a second severe episode), and patients with recurrence of a severe episode of AD.

In all operated patients the diagnosis was confirmed during surgery and by histological examination.

All patients were enrolled in a follow-up program comprised clinical examination within 30 days after surgery to assess the healing of surgical wounds and subclinical abdominal pain.

Recurrence was defined as representation with clinical symptoms similar to previous episodes and with AD confirmed by CT scan.

Follow-up was possible in all patients. All patients were contacted by telephone three months after discharge. The presence of abdominal pain, any digestive symptoms or trouble of canalization, any further access to the hospital, and the latest blood tests were investigated.

In patients treated conservatively (only medical treatment), the colonoscopy performed one month after discharge was done. Patients who presented any digestive alterations, were re-evaluated clinically and then contacted every six months.

Gender, Hinchey's stage, management during the hospitalization, type of surgical treatment, timing of procedures, ASA score, post-operative complications, length of hospital stay, recurrence of AD, and overall mortality were retrospectively analyzed.

All data were analyzed according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) criteria¹⁷.

STATISTICAL ANALYSIS

Statistical analysis was performed using "R". Continuous variables were summarized as either means with corresponding standard deviations or medians with interquartile range depending on normality while categorical as number and percentage. Age was explored as a continuous variable and as a categorical one. Univariate analysis was conducted to identify variables significantly associated with elderly patients. Statistical significance was defined as $p < 0,05$ with 95% confidence intervals.

Results

There were 279 patients, 64 (22,9 %) were young (≤ 50 years old), and 215 (77,1 %) were elderly (≥ 51 years or older).

TABLE I - Patients' age and Hinchey's stages

Age	50 yr	>50 yr	P(95%)**		
Total	64	215			
Gender			<0,0001		
M	48	65			
F	16	150			
Hinchey's Stage	0,16		Treatment		
0	21	78	99 CT	0	0
I	18	56	74 CT	0	0
II a	14	28	33 CT	4 EM-S	5 DEL-S
II b	7	16	12 CT	6 EM-S	5 DEL-S
III	3	21	0	23 EM-S	1 DEL-S
IV	1	16	0	17 EM-S	0

Yr=Years; n=Numbers; **p-value; CT= conservative treatment; EM-S= Emergency Surgery; DEL-S= Delayed surgery

All patients selected were caucasian and all were admitted in emergency. 19,4% of patients in the elderly group came from a nursing home.

Female gender was more frequent in elderly cohort (150 pts 69,7 % F vs 65 pts 30,3% M) than in the young (16 pts, 25% F vs 48 pts, 75% M), ($p < 0,001$). Hinchey's stage and treatment for each patient is summarized in Table I.

Concerning the initial management during the hospitalization, 229 patients (82,07%) received conservative treatment whereas other 50 (17,93 %), received EM-S. Regarding the conservative approach, 161 pts (70%) completed successfully the medical treatment during first hospitalization with normalization of clinical symptoms

and laboratory tests. The success of conservative treatment decreased with the increase of Hinchey's stage.

(Table I): (99 pts Hinchey's stage 0, 74 pts Hinchey I; 33 Hinchey IIa patients (86.84%) and in 12 Hinchey IIb patients (70.6%). Two patients presenting an intra-abdominal abscess (Hinchey II b) were treated by CT-guided percutaneous drainage. Eleven patients (11/229: 5 Hinchey's stage IIa, 5 Hinchey's stage IIb, and 1 Hinchey's stage III), underwent DEL-S due to unsuccessful of medical treatment. In particular, regarding type of surgery, 2 patients with ≤ 50 years old underwent open sigmoidectomy with primary anastomosis with regular postoperative course, whereas another "young" patient developed a fluid collection that required a surgical laparoscopic lavage and drainage. Eight "old" patients received open sigmoidectomy with primary anastomosis in 7 cases whereas in one patients Hartmann's procedure was performed.

High risk patients (4 Hinchey's stage IIa, 6 Hinchey's stage IIb, 23 Hinchey's stage III, and 17 Hinchey's stage IV) were operated in emergency setting (7 young and 43 elderly).

55 patients out of 229 (24,01%) underwent EL-S after hospital discharge because they presented more than two episodes of AD in a short period or presented complicated episodes of AD at hospital admission. Particularly: 12 Hinchey 0 patients (12,1%), 22 Hinchey I patients (22,7%), 14 Hinchey IIa patients (36.8%), and 7 Hinchey IIb patients (41,1%). As regard the intervention performed, 42 laparoscopic sigmoidectomy with primary anastomosis and 13 open sigmoidectomy with pri-

TABLE II - Timing and Type of surgical treatment

Age	Surgical approach and type of intervention	50 yr open	VLS	TOT	>50 yr open	VLS	TOT	TOT ≤ 50 and ≥ 50	P**(95%) p 0,71
Emergency	R-A	4	0	4	19	0	19	50	
	Hartmann	1	0	1	20	0	20		
	Lavage/Drainage	1	1	2	4	0	4		
	Total			7			43		
Subsequent	R-A	2	0	2	7	0	7	11	
	Hartmann	0	0	0	1	0	1		
	Lavage/Drainage	0	1	1	0	0	0		
	Total			3			8		
Elective	R-A	1	12		12	30		55	
	Total			13			42		

Yr=Years; pts=patients; R-A= Resection and anastomosis; VLS= video laparoscopic; **p-value

- Timing of surgery: p 0,71

Emergency 7vs 43, subsequent 3vs 8, elective 13 vs 42 pts

- Surgical approach vls/open: p 0,02

Open 9 vs 63, vls 14 vs 30

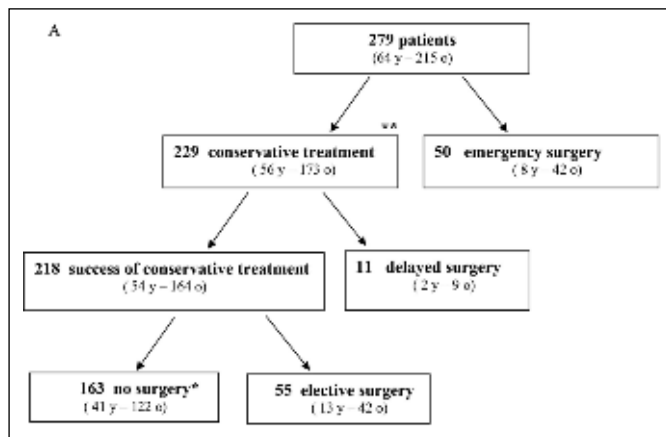
Open statistically significant in > 50 yr old pts (47/63 pts >50 in emergency)

- Type of surgery: p 0,04

R-A 19 vs 68, Hartmann's procedure 1 vs 21, lavage/drainage 3 vs 4)

Hhartmann's procedure statistically significant in > 50 yr old pts

TABLE III - type of patients' treatment for acute diverticulitis.



* y = young patients, o = old patients; * 161 pts: immediate response to antibiotics therapy; 2 pts: CT guided percutaneous drainage

TABLE IV - ASA score correlated with Age and risk in operated patients.

ASA	Age	P value**	N.S.
	50 yr		
1	37	45	N.S
2	24	114	N.S.
3	3	52	< 0,001
4	0	4	< 0,001
Low risk vs high risk patients			
1-2	61	159	N.S.
3-4	3	56	< 0,001

Yr= Years; vs= versus; ASA= American Society of Anesthesiologists status; **p-value; N.S.= no significance

TABLE V - ASA score correlated with Hinchey's stage

Hinchey	50 yr				> 50 yr			
	ASA score **p<0,001				ASA score **p<0,001			
0	1	2	3	4	1	2	3	4
I	18	2	1	0	23	48	7	0
IIa	10	8	0	0	15	34	7	0
IIb	6	7	1	0	6	13	9	0
III	2	5	0	0	0	8	8	0
IV	1	1	1	0	1	8	11	1
Tot	0	1	0	0	0	3	10	3
	37	24	3	0	45	114	52	4
	64				215			

ASA= American Society of Anesthesiologists status; tot=total; **p-value ; yr=years

mary anastomosis. The timing and type of surgical procedures of two cohort patients are summarized in Table II and III.

The type of intervention changed according the age, ASA score, Hinchey's stage, and timing of the surgical procedure. In particular, 76,36% (42/55) of elective proce-

dures were conducted in laparoscopy (92,3% in the young and 71,4% in the elderly). In all cases resection with primary anastomosis was performed and any significant differences between young and elderly were observed. For the EM-S, in "old cohort" patients, all 43 interventions were conducted in laparotomy. On the contrary, in "young cohort" patients (7 cases) there were 5 laparoscopic resection with primary anastomosis and two abdominal lavage et drainage (1 open and 1 laparoscopic).

Comparing the two cohort group no significative difference was found regarding the timing of surgery whereas regarding the type of approach (laparoscopic vs open) and type of Surgery (resection-anastomosis (R-A), Hartmann's procedures, and Lavage/Drainage) there were a significant difference (p=0,02 and p=0,04 respectively). Hartmann's procedures have been effectuated mainly in the elderly rather than in the young (46,51 % 20/43 vs 14,28 % 1/7) with a recanalization rates of 47.6% (10/21) in the elderly and 100 % in the young.

Mean hospital stay was 10 days (6-101) for the young and 20 (8-112) for the elderly.

The overall postoperative morbidity rate was 34,5% (40/116). Particularly: 21,5% (25/116) Surgical Site Infections (SSIs), 9,5% (11/116) anastomotic leakages, 1,8% (2/116) hemorrhage; and 1,8% (2/116) prolapsed stoma. 15% (6/40) of complications occurred in young patients while 85% (34/40) in elderly (p>0,05).

There were in total 26 post-operative complication in EM-S (26/50; 52%), 1 postoperative complications after DEL-S (1/11; 9,09 %) and 13 after EL-S (13/55; 23,63%).

Operative mortality was registered only in elderly cohort (4/40, 10%), because of pre-existing high risk comorbidity and age > 80 years.

The median follow-up time was 72 months (6 years; range 22-118 months) and the average rate of episodes of recurrent diverticulitis in non-operated patients was 19,6% (32 patients: 9 young vs 23 elderly; p=0,08). Among those, 22 patients presented only one episode of relapse disease whereas 10 patients presented more than one episode of symptoms representation. None of these patients needed surgical intervention and all patients received conservative treatment.

Observing the baseline conditions of the patients with regard to frailty and co-morbidities, ASA scores of 3 or 4 were registered more frequently in these patients with respect to the youngest patients, moreover, there was a statistically significant association between ASA scores and age (p<0,001) and with Hinchey's stage (Table IV and Table V).

Discussion

The incidence of diverticular disease rises with age, and by the age of 85, about 65% of the population in the industrialized world will have diverticula. The disease is much less frequent in the patients under the age of 50².

While most patients will remain asymptomatic, a minority will suffer from complications, the most common of which is AD occurring in 10-25% of the patients⁴⁻⁵. In most patients, AD is mild, responds well to antibiotic therapy, and usually does not recur. However, in up to 30% of patients, the disease may recur¹⁸⁻²⁰ and up to 25% of the patients might suffer complications such as abscess formation, fistula, or free perforation²¹. Data regarding the natural history of AD in terms of its severity and recurrence rate in young patients are conflicting, and no consensus has been reached regarding its treatment and timing of surgery^{22,23}. While some studies report a more severe course of disease and higher complications rate in young people^{1-3,6,24} other Authors affirm that diverticulitis in the young is not more aggressive than in the elderly^{10-11, 25-28}, but it tends to recur more often^{29,30}.

Our study aimed to evaluate the incidence and the response to surgical strategy particularly in emergencies and the natural history of AD in the young vs the elderly.

In Literature, there were substantial differences in the “in-hospital” surgery rates among the studies that looked at the natural history of diverticulitis in young patients. EM-S ranged between 17% and 88% in different series^{31,32}.

Lior H Katz et Al.²⁹ reported an EM-S rate of a range of 1.7–43.5% in the young versus 3.2–33.3% in elderly patients. In our series the EM-S rate was 43,10%, 10,9% were young whereas 20% were elderly).

There is no clear consensus as to whether younger patients (younger than 50) with diverticulitis are at increased risk of complications or recurrent disease. Nevertheless, guidelines and a recent review advise elective resection in younger patients^{8,22,32}.

Generally, the elective sigmoidectomy after the second episode of diverticulitis is a common practice for most patients^{1,2,4}. As for the younger patients, until lately, some preferred the policy of performing EL-S soon after the first attack. In the last few years, this policy has been reviewed^{15,29,30,32-35} and EL-S are not done routinely in every center.

Regarding our series, we can affirm that conservative treatment seems to cure early stage of AD without an increase in relapse rate in both cohorts; additionally, delayed don't leads to more postoperative morbidity (about 9% in our series).

In our experience, all our elective interventions were performed using the video-laparoscopic approach and consisted in resection with primary anastomosis, on the contrary, laparotomies were performed during EM-S. Concerning this point, we must admit, with regret, that we have to consider that we registered a considerable rate of morbidity in EL-S (about 23%). There were in total 26 post-operative complication in EM-S (52%). The type of intervention, because of the patient's general clinical conditions, ASA score and diffuse fecal peritonitis, was different than in the EL-S. We performed the Hartmann's procedure in most of those patients.

In some cases, a video-laparoscopic approach or the colonic resection with primary anastomosis probably could have been performed with an intraoperative colonic lavage but the patient's general conditions didn't permit these procedures.

In EM-S group, about half of patients (4/7 young and 19/43 elderly) received “resection-anastomosis” procedure, only 1 young vs 20 old patients received Hartmann's operation, with no statistical significance.

The potential sources of bias in our surgical strategy (resection with anastomosis vs Hartmann's procedure or laparotomy vs laparoscopy) could be the individual choice of the surgeon and his team about the type of intervention to perform, according to their surgical experience or devices availability in the operating room.

Observing the baseline conditions of the patients with regard to frailty and co-morbidities, the calculated ASA scores correlated with age resulted, unsurprisingly, higher in patients with > 50 (p<0,001). In fact ASA scores of 3 or 4 were registered more frequently in these patients with respect to the youngest patients.

There was a statistically significant correlation of all operated patients' ASA scores with Hinchey's stage demonstrating the difference in the “out-hospital management” of these patients and the easier accessibility of young people than the elderly to medical care.

Most likely, younger patients, came to the hospital at the onset of the first symptoms whereas older patients waited longer and then came to hospital with a more advanced clinical and radiological stage. These data could suggest that, in a future study, must to be taken into consideration also the time elapsed from the start of clinical symptoms and hospitalization. The reason for this difference in the clinical stage could be the fact that many of the patients that were older than 75 were living alone or came from inept nursing homes.

One regret is that in only 50% of the elderly it has been possible to perform a recanalization because they were “frail” elderly patients with high ASA score and therefore hardly predisposed to further surgery under general anesthesia.

In our series the rate of EM-S is in accordance with other experiences where this rate results higher in elderly patients^{19,29}.

Our data suggest the fact that the best surgical treatment in EL-S and that with the least morbidity was the video laparoscopic resection with immediate anastomosis. On the other hand the Hartmann's procedure was a valid strategy in Hinchey's IV stage patients but with a lower rate of recanalization in the elderly.

Conclusions

The aim of this study was to clarify the differences between young and elderly patients. In this point, the correlation between ASA score and Hinchey's score was

essential. The rate of incidence of acute and complicated colonic diverticulitis, the "in-hospital" surgeries as well as the rate of complications at admission were different between young and elderly patients, suggesting that the manifestations and course of the disease in the elderly are worse than those in the young. Nevertheless, the surgical procedures may differ because of the general conditions of the patients (ASA scores and comorbidities). The best surgical treatment, with the least rate of morbidity, appears to be resection with primary anastomosis with a laparoscopic approach. The same treatment can also be used whenever feasible with elderly patients.

Riassunto

Lo scopo del nostro studio è stato quello di valutare se ci fossero delle differenze nella presentazione clinica e nell'outcome, tra i pazienti più giovani e quelli più anziani affetti da diverticolite acuta (DA). 279 pazienti con diagnosi di DA trattati presso il Dipartimento di Chirurgia Generale di Trieste da gennaio 2007 a dicembre 2015 sono stati esaminati retrospettivamente e seguiti per un minimo di 4 anni. Abbiamo suddiviso i pazienti in due categorie: giovani ≤ 50 anni e anziani > 50 . Sono state analizzate retrospettivamente le seguenti variabili: sesso, American Society of Anesthesiologists (punteggio ASA) score, stadio di Hinchey, tipo e tempistica di intervento, morbilità, durata della degenza ospedaliera, tasso di recidiva e mortalità.

Sono stati presi in considerazione 279 pazienti, 64 (22,9%) erano giovani e 215 (77,1%) erano anziani. Il sesso femminile era predominante nella coorte dei pazienti anziani (150 pz 69,7% F vs 65 pz 30,3% M) rispetto ai giovani (16 pz, 25% F vs 48 pz, 75% M), ($p < 0,001$). I punteggi ASA più alti sono stati registrati nei pazienti anziani con correlazione statisticamente significativa con lo stadio di Hinchey. 229 pazienti (82,07%) sono stati sottoposti a terapia antibiotica come trattamento iniziale (trattamento conservativo), 50 pazienti (17,93%) sono stati sottoposti a un intervento chirurgico in emergenza e 11 sono stati sottoposti ad un intervento chirurgico differito.

Nella nostra esperienza, non è stata registrata nessuna differenza statisticamente significativa riguardo a stadio di Hinchey, il tempo operatorio, la morbilità, la durata della degenza ospedaliera ed il tasso di recidiva; mentre, per quanto riguarda il tipo di intervento chirurgico effettuato (resezione-anastomosi (R-A), procedure di Hartmann e Lavaggio / Drenaggio addominale) ci sono state differenze statisticamente significative ($p = 0,04$). In conclusione, le procedure di Hartmann sono state eseguite più frequentemente negli anziani rispetto ai giovani con ricanalizzazione in meno della metà degli anziani. Questi dati sembrano confermare che non vi sia alcuna differenza significativa nell'incidenza o nel decorso naturale della diverticolite del colon acuta e compli-

cata tra i giovani e gli anziani. Il miglior trattamento chirurgico, seguito dal minor tasso di morbilità, potrebbe essere la resezione con anastomosi primaria.

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