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Perforated vs nonperforated acute appendicitis: evaluation of short-term surgical outcomes in an elderly population

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Abstract

Background

Acute appendicitis is a common acute surgical abdominal condition and despite that most of cases are observed in children and young adults, its occurrence in the elderly seems to be increasing, with a higher risk of perforation. The aim of this study was to evaluate the surgical outcomes following appendectomy for acute appendicitis in the elderly, making a comparison between perforated and nonperforated groups regarding operative time, hospital stay and post-operative complications.

Methods

The medical records of 48 patients over the age of 60 years who had a pathologically confirmed diagnosis of acute appendicitis from January 2011 to December 2016 were retrospectively reviewed. Patients were grouped into those with perforated and those with nonperforated appendicitis and a comparison was made between both groups regarding demography, operative time, length of hospital stay and postoperative complications.

Results

From 48 patients over 60 years diagnosed with acute appendicitis, a perforated appendicitis was removed from 10 patients (20.8%). The Perforated Appendicitis (PA) group consisted of 3 males

and 7 females, and their mean age was 71.6 years (range 65-84). The Non Perforated Appendicitis (NPA) group included 22 males and 16 females, and their mean age was 76.5 years (range 63-96). The mean operative time was 58 ± 18.7 minutes and 43.3 ± 9.9 minutes in the perforated and nonperforated groups respectively, with statistically significant difference ($p= 0.0013$). The mean length of hospital stay was similar in the PA group and in the NPA group, being 6.5 ± 1.8 days and 5.4 ± 1.8 days respectively, but these differences were not statistically significant ($p=0.093$).

The frequency of postoperative complications was similar in both groups as they were observed in 3 patients (30%) of the PA group and 10 patients (26%) of the NPA group ($P = 0.2488$).

No postoperative intraabdominal abscess was observed in both groups and there was no death after the surgery.

Conclusions

Perforated appendicitis, despite requiring a longer mean operative time, in our series is not producing a longer hospital stay or more post-operative complications compared to non perforated appendicitis. The non operative management of uncomplicated appendicitis is a reasonable option in frail patients in order to avoid the burden of morbidity related to operation, nevertheless surgery remains the standard of care in all age groups.

Background

Acute appendicitis is a common acute surgical abdominal condition. In the general population lifetime risk is around 7%¹ and, despite that most of cases occur in children and young adults, the rate of appendicitis in the elderly seems to be increasing with an increase in life expectancy, varying

from 5% to 10%.² It is usually associated with higher morbidity and mortality. The risk of perforation in the elderly population is high, reaching levels of up to 70% in some reports.³

The aim of this study was to evaluate the surgical outcomes following appendectomy for acute appendicitis in the elderly, making a comparison between perforated and nonperforated groups regarding operative time, hospital stay and post-operative complications.

Methods

In this study carried out at General Surgery Department of “San Giovanni Battista” Hospital, Foligno, all patients aged 60 years and older who underwent appendectomy for appendicitis between January 2011 and December 2016 were retrospectively evaluated with the aim to compare the surgical results according to the presence or absence of a perforated appendicitis. Acute appendicitis confirmed by histopathology was considered in this study to assess whether or not the perforation influenced the following surgical outcomes: mortality, mean operative time, length of hospital stay, overall complications. All the operations were performed by consultant surgeons at our institution. Preoperative antibiotic prophylaxis was prescribed in all patients. In patients presenting at night and not undergoing appendectomy until the next morning, intravenous antibiotics were started on admission. NPA did not receive post-operative antibiotics, while 3-5 days of intravenous antibiotics were given for perforated appendicitis and an additional post-discharge 5-days course of oral antibiotics was routinely prescribed. All patients underwent appendectomy as an emergency basis with an open or laparoscopic approach according to the preference and experience of the surgical team on duty. Statistical analysis was performed using the student t-test for continuous variables and chi-square and Fischer exact tests for categorical data.

Results

From a total of 503 patients who underwent open and/or laparoscopic appendectomies, 48 patients aged over 60 years were selected. According to operative and histological reports, a perforated appendicitis was removed from 10 patients (20.8%). The Perforated Appendicitis (PA) group consisted of 3 males and 7 females, and their mean age was 71.6 years (range 65-84). The Non Perforated Appendicitis (NPA) group included 22 males and 16 females, and their mean age was 76.5 years (range 63-96) without difference between the two groups (Table 1). When comorbidities at diagnosis of appendicitis were evaluated, no statistically significant difference between the two groups was found. (Table 2). The mean operative time was 58 ± 18.7 minutes and 43.3 ± 9.9 minutes in the perforated and nonperforated groups respectively, with statistically significant difference ($p= 0.0013$).

The mean length of hospital stay was similar in the PA group and in the NPA group, being 6.5 ± 1.8 days and 5.4 ± 1.8 days respectively, but these differences were not statistically significant ($p= 0.093$) (Table 1).

The frequency of postoperative complications was similar in both groups as they were observed in 3 patients (30%) of the PA group and 10 patients (26%) of the NPA group ($P = 0.2488$). Pulmonary sepsis was the more frequently observed complication in the PA group, but the difference between the two groups was not statistically significant ($P = 0.1469$). (Table 3).

No postoperative intraabdominal abscess was observed in both groups and there was no death after the surgery.

When comparing the laparoscopic with the open surgery group, the mean operative time was 41.4 ± 13.3 minutes and 47.9 ± 13.3 minutes ($p= 0.1491$), the mean hospital stay was 4.8 ± 1.7 days and 5.9 ± 1.8 days ($p= 0.0769$), the overall postoperative complications was 25% and 30.5% ($p=1$), respectively. All these differences were not statistically significant. Subgroup analysis of

laparoscopic procedures in PA compared with NPA did not show statistically significant differences (mean operative time in PA was 51.6 ± 23.6 minutes, in NPA was 38 ± 7.2 minutes; $p= 1.1290$), while open approach was statistically shorter in non perforated group (mean operative time in PA was 60.7 ± 17.6 minutes, in NPA was 44.8 ± 10.2 minutes; $p=0.003$).

Only one patient from the PA group (10%), who underwent an open appendectomy, was admitted again due to bowel obstruction, but he recovered from symptoms after conservative treatment and was discharged.

During this study period, the laparoscopic surgery was never converted to an open one.

Discussion

Acute appendicitis is one the most common acute disease requiring emergency operation. In older population it remains a very challenging condition to deal with because of the peculiar anatomical, physiological and pathological features of the appendix in this population. A shrinkage of the appendix with reduction of the lymphatic tissues and fibrotic luminal stenosis are frequently observed. Moreover there is a higher vulnerability to ischemia and a higher risk of early perforation because of a weaker anti-inflammatory function of the mesentery.⁴

Patients usually present with an atypical symptomatology with a frequent delay in diagnosis. The poor immunologic response leads to mild fever and to an increase in white blood cell count⁵⁻⁶ and the change in the nervous system response caused by aging increases the threshold for pain and modifies its detection, making the clinical features of the elderly with appendicitis usually milder than in the young population.

Appendicitis has a perforation rate ranging between 17-20% in the general setting, which increases up to 30-70% in patients over 60 years.⁷ The high frequency of atypical or non classical

presentation leads to delay in diagnosis with the result of more complications. This peculiarity has justified the thought that appendicitis in the elderly is a separate entity.⁸

In our experience perforation was observed in 10 (20%) patients, a result that lies below the range reported in other studies.⁹⁻¹⁰ None of comorbidities at presentation seemed to influence the risk of perforation and despite other results suggesting that perforation could be associated with male sex,¹¹ no sex predilection for perforation was observed.

In general the atypical presentation and the lowered physiological reserve in the elderly made diagnosis difficult with higher morbidity and mortality. The mortality rate following perforated appendicitis is observed between 2.3 – 10%¹ and can be as high as 16 times as what is observed in the young adult with appendicitis.¹²

In this study there was no mortality and the overall post-operative complications rate was 30% (3 patients) and 26% (10 patients) in the PA and NPA groups respectively, without a statistical significant difference (P=0.2488).

Recently Omari et al. reported a complication rate three times more frequent in the perforated as compared to the nonperforated group,¹ similarly Sirikurnpiboon et al. demonstrated a higher number of complications in the perforated appendicitis group,¹¹ consistently with other studies showing that complications were more frequent in the groups with perforation.⁹⁻¹³ In our experience, on the contrary, the complication rate was similar in both groups.

Hospital stay was 6.5 days and 5.4 days for PA and NPA, in line with previous studies showing a longer time to recovery in old people compared with younger age groups.¹⁴⁻¹⁵ Differently from other studies where the hospital stay was longer for patients with perforated appendicitis,^{1,11} no significant difference between the two groups were found in our cohort.

In this study the mean operative time was significantly shorter in NPA and this can be easily justified considering the technical difficulties related to complicated appendicitis.

In addition, comparative analysis of length of laparoscopic operation in PA and NPA did not show differences ($p= 1.1290$), while open approach had a shorter operative time in NPA, with a statistically significant difference ($p=0.003$).

The similar operative time of laparoscopy in both groups could be explained by our use of stapler to seal and divide the appendix which shortens the operative time in complicated cases. Moreover in case of peritoneal contamination laparoscopic approach could remove the intraperitoneal exudates more rapidly and easily, making this approach time saving mainly in complicated operation.

Many series in literature reported the advantages of laparoscopic approach in terms of decreased postoperative pain, wound infection, time for recovery of bowel movement and wider field of vision for surgery to facilitate additional diagnosis and treatment in cases of ambiguous diagnosis or other associated diseases.¹⁶⁻¹⁸

Concerning postoperative complications, the superiority of laparoscopy is still under debate. Some studies reported that laparoscopic appendectomy was associated with a higher incidence rate of postoperative intraperitoneal abscess compared to open surgery,¹⁹⁻²⁰ but according to other experiences, even in complicated appendicitis, no difference in abscess formation and small bowel obstruction between the two surgical approaches was found.²¹⁻²² Our results showed that the rate of total complications was similar in the both groups, even if in other studies the post-operative morbidity profile was clearly in favour of laparoscopy²³⁻²⁴ and especially the rate of postoperative wound infection was significantly lower in the laparoscopy group.²⁵

Moreover, differently from other results where laparoscopy was associated with a shorter hospital stay,²³⁻²⁶ in our study the length of hospital stay was similar in both groups, and that was thought to be related to the fact that, despite meeting the criteria for discharge, the elderly are usually discharged from hospitals after a complete recovery.

Conclusions

This study demonstrates that elderly patients affected by a perforated appendicitis, despite a longer mean operative time, do not experience a longer hospital stay or more post-operative complications compared to the nonperforated group. In addition, laparoscopy has not shown obvious advantages compared to open surgery, but nevertheless, with a similar operative time in both groups and a comparable profile of morbidity and mortality, if not contraindicated, has to be considered a preferential treatment for appendicitis in this age group.

A limitation of the present study can be identified in the retrospective design and in the small cohort of patients, with potential selection bias, but its results demonstrates that elderly population, despite representing a high risk group, can safely undergo surgery. The non operative management with antibiotics cannot be recommended routinely but, in selected patients potentially unfit for surgery with uncomplicated appendicitis, is a reasonable option in order to avoid the burden of morbidity related to operation. Nevertheless surgery remains the standard of care in all age groups.

List of abbreviations

PA: perforated appendicitis, NPA: nonperforated appendicitis

Declarations

Authors' contributions

Study conception and design: Avenia, Rondelli, De Rosa

Acquisition of data: De Rosa, Sanguinetti, Bugiantella, Polistena

Analysis and interpretation of data: De Rosa, Rondelli, Stella, Boni

Drafting of manuscript: De Rosa, Rondelli, Sanguinetti, Bugiantella, Polistena

Critical revision: Avenia, Ceccarelli, Balzarotti, Rondelli.

All the authors have read the manuscript and approved the submission to this journal.

Ethics approval and consent to participate

Given the retrospective observational nature of the project, the Local Ethics Committee stated that the study did not necessitate ethics approval. All patients, anyway, were asked to give written informed consent for use and publication of data.

Availability of data and materials

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors confirm that there are no known conflicts of interest associated with this publication.

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Tables

Table 1. Patients characteristics in the two groups

	PA group	NPA group	P value
Age (years) (range)	71.6 (65-84)	76.5 (63-96)	NS
Male/female ratio	3/7	22/16	NS
Operative time (min)	58 ±18.74	43.3 ±9.88	0.0013
Hospital stay (days)	6.5 ± 1.8	5.4 ±1.8	0.093
Laparoscopic/open	3/7	9/29	NS

Table 2. Pre-operative comorbidities in the two groups

	PA group (pts) (%)	NPA group (pts) (%)	P value
Hypertension	1	5	NS
Diabetes	0	1	NS
BPCO	1	3	NS
SLA	0	1	NS
Obesity	0	2	NS
Hepatitis C	0	1	NS
Atrial fibrillation	1	2	NS
CKD	0	1	NS
Metabolic syndrome	1	2	NS
CIHD	1	2	NS
Osteoporosis	0	1	NS
Overall comorbidities	5 (50%)	21 (55.2%)	1

Table 3. Complications after surgery in the two groups

	PA group (pts) (%)	NPA group (pts) (%)	P value
Pneumonia	3	4	0.1469
Ileus	0	1	1
AKI	0	2	1
Cardiac arrhythmia	0	2	1
Wound infection	0	1	1
Overall complications	3 (30%)	10 (26%)	P=0.2488