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Original research

Incidental appendectomy? Microscopy tells another story: A retrospective cohort study in patients presenting acute right lower quadrant abdominal pain

Dario Tartaglia, Andrea Bertolucci*, Christian Galatioto, Matteo Palmeri, Gregorio Di franco, Rita Fantacci, Niccolò Furbetta, Massimo Chiarugi

Emergency Surgery Unit, University of Pisa, Pisa, Italy

HIGHLIGHTS

- Only 24% of macroscopically normal appendices during laparoscopy for acute lower abdominal pain are histologically normal.
- The majority of normal-looking appendices showed a catarrhal inflammation without serosa involvement at histology.
- A 2% of the innocent appendices showed a neuroendocrine tumor leading the patients to receive further treatments.
- Appendectomy should be performed in all diagnostic laparoscopies for acute lower abdominal pain showing a normal appendix.

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ABSTRACT

Background: Optimal management of macroscopically normal appendix encountered during laparoscopy for acute abdominal pain is still unclear.

Methods: 164 acute abdominal pain cases in which laparoscopy showed a normal appendix were reviewed. No other intra-peritoneal acute disease was present in 50 patients (Group 1) whereas a miscellanea of intra-peritoneal conditions was identified in the other 114 (Group 2). All the patients underwent appendectomy with specimen examination.

Results: Following incidental appendectomy significant microscopical changes were seen in 125 specimens (76%). Among these, inflammation was found in 122 and neuroendocrine tumors in 3. Appendices harbored pathological changes in n = 45 patients (90%) of Group 1 and in n = 34 patients (70%) of Group 2 patients ($p < 0.05$). Morbidity for incidental appendectomy was 2%.

Conclusion: This study supports an appendectomy in patients who are undergoing laparoscopy for acute right lower quadrant abdominal pain even when the appendix appears normal on visual inspection.

1. Introduction

Laparoscopic appendectomy (LA) is one of the most commonly performed acute abdominal surgical operations [1]. Up to 40% of appendices identified during surgery, however, appear macroscopically normal [2,3]. To date, no agreement has been reached as to whether a macroscopically normal appendix found at laparoscopy for acute right lower quadrant abdominal (RLQA) pain should be removed or left in situ.

A negative appendectomy is not completely risk-free as significant morbidity rates and extended hospital stays have been reported [4,5]. On the other hand, according to the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), the removal of a normal appendix, after exclusion of other significant diseases, should be considered although in individual clinical scenarios. This choice is based on the observation that a macroscopically normal appendix may harbor abnormal histopathology [6]. Thus, surgery in these cases is addressed against endo-appendicitis rather than appendicitis and it may prevent recurrence of symptoms once the appendix has been left in situ [7–9].

The aim of this study was to analyze the microscopical changes observed in a series of apparently normal appendices removed

* Corresponding author. Emergency Surgery Unit, University of Pisa, New Santa Chiara Hospital, Via Paradisa 2, 56124 Pisa, Italy.
E-mail address: andreabertolucci83@hotmail.com (A. Bertolucci).

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during laparoscopic surgery for acute RLQA pain.

2. Patients and methods

A database containing the charts of 1388 patients who underwent laparoscopic appendectomy for acute RLQA pain during the period 2004–2014 was searched. One-hundred-sixty-four patients (20 males and 144 females; median age of 23.4 yrs, range: 4–52) with a macroscopically normal appendix at surgery were identified (Table 1). The appendix was defined as macroscopically normal in absence of hyperemia/necrosis, wall thickness, parietal fibrin deposit and/or peri-appendicular peritoneal fluid effusion. We divided these patients into two groups: Group 1 included 50 patients (30%) who did not present any simultaneous intra-peritoneal disease at laparoscopy; Group 2 comprised 114 patients (70%), in whom digestive tract or gynecological (55%) conditions that could have explained the acute symptoms were identified.

As the policy of our institution was to remove a normal-looking appendix whether or not any other abdominal pathology was present, incidental appendectomy was always performed. Senior surgeons assisted surgery and evaluated the recorded procedures on the screen in order to confirm the "normality" of the appendix. Laparoscopic surgery was performed with patient supine in the Trendelenburg position and 10°–15° left rotation of the table. After induction of the pneumoperitoneum with an intra-abdominal pressure ranging from 10 to 14 mmHg 3 trocars were inserted. Following laparoscopic exploration of the cavity, the mesoappendix was dissected and blood vessels were secured and divided between clips, bipolar coagulation or staplers. The appendix stump was either stapled or closed with a loop. The specimen was placed in a plastic bag and removed via the umbilical port. The abdominal cavity was then irrigated with saline solution.

Appendectomy specimens were prepared and immediately fixed in formalin before transport to the pathology laboratory. Here specimens were sectioned at the tip, the body, and the base and examined by a senior pathologist. Four classes of appendicitis were identified: 1) catarrhal, with the presence of focal mucosa inflammation, 2) phlegmonous, with polymorphonuclear infiltration of the entire appendicular wall without evidence of necrosis, 3) gangrenous with the same characteristics as the former but with necrosis, 4) scleroatrophic with occasional findings of granulation tissue and fibrosis associated with acute and chronic inflammation. The appendix was defined normal when no evidence of phlogosis was found.

The main outcome measure of the study was the prevalence of pathological changes in normal-looking appendices. Secondary outcome measures included length of the procedure, postoperative hospital stay and morbidity. This latter parameter was classified according to the Clavien-Dindo Classification [10]. The paper has been worded in line with the STROBE Statement [11]. Data collection and analysis were performed according to the institutional guidelines and to the ethical standards of the Helsinki Declaration.

Table 1
Patients' general and operative data.

Total patients	164	
F:M (N, %)	144 (88%): 20 (12%)	
Median age (range)	23.8 (4–52)	
Etiopathology (N, %)	No pathologies	50 (30%)
	Digestive causes	24 (15%)
	Gynecological causese	90 (55%)
Operative time (min)	49.24 (20–140)	
Average length stay (days)	1.76 (1–5)	
Morbidity (N, %)	3 (2%)	
Mortality	0	

Statistical analysis was performed with SPSS software vers. 17 (SPSS, Chicago, Illinois, USA). Comparisons between groups were made using Student's t-test and Fisher's exact test accordingly. Differences were defined statistically significant when p value was <0.05.

3. Results

Only 24% (n = 39) of the normal-appearing removed appendices were confirmed to be normal after microscope examination. In the other 125 specimens the pathologist reported catarrhal appendicitis in 109 (66%), phlegmonous appendicitis in 8 (5%), scleroatrophic changes in 5 (3%) and neuroendocrine tumors in 3 (2%) (Table 2). The majority of the catarrhal appendices were characterized by mild or intermediate focal serositis. All the phlegmonous appendices presented intra-parietal phlogosis with leukocyte infiltration of the mucosa and submucosa but not extending to the serosa.

In group 2 patients, the appendix appeared normal but other conditions affecting the digestive tract (n = 24, 15%) or the female reproductive system (n = 90, 55%) were detected and managed. Comparison between group 1 and group 2 showed significant differences in the number of normal appendices (5 in Group 1 *vs* 34 in Group 2, $p < 0.05$) and the number of those with of catarrhal appendicitis (40 of Group 1 *vs* 69 of Group 2, $p < 0.05$). No significant differences were found for the other histological items. (Table 3).

The mean operative time was 49 min (range 20–140) with no need to convert to open surgery. There were 3 recorded postoperative complications (2%): two patients presented hyperpyrexia resolved with antibiotic therapy (Grade I Clavien-Dindo Classification) and the last had a transient cutaneous rash due to adverse drug reaction (Grade II Clavien-Dindo Classification). The average hospital stay was 1.76 days (range 1–5 days) (Table 1).

4. Discussion

Thanks to the image clarity and magnification provided by laparoscopy, there is an increasing trend, in patients with RLQA pain, to identify a normal looking appendix. In the open appendectomy era, a normal-looking appendix was almost always removed, even if the cause of the pain was located elsewhere in the abdominal cavity.

In a recent international survey by Jaunoo et al. among members of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), the French Society for Endoscopic Surgery (SFCE), and the Italian Society for Endoscopic Surgery (SICE), 64% to 73% of surgeons affirmed that they would remove a macroscopically normal appendix in patients with right iliac fossa pain. It is believed that the advantages include early diagnosis of neoplasms, removal of endoluminal appendicitis, avoidance of misdiagnosis in acute abdomen patients, and the prevention of acute appendicitis in later life [12].

Phillips et al. argue that the removal of macroscopically normal appendices in patients undergoing laparoscopy for right iliac fossa

Table 2
Histopathology results.

Histological diagnosis	Number (%)
Catarrhal appendix	109 (66%)
Phlegmonous appendix	8 (5%)
Scleroatrofic appendix	5 (3%)
Neuroendocrine tumor	3 (2%)
Normal appendix	39 (24%)