Mortality associated with emergency abdominal surgery in the elderly

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Introduction: Elderly patients with life-threatening abdominal disease are undergoing emergency surgery in increasing numbers, but emergency procedures generally are associated with increased morbidity and mortality. We carried out a retrospective and prospective study at a tertiary centre in Spain to analyze the factors contributing to death after emergency abdominal surgery in elderly patients and to determine whether there were differences in the death rate between those aged 70–79 years and those aged 80 years and older. **Methods:** The study population comprised 710 patients aged 70 years or older who underwent emergency surgery for intra-abdominal disorders. Between 1986 and 1990, we reviewed the charts of 302 patients, and between 1991 and 1995, we collected prospective data on 408 patients. The patients were divided by age into 2 groups: group 1 — 364 patients aged 70–79 years; and group 2 — 346 patients aged 80 years or older. In the analysis, w**e considered patient a**ge, sex, perioperative risk, the time between onset of symptoms and admission to hospital and between admission to hospital and surgery, diagnosis, type of operation, operative findings, morbidity, mortality and length of hospital stay. **Results:** The overall mortality was 22% (19% in group 1 and 24% in group 2). Multiple regression analysis showed that American Society of Anesthesiologists (ASA) grading ($p = 0.0001$), interval from onset of symptoms to admission ($p = 0.007$), mesenteric infarction ($p = 0.005$), a defunctioning stoma and palliative bypass ($p = 0.003$) and nontherapeutic laparotomy ($p = 0.0003$) were predictive of death. **Conclusions:** Mortality in elderly patients operated on for an acute abdomen can be predicted by ASA grade (perioperative risk), delay in surgical treatment and conditions that permit only palliative surgery. Increasing age (70–79 yr or ≥ 80 yr) does not affect mortality, morbidity or length of hospital stay.

Introduction : Il arrive de plus en plus souvent que des patients âgés présentant une affection abdominale possiblement mortelle subissent une chirurgie d'urgence, mais les interventions d'urgence sont généralement associées à une morbidité et à une mortalité plus importantes. Nous avons effectué une étude rétrospective et prospective dans un centre tertiaire d'Espagne pour analyser les facteurs contribuant au décès après une intervention abdominale d'urgence chez les patients âgés et pour savoir si le taux de mortalité diffère entre les patients de 70 à 79 ans et ceux de 80 ans et plus. **Méthodes :** La population de l'étude comprenait 710 patients de 70 ans et plus ayant subi une intervention d'urgence pour traiter un trouble intra-abdominal. Entre 1986 et 1990, nous avons passé en revue les dossiers de 302 patients, et entre 1991 et 1995, nous avons recueilli des données prospectives au sujet de 408 patients. Les patients ont été répartis en deux groupes selon l'âge : le groupe 1 comprenait 364 patients de 70 à 79 ans et le groupe 2, 346 patients de 80 ans et plus. Notre analyse tenait compte de l'âge du patient, du sexe, du risque périopératoire, de la période écoulée entre l'apparition des symptômes et l'admission à l'hôpital et de la période écoulée entre l'admission à l'hôpital et la chirurgie, du diagnostic, du type d'intervention, des constatations opératoires, de la morbidité, de la mortalité et de la durée de l'hospitalisation. **Résultats :** Dans l'ensemble, la mortalité s'est établie à 22 % (19 % dans le groupe 1 et 24 % dans le groupe 2). L'analyse de régression multiple a montré que la classification de l'American Society of Anesthesiologists (ASA) ($p = 0{,}0001$), la période écoulée entre l'apparition des symptômes et l'admission ($p = 0{,}007$), l'infarctus mésentérique ($p = 0{,}005$), la stomie permanente et le pontage palliatif ($p = 0{,}003$), de même que la laparotomie non thérapeutique ($p = 0{,}0003$) étaient des prédicteurs de la mortalité. **Conclusions :** La classification de l'ASA (risque périopératoire), le délai d'intervention chirurgicale et les cas dans lesquels seules des chirurgies palliatives sont praticables peuvent permettre de prédire la mortalité chez des patients âgés subissant une intervention en raison d'un abdomen aigu. L'âge croissant (70 à 79 ans ou 80 ans et plus) n'a pas d'incidence sur la mortalité, la morbidité ou la durée de l'hospitalisation.

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One notable characteristic of people living in countries of the developed world is the increase in life span seen in recent decades. In 1981, about 7.4% of the Spanish population was aged 70 years or older. This rate increased to 9.2% in 1991, and the projection for 2000 is 11.5%. In the last 13 years, the number of people over 80 years of age in Spain has increased by 56%.

In spite of persisting taboos about surgery in elderly people, the numbers of elderly patients with abdominal disease who undergo surgical treatment has increased during this time.

Compared with elective surgery, emergency abdominal surgery is associated with increased morbidity and mortality, especially in old people.[1–25] We now treat, in life-threatening conditions, some elderly patients who have been rejected for elective surgery on the basis of overestimated risk.

The aim of this study is to report our experience of emergency abdominal surgery in elderly patients and to analyze the factors that contribute to their death.

Patients and methods

Between 1986 and 1995, 710 patients aged 70 years or over were operated on because of acute abdominal complaints. Those operated on between 1986 and 1990 (302 patients) were studied retrospectively, whereas those operated on between 1991 and 1995 (408 patients) were studied prospectively.

We divided the series into 2 groups: group 1 — 364 patients aged 70–79 years (mean [and SD] 74.3 [2.8] yr); group 2 — 346 patients aged 80 years or older, (mean [SD] 84.7 [3.7] yr).

The variables analyzed were: age, sex, perioperative risk, the time between onset of symptoms and admission to hospital and between admission to hospital and surgery, diagnosis, type of operation, operative findings, morbidity, mortality and length of hospital stay.

Perioperative risk was classified in accordance with the American Society of Anesthesiologists (ASA) criteria. Age was not been taken into account for ASA evaluation.

Some cases were considered as emergencies despite long time intervals between the onset of symptoms and admission and between admission and surgery. In some patients, especially those whose social conditions were poor or who had intestinal obstruction due to colon cancer but in whom the obstruction was initially incomplete, the interval between the onset of symptoms and admission could be up to 7 days. Similarly, the interval between admission and operation could be as long as 7 days, since some patients (e.g., those with acute cholecystitis, intestinal obstruction due to adhesions, gastrointestinal bleeding treated with endoscopic methods) were first treated conservatively, and only when the conservative treatment failed did they undergo surgery.

For analysis we divided operations into gastrointestinal resection (gastric, small bowel and large bowel), hernia repair, cholecystectomy (including sphincterotomy and choledochotomy), appendectomy, intestinal-bypass and stoma, gastro- intestinal suture, laparotomy, adhesiolysis and other. Laparotomy included operations in which the abdomen was opened but no other surgical procedure undertaken.

We divided morbidity into local (e.g., wound infection, abdominal abscess, leaks, adhesions) and systemic (e.g., cardiac, pulmonary or renal insufficiency, pneumonia, sepsis, gastrointestinal bleeding). Except for superficial vein thrombosis, all complications were analyzed. In-hospital death included all deaths that oc-

Table 1

Characteristics of Two Groups of Elderly Patients Who Underwent Emergency Abdominal Surgery: Group 1 (70–79 Years), Group 2 (≥ 80 Years)

	Group, no. (and %)	
Characteristic	1 (*n* = 364)	2 (*n* = 346)
Sex		
Male	193 (53)	139 (40)
Female*	171 (47)	207 (60)
American Society of Anesthesiologists grading		
I–II	163 (45)	127 (37)
III	83 (23)	97 (28)
IV	112 (31)	109 (31)
V	6 (1)	13 (4)
Etiology†		
Intestinal obstruction	136 (37)	154 (45)
Peritonitis	113 (31)	94 (27)
Gastrointestinal bleeding	26 (7)	10 (3)
Vascular mesenteric disorder	13 (4)	14 (4)
Other	76 (21)	74 (20)
Time from onset of symptoms to hospital admission, h		
< 48	187 (52)	182 (53)
≥ 48	177 (48)	164 (47)
Time from hospital admission to surgery, h		
< 24	259 (71)	252 (73)
≥ 24	105 (29)	94 (27)
Time from onset of symptoms to surgery, h		
< 72	158 (43)	156 (45)
≥ 72	206 (57)	190 (55)

*χ^2 = 11.2, 1 df, p = 0.0008.
†χ^2 = 9.59, 4 df, p = 0.048.

curred in the hospital, regardless of the number of days postoperatively.

When we compared the prospective and retrospective portions of the study, the only remarkable difference was related to age (in the second period there was a significantly greater number of patients aged 80 years and older), so we decided to analyze both periods of the study together.

Statistical analysis was performed with use of the χ^2 test with Yates' correction when necessary and Student's *t*-test, according to the nature of the variables analyzed. Multivariate analysis was performed using multiple logistic regression.

Results

There were 378 women and 332 men. Abdominal wall (23%), colorectal (21%), biliary (20%) and small-bowel diseases (15%) were more common than gastroduodenal (9%), appendiceal (11%) and other disorders (1%). Complicated malignant disease was responsible for an acute abdomen in 133 patients (103 colorectal, 12 biliary–pancreatic, 8 gastroduodenal, 8 small intestine and 2 other).

In patients with acute cholecystitis and acute appendicitis, the gallbladder and the appendix were gangrenous in 53% and 44%, respectively.

When we compared both periods of the study, we found no differences related to sex, associated diseases, ASA grading, diagnosis, type of operation, or morbidity. However, mortality decreased from 24.2% in the first period to 20.1% in the second. The only remarkable difference was related to age: in the first period (1986–1990) 42% of patients were aged 80 years or older, whereas in the second period (1991–1995) 53% were in this age group ($p = 0.005$, 1 df, $\chi^2 = 8.04$). Therefore mortality in the second period was lower despite an increase in average age.

Table 1 shows the characteristics of the groups. In group 2 patients (≥ 80 yr of age), female sex, cardiac disease and intestinal obstruction were more common.

Overall, there was 1 coexisting condition in 234 (33%) patients, and 2 or more coexisting conditions were present in 178 (25%) patients. The causes of intestinal obstruction were colorectal carcinoma in 81 cases, colorectal benign disease in 10, incarcerated or strangulated hernia in 125, biliary ileus in 10, and adhesions in 44; in the remaining 20 patients the intestinal obstruction resulted from other causes. Peritonitis was of biliary origin in 62 cases, appendiceal in 48, colorectal in 47, gastroduodenal in 30 and small intestinal in 20 cases. The median interval from onset of symptoms to hospital admission for the series was 48 hours (range from 1 h–10 d) and the interval from hospital admission to operation was 7 hours (range from 1 h– 7 d).

With respect to the number and type of operations carried out in each group (Table 2), the most significant differences were the greater number of hernia repairs in group 2 and the greater numbers of cholecystectomies and appendectomies in group 1. Of the 137 gastrointestinal resections performed, 84 were colorectal, 47 small intestinal (24 for strangulated hernia) and 6 gastric. Among intestinal bypass and stoma operations, 44 were for defunctioning the stoma and 22 were palliative bypasses. Cholecystectomy was done in 110 patients, with a sphincterotomy in 18. Laparotomies include 13 cases of mesenteric infarction and 12 cases of peritoneal carcinomatosis.

There were no significant differences in morbidity, the number of reoperations or mortality between the groups (Table 3). Overall 342 (48%) patients had morbidity of some kind. Local and systemic morbidities were 25% ($n = 181$) and 33% ($n = 233$) respectively (Table 4). Only the incidence of cardiac complications was significantly increased

Table 2

Number of Procedures Done in Two Groups of Elderly Patients Who Underwent Emergency Abdominal Surgery: Group 1 (70–79 Years), Group 2 (≥ 80 Years)

	Group, no. of procedures	
Procedure	1 ($n = 364$)	2 ($n = 346$)
Gastrointestinal resection	70	67
Hernia repair	62	76
Cholecystectomy	62	48
Appendectomy	51	23
Gastrointestinal oversewing	26	32
Palliative bypass and defunctioning stoma	31	35
Laparotomy	19	21
Other	43	44

$\chi^2 = 14.39$, 7 df, $p = 0{,}0447$.

Table 3

Comparative Results for Two Groups of Elderly Patients Who Underwent Emergency Abdominal Surgery: Group 1 (70–79 Years), Group 2 (≥ 80 Years)

	Group, no. (and %)	
Result	1 ($n = 364$)	2 ($n = 346$)
Local morbidity	96 (26)	85 (25)
Systemic morbidity*	106 (29)	127 (37)
Reoperations	21 (6)	18 (5)
Death	70 (19)	83 (24)

*$\chi^2 = 4.29$, 1 df, $p = 0.038$.

in patients over 80 years of age (group 2) ($p = 0.04$).

Thirty-nine patients required reoperation because of evisceration (10 patients), diffuse peritonitis (6), adhesions (5), anastomotic leak (3), intra-abdominal abscess (3), wound infection (3), strangulated hernia (3), arterial embolism (2) and acute cholecystitis, gastrointestinal bleeding, elective "second look" and normal laparotomy (1 patient each).

The overall mortality for the series was 22% ($n = 153$), and the 30-day mortality was 20% ($n = 145$). Median postoperative stay was 12 days (range from 0–106 d) for patients in group 1, and 11 days (range from 1–46 d) for those in group 2. Univariate analysis of the mortality is shown in Table 5. The majority of analyzed factors increase the mortality. Mortality by type of operation is shown in Table 6.

Multiple regression analysis (Table 7) shows that ASA grading ($p = 0.0001$), interval from the onset of symptoms to hospital admission ($p = 0.007$), acute vascular mesenteric disease ($p = 0.005$), defunctioning the stoma and palliative bypass ($p = 0.003$) and laparotomy ($p = 0.0003$) were the predictive mortality factors in this series.

Table 4

Details for Patients Who Suffered Morbidity After Emergency Abdominal Surgery According to Age: Group 1 (70–79 Years), Group 2 (≥ 80 Years)

	Group, no. (and %)	
Type of morbidity	1 ($n = 364$)	2 ($n = 346$)
Local		
Wound infection	62 (17)	54 (16)
Abdominal abscess	8 (2)	6 (2)
Intestinal obstruction	13 (4)	9 (3)
Anastomotic leak	13 (4)	6 (2)
Other	22 (6)	29 (8)
Systemic		
Respiratory complications	43 (12)	38 (11)
Cardiac complications*	24 (7)	39 (11)
Renal complications	18 (5)	15 (4)
Urinary tract complications	14 (4)	22 (6)
Cerebrovascular complication	5 (1)	5 (1)
Thromboembolism	7 (2)	11 (3)
Gastrointestinal bleeding	9 (2)	7 (2)
Sepsis	29 (8)	20 (6)
Other	5 (1)	1 (0)

*$\chi^2 = 4.24$, 1 df, $p = 0.0395$.

Table 5

Univariate Analysis of Mortality for a Series of Elderly Patients Who Underwent Emergency Abdominal Surgery

Variable	Deaths / patients, no. (and %)	χ^2 test
Sex		1.19, 1 df, $p = 0.3$
Male	78/332 (23)	
Female	75/378 (20)	
ASA grading		129.96, 4 df, $p = 0.0001$
I–II	17/290 (6)	
III	35/180 (19)	
IV	84/221 (38)	
V	17/19 (89)	
Time from onset of symptoms to hospital admission, h		14.74, 1 df, $p = 0.0001$
< 48	58/369 (16)	
≥ 48	95/341 (28)	
Time from hospital admission to surgery, h		12.4, 1 df, $p = 0.0004$
< 72	48/314 (15)	
≥ 72	105/396 (27)	
Etiology		49.22, 4 df, $p = 0.0001$
Obstruction	61/290 (21)	
Peritonitis	40/207 (19)	
Gastrointestinal bleeding	13/36 (36)	
Intestinal infarction	19/27 (70)	
Other	20/150 (13)	
Pathological findings		12.26, 2 df, $p = 0.002$
Nontumoral	113/577 (20)	
Malignant disease without distant metastasis	22/90 (24)	
Malignant disease with distant metastasis	18/43 (42)	

Discussion

It is difficult to evaluate the results of emergency surgery in elderly patients.[1] This series is not comparable to those reported in the 1960s or

Table 6

Mortality According to Type of Procedure for a Series of Elderly Patients Who Underwent Emergency Abdominal Surgery

Procedure	Deaths / patients, no. (and %)
Gastrointestinal resection	33/137 (24)
Hernia repair	12/138 (9)
Cholecystectomy	9/110 (8)
Appendectomy	5/74 (7)
Intestinal bypass and defunctioning stoma	26/66 (39)
Gastrointestinal suture	16/58 (28)
Laparotomy	23/40 (58)
Adhesiolysis	7/37 (19)
Other	22/50 (44)

1970s. Even the reports over the last 20 years differ in the incidence of diseases and in surgeons' attitudes.

This series is the first in which almost 50% of patients were over 80 years of age. During the second period of the study, there was a significant increase in the age of patients and the number of older patients in relation to the previous 5 years. The significant predominance of women among patients over 80 years of age is justified because of their higher life expectancy.

As previously described,[2–7] more than 50% of our patients had associated diseases. These are responsible for the increased perioperative risk and, consequently, mortality.

The difficulty in diagnosing an acute abdomen in elderly patients is well established.[8–10] Mean intervals between onset of symptoms and admission to hospital of 49 hours for gangrenous appendicitis and 7 days for localized or pelvic peritonitis secondary to colonic diverticulitis have been reported.[9] Fifty percent of our patients arrived at the hospital 48 hours after the onset of symptoms. In many of them the difficulty in obtaining an accurate history, the mild character of symptoms and the diminution of sensibility at exploration were responsible for the delay in surgical decision-making, the progress of the disease state (high incidence of gangrenous appendicitis and cholecystitis) and the increase in mortality.

The mortality of our series (22%) is similar to the rates in the majority of published reports.[3–8,11–19] Nonetheless, death rates under 17%[18,19,23,24] and over 30%[20] have been reported. In addition to the mortality associated with surgery because of an acute abdomen in the elderly there is a high morbidity, particularly from coexisting diseases. Our results (48%) are similar to those reported previously.[2,4,5,8,11,21,25]

Many factors have been described as responsible for surgical mortality of the acute abdomen in elderly patients. These include associated diseases or ASA grading,[5,6,8,12,14,16–19,23,24] age over 80 years,[13,17,20] colorectal surgery,[11,17,19] malignant disease[4,14,15,20,21,23,24] and the severity of the surgical condition.[6,13,15,19,22–24] Univariate analysis revealed that most of the factors analyzed increased the mortality (including ASA grading IV–V, increased time lapse from the appearance of symptoms to hospital admission and hospital admission to surgery, intestinal infarction, malignant disease with distant metastasis and palliative surgery). Multivariate analysis revealed that independent mortality-related factors are the perioperative risk (ASA grade), the time elapsed between onset of symptoms and hospital admission and the disorders that only permit palliative surgery (gastrointestinal bypass, colostomy) or no surgical intervention (nontherapeutic laparotomy), such as advanced vascular mesenteric disease or advanced complicated gastrointestinal malignant disease. In contrast to the findings of others,[13,17,20] our experience is that the increase of age in this group of patients is not associated with higher morbidity or mortality.

In the light of our results, surgical decisions (to operate or not, and whether to perform an aggressive or nonaggressive procedure) in elderly patients admitted as emergencies for abdominal complaints must never be based on the age of the patient. On the other hand, today it is less admissible for elderly patients to die

Table 7

Regression Analysis (Beta Coefficient Table) of Mortality-Related Factors for a Series of Elderly Patients Who Underwent Emergency Abdominal Surgery

Variable	Coefficient	Standard error	Standard coefficient	*t*-value	Probability
Intercept	0.333				
Sex	0.046	0.028	0.056	1.63	0.103
Age	–0.032	0.028	–0.038	1.12	0.2618
American Society of Anesthesiologists grading	–0.142	0.017	–0.314	8.50	0.0001
Intestinal obstruction	0.036	0.038	0.043	0.93	0.3554
Peritonitis	0.044	0.042	0.049	1.06	0.2899
Gastrointestinal bleeding	0.117	0.076	0.062	1.54	0.1252
Mesenteric infarction	0.251	0.09	0.106	2.80	0.0053
Distant metastasis	0.034	0.066	0.02	0.52	0.6003
Time from onset of symptoms to hospital admission	–0.096	0.035	–0.116	2.70	0.0072
Time from hospital admission to surgery	–0.05	0.034	–0.055	1.46	0.1438
Time from onset of symptoms to surgery	0.031	0.041	0.033	0.75	0.4525
Gastrointestinal resection	0.036	0.038	0.035	0.95	0.3411
Intestinal bypass and defunctioning stoma	0.164	0.055	0.116	3.00	0.0028
Nontherapeutic laparotomy	0.232	0.063	0.138	3.66	0.0003
Suture of gastrointestinal perforation	0.073	0.058	0.049	1.26	0.2074

because of complicated previously known disease, particularly hernia and biliary lithiasis (10% and 9% of the deaths in our series, respectively), when the mortality is zero after elective surgery.

Conclusions

In our experience, the mortality in elderly patients operated on because of an acute abdomen depends on perioperative risk, delay in surgical treatment and conditions that only permit palliative surgery or no surgical intervention (nontherapeutic laparotomy). Increased age (from 70–79 yr to ≥ 80 yr) does not affect mortality, morbidity or length of hospital stay.

The only way to improve results is to manage elderly patients electively. To achieve this, patients with previously known disease (e.g., abdominal hernia and biliary lithiasis) should be operated on early, and symptoms that could be attributed to physiological changes due to age, especially changes in the bowel habit, should be studied adequately.

Competing interests: None declared.

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