

Acute abdomen in the elderly. A peripheral general hospital experience

D. COSTAMAGNA, N.S. PIPITONE FEDERICO, S. ERRA¹, M. TRIBOCCO,
F. PONCINA, G. BOTTO, P. DEREGIBUS, A. ZULLO, G. SERVENTE, R. DURANDO

SUMMARY: Acute abdomen in the elderly. A peripheral general hospital experience.

D. COSTAMAGNA, N.S. PIPITONE FEDERICO, S. ERRA, M. TRIBOCCO,
F. PONCINA, G. BOTTO, P. DEREGIBUS, A. ZULLO, G. SERVENTE,
R. DURANDO

We reviewed our experience on 291 consecutive patients aged over 65 years who were operated on for acute abdomen during the period 2003-2007 at "Santo Spirito" Hospital of Casale Monferrato, a peripheral hospital in the Piedmont region. The mean age of the patients was 78 years and the male:female ratio was 149/142. A total of 126 patients (43%) had one or more associated disease. The most common causes for an emergency operation were mechanical bowel obstruction (45%), hollow viscus perforation (18%) and strangulated hernia (18%). 234 patients (80%) recovered and were free from major complications. The remaining 57 (20%) developed at least one major complication (including death). The 30-days postoperative deaths were 33 (11%). Nonlethal major complications were 24 (8%).

The commonest complications were cardio-respiratory. Septic complications were 15. Total reoperations for surgical complications were 5. Mesenteric ischaemia and secondary peritonitis were the most important causes of fatal outcome (respectively 42 and 17% of mortality). We also reported high mortality among patients with peritoneal carcinomatosis (24%). Emergency surgery was relatively safe for the remaining groups of patients, with a complex mortality ratio of 5.3%. We conclude that "acute abdomen" is still an appreciably frequent cause of death in the older age group. A high level of vigilance and early attention is therefore advocated. Anyway, excluding some severe conditions, the overall success of surgical interventions for abdominal emergency is satisfactory in the majority of older people. About the debated role of peripheral hospitals in the health care system, we conclude that the surgical treatment of the acute abdomen in the elderly is safe and feasible in the peripheral hospitals, and that these hospitals play a determining role in the management of old patients, especially in emergency.

RIASSUNTO: L'addome acuto nell'anziano. Esperienza di un ospedale periferico.

D. COSTAMAGNA, N.S. PIPITONE FEDERICO, S. ERRA, M. TRIBOCCO,
F. PONCINA, G. BOTTO, P. DEREGIBUS, A. ZULLO, G. SERVENTE,
R. DURANDO

Abbiamo rivisto la nostra esperienza su 291 pazienti consecutivi di età superiore ai 65 anni, operati per addome acuto dal 2003 al 2007 presso l'Ospedale "Santo Spirito" di Casale Monferrato, un ospedale periferico del Piemonte. L'età media era di 78 anni e il rapporto maschile: femminile di 149/142. Un totale di 126 pazienti (43%) aveva una o più patologie associate. Le cause più comuni di intervento urgente sono state l'oclusione (45%), la perforazione di viscere cavo (18%) e l'ernia strozzata (18%). 234 pazienti (80%) hanno avuto un decorso libero da complicanze maggiori. I rimanenti 57 (20%) hanno sviluppato almeno una complicanza maggiore (inclusa la morte). I decessi postoperatori a 30 giorni sono stati 33 (11%). Le complicanze maggiori non letali sono state 24 (8%). Le complicanze più comuni sono state quelle cardiorespiratorie. Le complicanze settiche sono state 15. I reinterventi per complicanze chirurgiche sono stati 5. L'infarto intestinale e la peritonite secondaria sono state le cause più importanti di decesso (rispettivamente 42 e 17% della mortalità). Abbiamo inoltre riportato una mortalità elevata fra i pazienti con carcinomi peritoneali (24%). La chirurgia in urgenza è stata relativamente sicura per i rimanenti gruppi di pazienti, con una mortalità complessiva del 5.3%.

In conclusione riteniamo che l'addome acuto sia ancora una causa apprezzabilmente frequente di morte fra gli anziani. Sono perciò richiesti un alto livello di vigilanza ed una precoce attenzione. Tuttavia, escludendo alcune gravi condizioni, i risultati complessivi della chirurgia addominale in urgenza sono soddisfacenti nella maggior parte dei pazienti anziani. Alla luce dell'attuale vivace dibattito sul ruolo degli ospedali periferici nel Sistema di Assistenza Sanitaria, ci sentiamo di poter affermare che il trattamento dell'addome acuto nell'anziano è sicuro e fattibile in questi ospedali, e che questi giocano un ruolo determinante nel trattamento dei pazienti anziani, specialmente in emergenza.

KEY WORDS: Acute abdomen - Emergency surgery - Elderly patients - Peripheral hospital.
Addome acuto - Chirurgia d'urgenza - Paziente anziano - Ospedale periferico.

"Santo Spirito" Hospital - Casale Monferrato - Italy
General Surgery Department
(Chief: Dott. R. Durando)

¹ Department of Pathology and Anatomy
(Chief: Dott. M. Pavesi)

© Copyright 2009, CIC Edizioni Internazionali, Roma

Introduction

An "acute abdomen" is defined a condition caused by an underlying intra-abdominal disease, which would

typically present with acute onset of abdominal pain and may be associated with features of “peritonism” on clinical examination (1).

In most western countries the number of elderly people is constantly rising, which means that an increasing proportion of patients admitted for abdominal pain at the emergency department are elderly (2). The clinical presentation of an older patient with abdominal pain may be very different from that seen in a younger patient. Older patients tend to present later in the course of their illness and have more nonspecific symptoms (2,3). In retrospective studies, more than one half of older patients presenting to the emergency department with acute abdominal pain required admission, and 40 to 50 % required immediate surgery (4).

Morbidity and mortality among older patients with acute abdomen are high. Complication rates of 40-50% have been reported. The mortality rate for emergency abdominal surgery is 15 to 34 % (3-5). Compared with elective surgery, emergency abdominal surgery is associated with increased morbidity and mortality, especially in old people. We now treat, in life-threatening conditions, some elderly patients who have been rejected for elective surgery on the basis of overestimated risk (6, 7). Many factors have been described as responsible for surgical mortality of the acute abdomen in elderly patients. These include associated diseases, age over 80 years, intestinal infarction, malignant diseases with distant metastases and palliative surgery (6).

Based on these aspects, we have reviewed our experience and results in 291 consecutive elderly patients who underwent emergency abdominal surgery at “Santo Spirito Hospital” of Casale Monferrato, a peripheral hospital in the Piemonte region.

In the last years, the debate is open about the role of peripheral hospitals in the health care system and the impact of their redimensioning or closure on the medical services to the local communities (7,8). Our intent is to emphasize the determining role of these hospitals in the management of residents, especially when they are old.

Patients and methods

The study is based on retrospective analysis of files of a total of 291 patients aged 65 or over who underwent surgical operation for an acute abdomen presentation, during a 5-year period (from January 2003 to December 2007) at the peripheral emergency hospital of Casale Monferrato. “Santo Spirito” Hospital of Casale Monferrato in Piemonte Region, Italy, is a peripheral general hospital with a catchment population of about 120.000 inhabitants. The hospital provides full 24-hour emergency service with surgery, gynaecology, internal medicine, X-ray and an intensive care unit.

Ruptured abdominal aortic aneurysm has been excluded from this study since this pathology is not treated in our hospital, and patients after diagnosis are transferred to other centres with vascular

surgery service. Gynaecological pathology has also been excluded, since patients are referred to the specialistic division.

We analysed age, sex, perioperative risk, diagnosis, type of operation, operative findings, major systemic morbidity (e.g., cardiac, pulmonary or renal failure, pneumonia, sepsis), in-hospital mortality, and the number of re-operations for complications.

Results

The mean age of the patients was 78 years (range 65–98), 52 (18%) of the cases were 85 years and above; 142 (49%) were females and 149 (51%) were male (Table 1). Table 2 shows the distribution of patients per year. A total of 126 patients (43%) had one or more associated disease: 47 had cardiovascular disease including 9 with myocardial infarction, 33 had chronic pulmonary disease, 28 had neurological pathologies, 13 had chronic renal failure (3 patients in dialytic treatment), 32 personal history of other malignancies, one inflammatory bowel disease, 2 rheumatoid arthritis, one Child Class C cirrhosis (Table 3). The mean time from admission to the operation was 2,6 days (range 0–25). The interval between admission and operation could be long, since some patients were first treated conservatively, and only when the conservative treatment failed did they undergo surgery. The major presentation groups were mechanical bowel obstruction, $n=131$ (45%), strangulated hernia, $n=53$ (18%); hollow viscus perforation, $n=51$ (18%), acute appendicitis $n=21$ (7%), acute cholecystitis, $n=11$ (4%), mesenteric vascular occlusion, $n=12$ (4%); other presentations were seen in 12 patients (4%) (Table 4). The distribution of the final diagnosis by age is shown in Table 5. The different procedures performed were: hernia repair ($n=53$), cholecystectomy ($n=11$), appendicectomy ($n=19$), Hartmann’s procedure ($n=24$), hollow viscus perforation closure ($n=26$), by-pass ($n=11$), adhesiolysis ($n=31$), partial gastrectomy ($n=4$),

TABLE 1 - DEMOGRAPHIC FEATURES OF PATIENTS.

Age group	Patients (%)	Male (%)	Female (%)
65 – 74	102 (35)	61	41
75 – 84	137 (47)	67	70
85 – 94	47 (16)	20	27
≥ 95	5 (1)	1	4
Total	291	149 (51)	142 (49)

TABLE 2 - DISTRIBUTION OF PATIENTS PER YEAR.

	2003	2004	2005	2006	2007
Male	21	31	33	34	30
Female	22	26	21	32	41
Total	43	57	54	66	71

TABLE 3 - PREOPERATIVE COMORBIDITY.

Associated disease	Patients, %
Cardiovascular disease	47
Chronic pulmonary disease	33
Neurological pathologies	28
Chronic renal failure	13
Previous malignancies	32
Others	4
Total 126/291 (43%)*	

* more than one concomitant disease in single patient

TABLE 4 - INDICATIONS FOR EMERGENCY ABDOMINAL SURGERY.

Disease	Patients, n (%)
Strangulated hernia	53 (18)
Hollow viscus perforation	51 (18)
Mechanical bowel obstruction	131 (45)
Mesenteric vascular occlusion	12 (4)
Acute appendicitis	21 (7)
Acute cholecystitis	11 (4)
Miscellaneous	12 (4)
Total	291

right colectomy ($n=16$), left colectomy ($n=12$), sigmoid resection ($n=14$), anterior rectum resection ($n=5$), total colectomy ($n=1$), ileal resection ($n=17$), colostomy alone ($n=17$), explorative laparotomy ($n=8$), volvulus derotation ($n=19$), others ($n=3$). Details of procedures are shown in Table 6.

234 patients (80%) recovered and were free from major complications. The remaining 57 (20%) developed at least one major complication (including death). The 30-days postoperative deaths were 33 (11%). Non-lethal major complications were 24 (8%). The commonest complications were cardio-respiratory ($n=28$, 50% of morbidity and 48% of mortality). Septic complications were 15 (5 nonlethal and 10 lethal). Total reoperations for surgical complications were 5. These complications and the causes of death in relation to diagnosis and type of procedure are listed in Tables 7 and 8. We also divided the population into two groups (age 65 – 74 and age ≥ 75), considering morbidity and mortality separately and accordingly to the age of patients. The results are reported in Table 9.

Intestinal obstruction

- Thyirty-one patients underwent adhesiolysis. Six patients presented major cardiovascular, pulmonary and neurological comorbidity; seven patients had personal history of cancer. Major nonlethal complications were seen in 4 cases; 3 deaths.

- Ileal volvulus. We performed 16 derotations and 8 ileal resections. Major comorbidity was present in 5 patients. We observed 1 major complication and 1 postoperative death.
- Sigmoid volvulus. There were 6 patients. They were treated by derotation (2), Hartmann's procedure (3), resection and protective colostomy (1). Major comorbidity was described in 2 patients. We observed 4 postoperative deaths.
- Peritoneal carcinomatosis. The primitive tumours were: prostate (1), large bowel (10), ovary (3), bladder (1), breast (1). One case of peritoneal pseudomixoma was described. We performed 4 explorative laparoscopies, 7 by-pass, 6 colostomies. Four postoperative deaths were observed.
- Pancreatic cancer. Two patients underwent by-pass. One patient died.
- One case of ileal adenocarcinoma underwent ileal resection.
- Right colonic carcinoma. We performed 12 right colectomies and 2 by-pass. Major comorbidity was present in 5 patients. In the resected patients (10) the stage was T2 in 1 patient, T3 in 8, N0 in 6, N1 in 2, N2 in 1. The grade was G1 in 2 patients, G2 in 3, G3 in 4. Liver metastases were described in 4 patients. We described one case of neuroendocrine cecal tumour. Three major complications were observed.
- Left and sigmoid colonic carcinoma. Operations were: left colectomy (10), left colectomy and colostomy (1), sigmoid resection (7), sigmoid resection and colostomy (2), Hartmann's procedure (4). The stage was T2 in 3 patients and T3 in 18 patients, T4 in 3, N0 in 13, N1 in 6, N2 in 5. The grade was G1 in 5 patients, G2 in 14, G3 in 5. Three major complications were observed. One reoperation was done due to volvulus.
- Rectum carcinoma. We performed 3 anterior resection, 2 anterior resection and colostomy, 2 Hartmann's procedures, 5 colostomies. In the resected patients (7) the stage was T2 in 2 patients, T3 in 5, N0 in 2, N1 in 3, N2 in 2. The grade was G1 in 1 patient, G2 in 6. Liver metastases were present in 3 patients. One patient had pulmonary cancer associated. One major complication and one reoperation were described. Three postoperative deaths were observed.

Strangulated hernia

There were 53 cases of strangulated hernia (inguinal hernia, $n=18$, femoral hernia, $n=21$, umbilical hernia, $n=7$, incisional hernia, $n=7$). Two patients had small bowel resection and one died. One acute respiratory distress and one cardiac failure were observed. A patient required reoperation and orchiectomy.

TABLE 5 - DETAILED ANALYSIS OF CAUSES OF ABDOMINAL SURGICAL EMERGENCY.

Disease	Patients, n	Age (yrs)			
		65 – 74	75 – 84	85 – 94	≥ 95
Incarcerated inguinal hernia	18	5	6	7	-
Incarcerated femoral hernia	21	3	13	5	-
Incarcerated umbilical hernia	7	2	3	1	1
Incarcerated incisional hernia	7	4	2	1	-
Perforated duodenal ulcer	14	5	8	1	-
Perforated gastric ulcer	8	3	5	-	-
Acute appendicitis	21	12	8	1	-
Acute cholecystitis	11	4	5	2	-
Gastric malignancy	3	1	2	-	-
Pancreatic malignancy	2	-	2	-	-
Ileal malignancy	3	3	-	-	-
Right colonic malignancy	14	7	4	3	-
Left colonic malignancy	24	10	9	3	2
Rectum malignancy	12	6	3	3	-
Peritoneal carcinomatosis	17	7	10	-	-
Colonic diverticulitis	20	6	13	1	-
Adhesions	31	7	17	5	2
Ileal volvulus	24	7	12	5	-
Sigmoid volvulus	6	1	4	1	-
Small and large bowel vascular occlusion	3	-	2	1	-
Small bowel vascular occlusion	6	2	1	3	-
Large bowel vascular occlusion	3	1	2	-	-
Gallstone ileus	1	-	-	1	-
Foreign body	1	-	1	-	-
Emoperitoneum	1	-	1	-	-
Omental volvulus	1	1	-	-	-
Jatrogenic perforation	4	1	2	1	-
Paralytic ileus	4	3	1	-	-
Megacolon	1	-	1	-	-
Jejunostomy dehiscence	1	1	-	-	-
Splenic rupture	1	-	-	1	-
Jejunal diverticulum perforation	1	-	-	1	-
Total	291	102	137	47	5

Hollow viscus perforation

Most free visceral perforations were due to gastroduodenal ulceration (14 duodenal and 8 gastric perforation).

For duodenal perforated ulcer, 13 patients have been treated by simple closure and subsequent medical treatment. One partial gastrectomy was performed. One patient had personal history of cerebral stroke, two patients had an operation for cancer in the past. One pulmonary oedema and one cardiac failure were observed with resolution. Three post-operative deaths were observed.

For gastric perforated ulcer, 7 patients underwent simple closure. One subtotal gastrectomy was done. We observed one case of pneumonia.

The colonic perforations were due to sigmoid diverticular disease. These were treated by Hartmann's procedure (14), Hartmann's procedure and ileal resection in sigmoid-ileal fistula (1), resection and protective colostomy (2), resection alone (1), colostomy alone (1), colostomy and closure of colovesical fistula in one male patient (1). One patient with associated esophageal cancer died in the post-operative time after Hartmann's procedure. One patient with severe bronchopneumopathy underwent reoperation for wall dehiscence and died. Two further post-operative deaths were observed. Four patients presented with associated cardiopathy, but no complications arose. One case of sepsis was observed with resolution.

TABLE 6 - PROCEDURES ACCORDING TO THE DIAGNOSIS.

Procedure	Diagnosis	Cases, n	
Hernia repair with resection	Strangulated hernia	51	
		2	
Cholecystectomy	Cholecystitis	11	
Appendectomy	Appendicitis	19	
Hartmann's procedure	Rectum-sigmoid cancer	6	
	Diverticulitis	15	
	Sigmoid volvulus	3	
Hollow viscus perforation closure	Gastroduodenal ulcer	20	
	Cancer	1	
	Jatrogenic colonic perforation	3	
	Jejunostomy dehiscence	1	
	Perforated jejunal diverticulum	1	
By-pass	Colonic cancer	2	
	Pancreatic cancer	2	
	Carcinomatosis	7	
Adhesiolysis	Adhesions	31	
Partial gastrectomy	Gastroduodenal ulcer	2	
	Perforated gastric cancer	1	
	Bleeding gastric tumor	1	
Right colectomy	Colonic cancer	12	
	Appendicitis	2	
	Mesenteric occlusion	2	
Left colectomy with colostomy	Colonic cancer	10	
	Colonic cancer	1	
	Mesenteric occlusion	1	
Sigmoid resection	Cancer	7	
	Diverticulitis	1	
	with colostomy	Cancer	2
		Diverticulitis	2
		Volvulus	1
Iatrogenic perforation	1		
Anterior resection with colostomy	Rectal cancer	3	
		2	
Total colectomy	Mesenteric occlusion	1	
Ileal resection	Mesenteric occlusion	6	
	Volvulus	8	
	Lymphoma	2	
	Adenocarcinoma	1	
Colostomy	Diverticulitis		
	(one colovesical fistula)	2	
	Rectum-sigmoid cancer	5	
	Carcinomatosis	6	
	Emoperitoneum	1	
	Paralytic ileus	2	
Megacolon	1		
Explorative laparotomy	Carcinomatosis	4	
	Mesenteric occlusion	2	
	Paralytic ileus	2	
Volvulus derotation	Sigmoid volvulus	2	
	Ileal volvulus	16	
	Omental volvulus	1	
Foreign body removal	Foreign body	1	
Stone removal	Gallstone ileus	1	
Splenectomy	Splenic traumatic rupture	1	
Total		291	

One case of perforated gastric cancer was treated by partial gastrectomy. A patient with perforated gastric cancer was treated by closure and gastrointestinal by-pass. Two cases of perforated ileal lymphoma underwent ileal resection (one post-operative death). We observed four cases of jatrogenic perforation after colonoscopy in diverticular disease: three were treated by simple closure and one by resection and colostomy. A case of perforated jejunal diverticulum was treated by closure.

Acute appendicitis

We treated 21 appendicitis. One patient died following emergency appendectomy. Two patients required right emicolectomy for appendicitis with an inflammatory mass. A case of appendiceal mucocele was described, without peritoneal invasion.

Acute cholecystitis

There were 11 cholecystitis. We only considered the cases of empiematous, gangrenous or perforated cholecystitis. One patient developed postoperative jaundice and required E.R.C.P.

Mesenteric vascular occlusion

In our series 12 patients (4%) have been observed. In 6 cases a small bowel vascular occlusion was found and ileal resection was performed. Two of these patients presented cardiac failure and cardiac ischaemia on the post-operative period. One death has been reported in a 94-year-old patient with cardiological disease. In 3 cases the infarction involved a colonic tract, with one case of death after resection. In 3 cases a diffused intestinal infarction was found. In two cases an explorative laparotomy was performed, and in only one patient total colectomy was done. All three patients died.

Miscellaneous

One female patient underwent subtotal gastrectomy for bleeding gastric ancient schwannoma. We described one case of gallstone ileus, one case of foreign body in the ileocecal valve, one emoperitoneum in a patient taking warfarin, one omental volvulus, one jejunostomy dehiscence in patient with gastric cancer (patient died on the postoperative time), one post-traumatic splenic rupture (postoperative death). A patient with megacolon was treated by colostomy. We performed two colostomies and two laparotomies in four patients with paralytic ileus. We observed one pulmonary oedema.

Discussions and conclusions

This series reveals that over a five-year period a considerable number of older patients needed emergency

TABLE 7 - CAUSES OF DEATH ACCORDING TO THE DIAGNOSIS AND TYPE OF PROCEDURE.

Diagnosis	Procedure	Cause of death	Deaths, n (%)
Colonic diverticulitis	Hartmann's procedure	Sepsis; one case of wall dehiscence, reoperation and death	4
Sigmoid volvulus	Hartmann's procedure	Cardiac failure	1
	Resection and colostomy		2
	Derotation		1
Ileal volvulus	Derotation	Cardiac failure	1
Incarcerated hernia	Resection	Sepsis	1
Peritoneal carcinomatosis	By-pass		2
	Explorative laparotomy	Cancer	2
Rectal neoplasia	Colostomy	Respiratory distress, sepsis	2
	Anterior resection	Respiratory distress	1
Duodenal ulcer	Closure	Cardiac failure (1), sepsis (1), dehiscence and reoperation (1)	3
Adhesions	Lysis	Cardiac failure (1), pulmonary embolism (1), pneumonia (1)	3
Acute appendicitis	Appendectomy	Sepsis	1
Jejunostomy dehiscence	Closure	Sepsis	1
Mesenteric vascular occlusion	Ileal resection		1
	Right colectomy	Cardiac failure	1
	Explorative laparotomy		2
	Total colectomy		1 (intraoperative death)
Splenic rupture	Splenectomy	Cardiac failure	1
Ileal perforation	Resection	Sepsis	1
Pancreatic cancer	By-pass	Cancer	1
Total			33 (11%)

TABLE 8 - NON-LETHAL MAJOR COMPLICATIONS WITHIN 30 DAYS ACCORDING TO THE DIAGNOSIS AND TYPE OF PROCEDURE.

Diagnosis	Procedure	Major complications (n)	Cases, n (%)
Gastroduodenal ulcer	Closure	Pleural effusion (1), pulmonary edema (1), cardiac failure (1)	3
Colonic cancer	Right emicolectomy	Pleural effusion (1), pneumonia (1), myocardial infarction (1)	3
Left and sigmoid cancer	Resection	Sepsis (1), bleeding gastric ulcer in intensive care unit (1), occlusion due to volvulus and reoperation (1)	3
Rectal cancer	Anterior resection	DVT (1), emoperitoneum and reoperation (1)	2
Adhesions	Lysis	Pneumonia (2), pleural effusion (1), enteric fistula (1)	4
Paralytic ileus	Colostomy	Pulmonary oedema	1
Mesenteric vascular occlusion	Ileal resection	Cardiac failure (1), cardiac ischaemia (1)	2
Strangulated hernia	Repair	Cardiac failure (1), respiratory failure (1), ematoma and reoperation with orchiectomy (1)	3
Acute cholecystitis	Cholecystectomy	Jaundice	1
Ileal volvulus	Derotation	Acute renal failure	1
Colonic diverticulitis	Hartmann's procedure	Sepsis	1
Total			24 (8%)

abdominal surgery. The number of elderly people requiring surgical management is continuously rising, secondary to the significant increase in life expectancy in recent times. In general 65 years of age is accepted as a baseline for geriatric surgery (5).

It is difficult to evaluate the results of emergency surgery in elderly patients. Most often series are not comparable, due to the large difference among described populations (age, sex, race, etc.). The present study showed a small but progressive increase in the number of patients

TABLE 9 - MORBIDITY AND MORTALITY ACCORDING TO THE AGE OF PATIENTS.

Age	Overall morbidity	Non-lethal morbidity	Mortality
65-74	17.6%	7.8%	9.8%
≥ 75	20.6%	8.5%	12.2%

from 2003 to 2007. No difference about sex has been observed.

Mechanical bowel obstruction has been the most common presentation ($n=184$, 63%). In other series the frequency is lower (15-20%) (5). Malignancy was the most frequent cause of occlusion ($n=70$). Our most significant finding was a stenosing gastrointestinal tumour ($n=53$). Peritoneal carcinomatosis caused occlusion in further 17 patients. Adhesions and volvulus take second place in mechanical occlusion ($n=61$). Strangulated hernia caused 53 cases of occlusion, fortunately with a low incidence of necrosis in the entrapped bowel segment. Frequency of strangulated hernia in literature was reported as 10 to 25%, with a higher rate of 36.4 % among nonagenarian patients (10, 11).

Mesenteric vascular occlusion is an expected surgical emergency in the elderly, especially in those with cardiovascular disorders. Findings of the present study have shown a frequency of 4%. Other reports have shown the frequency to be under 10% (5, 10). The clinical course and outcome is disastrous and worse than any other abdominal emergency. We observed a mortality of 42%, but a mortality rate over 80% has been reported (12).

Acute appendicitis rarely occurs in the elderly, but with a high perforation rate. Abdominal sepsis secondary to appendiceal perforation increases morbidity and mortality (12% in literature) (13). We observed one lethal outcome.

Compared to literature (5, 10), we described a lower-number of acute cholecystitis. We retain that this difference is due to different criteria of inclusion of patients in the study (we only considered empiematous, gangrenous and perforated cholecystitis).

Hollow viscus perforation is another common group of surgical emergency in older people (51 patients in our report, 18%). Peptic ulcer and colonic diverticulitis were the leading cause among our patients. Free perfora-

tions into the peritoneal cavity and abdominal sepsis carry a considerable high rate of morbidity and mortality in advanced age (5).

A 4.5% incidence of reoperations for complications has been reported (10). We described a 1.7% incidence. Overall morbidity (20%) and mortality ratio (11%) are a bit lower compared to some results reported in literature (3-6). We retain that it could be related to a different distribution of risk factors among patients. Even dividing the patient into two groups according to the age, we can see that the difference of morbidity and mortality in younger patients (age 65-74) is not so high to influence the overall results, and that these are similar in these two subpopulations.

Similarly to other reports, we noted that mesenteric ischaemia and secondary peritonitis are the most important causes of fatal outcome (respectively 42 and 17% of mortality). Including also nonlethal events for these two groups, morbidity ratio was 58 and 23%. We also reported high mortality among patients with peritoneal carcinomatosis (24%). Emergency surgery was relatively safe for the remaining groups of patients, with a complexive mortality ratio of 5.3%. In particular we observed a morbidity (lethal and nonlethal events) of 21% for both patients with malignancy without carcinomatosis and patients with adhesions and volvulus. These patients had respectively a mortality ratio of 5,6 and 13%.

We conclude that "acute abdomen" is still an appreciably frequent cause of death in the older age group. A high level of vigilance and early attention is therefore advocated. Anyway, excluding some severe conditions, the overall success of surgical interventions for abdominal emergency is satisfactory in the majority of older people. Considering the recent debate about the role of peripheral hospitals in the Health care system, we also retain that the surgical treatment of the acute abdomen in the elderly is safe and feasible in the peripheral hospitals, and that peripheral hospitals play a determining role in the management of old patients, especially in the emergency.

Acknowledgements

We express our gratitude to Mario Siricani, "Santo Spirito" Hospital of Casale Monferrato Archive, Carla Galea and Lorenzo Causarano, University of Turin, Medical and Surgical Disciplines Library, for their support and collaboration.

References

1. Ng CY, Squires TJ, Busutil A. Acute abdomen as a cause of death in sudden, unexpected deaths in the elderly. *Scot Med J* 2007;52:20-3.
2. Laurell H, Hansson LE, Gunnarsson U. Acute abdominal pain among elderly patients. *Gerontology* 2006;52:339-44.
3. Lyon C, Clark DC. Diagnosis of acute abdominal pain in older patients. *Am Fam Physician* 2006;74:1537-44.
4. McIntyre R, Reinbach D, Cuschieri RJ. Emergency abdominal

- surgery in the elderly. *J R Coll Surg Edinb* 1997;42:173-8.
5. Gürleyik G, Gürleyik E, Unalmi er S. Abdominal surgical emergency in the elderly. *Turk J Gastroenterol* 2002;13:47-52.
 6. Arenal JJ, Bengochea-Beeby M. Mortality associated with emergency abdominal surgery in the elderly. *Can J Surg* 2003;46:111-6.
 7. Holmes GM, Slifkin RT, Randolph RK, Poley S. The effect of rural hospital closures on community economic health. *Health Serv Res* 2006;41:467-85.
 8. Reif SS, DesHarnais S, Bernard S. Community perceptions of the effects of rural hospital closure on access to care. *J Rural Health* 1999 Spring;15:202-9.
 9. Kettunen J, Paajanen H, Kostainen S. Emergency abdominal surgery in the elderly. *Hepatogastroenterol* 1995;42:106-8.
 10. Miettinen P, Pasanen P, Salonen A, Lahtinen J, Alhava E. The outcome of elderly patients after operation for acute abdomen. *Ann Chir Gynaecol* 1996;85:11-5.
 11. Rigberg D, Cole H, Hiyama D, McFadden D. Surgery in nineties. *Am Surg* 2000;66:813-16.
 12. Mamode N, Pickford I, Leiberman P. Failure to improve outcome in acute mesenteric ischaemia: seven-year review. *Eur J Surg* 1999;165:203-208.
 13. Lee JF, Leow CK, Lau WY. Appendicitis in the elderly. *Aust N Z J Surg* 2000;70:593-6.
-