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Appendicular pseudodiverticula and acute appendicitis. Our 12-year experience

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ABSTRACT

Introduction: the presence of diverticula and their complications in the cecal appendix is an uncommon disease. We present a series of 13 patients with this condition, and perform a review of the literature.

Patients and method: we carried out a retrospective study of patients undergoing appendectomy for acute appendicitis in the last twelve years in our department. The pathological examination of these episodes revealed 13 cases with a diagnosis of diverticular disease, all of them consisting of pseudodiverticula. Their clinical manifestations, laboratory results, imaging tests, and histology were analyzed, and findings were compared to those in the previous literature.

Results: the incidence of diverticular disease in our setting was 13 cases (0.8%) among 1,634 appendectomies for acute appendicitis. Diverticulitis was found in 8 patients (61.5%), and diverticulosis (38.5%) in 5. Appendicular perforation was more common in patients with diverticular disease (53.8%) as compared to those without this condition (31.1%).

Conclusions: complicated diverticular disease in the vermiform appendix of adult patients may result in insidious, recurrent manifestations that may confound preoperative diagnosis. A higher risk for appendicular perforation renders appendectomy the therapy of choice, even prophylactically when the condition is incidentally identified preoperatively.

Key words: Appendicular diverticulosis. Appendicular diverticulitis. Acute appendicitis.

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INTRODUCTION

The finding of diverticula in the cecal appendix represents an uncommon condition (0.004-2.1%) that was first described in 1893 by Kelynack (1-3). Diverticula are more common in the colon, with a decreasing incidence from sigma (90%), to descending colon (45%), to transverse colon (15%), to ascending colon (10%), to cecum (5%), to rectum (0.5%) (4,5).

The classification of diverticula into true and false (or pseudodiverticula) types is based on histological criteria pointing to their congenital or acquired origin, respectively.

A diagnosis is rarely reached preoperatively in the absence of a high index of suspicion and corroborative imaging tests (ultrasounds, computerized axial tomography). Therefore, these patients are usually diagnosed with and treated for acute appendicitis. However, despite similarities, both conditions have subtle differentiating characteristics. A definitive diagnosis is established following a pathological examination of surgical specimens, with four morphological types according to the classification by Lip-ton et al. (5,6).

The singularity of this condition, present in the literature as isolated case reports, led us to present 13 cases of pseudodiverticula emerged from twelve years of practice in our department, to compare their clinical, laboratory, and pathological characteristics with findings in the previous literature, and to provide a review of this disease.

PATIENTS AND METHODS

We performed a retrospective study of appendectomies for acute appendicitis in our department. From January 1, 1998 to June 30, 2010, 1634 patients were operated upon for acute appendicitis, 13 of whom had appendicular pseudodiverticula.

A review of medical records provides the following data: age, sex, clinical manifestations, diagnostic tests (lab and imaging tests), surgical technique, and pathological examination.

The statistical study was performed using the SPSS for Windows software, version 14.0. Quantitative variables were reported as mean (median for non-Gaussian variables) and range, whereas discrete variables were reported as number of cases and percentage. A comparison of discrete variables was performed using the chi-squared method, and Student's t-test was used for mean differences. *p*-values < 0.05 were considered statistically significant.

RESULTS

The sample of 13 patients included in the study was selected based on a histological diagnosis of appendicular diverticular disease for 12 cases, and intraoperatively for 1 case (Fig. 1), from a total of 1,634 individuals undergoing appendectomy for acute appendicitis in the last twelve years in our department.

The incidence of cases with appendicular diverticula was 13 (0.8%). Regarding sex, they were more prevalent in males –9 (69.2%)– than in females –4 (30.8%)– and mean age was 49.8 years (range 19-87 years). Appendicitis has an overall distribution that is similar for both sexes –males, 987 (60.9%) and females, 634 (39.1%), with a significantly younger mean age of 25.6 (range 3-99).

Morphological types as suggested by Lipton et al. (5) allow a classification of appendicular diverticula in our study as follows (Table I):

- Type II: acute appendicitis and acute diverticulitis. We found a frequency of 8 cases (61.54%), 6 (75%) of which were perforated.
- Type III: acute appendicitis and non-complicated appendicular diverticula. Frequency was 5 (38.5%) cases, 1 (20%) of which was perforated.

Overall, the frequency of perforation among patients with diverticular disease and acute appendicitis was 7 (53.8%), almost twice as high as in patients with appendicular inflammation alone [505 (31.1%)], with results reaching statistical significance.

DISCUSSION

Appendicular pseudodiverticula, even considering the rarity of diverticular disease in the appendix (mean incidence of 1%), are the most common presentation form. Their incidence is estimated as 0.77% in appendectomy specimens, and 0.66% in necropsy specimens, *versus* true diverticula, which only develop in 0.014% of surgical specimens and represent 1 to 6.6% of appendicular diverticulosis (5-7,8).

False diverticula, pseudodiverticula or acquired diverticula seem to result from increased pressure on low-resis-

Fig. 1. Cecal appendix with pseudodiverticula (black arrows).

tance spots in the appendicular wall, including vascular hiatuses and inflamed areas, from a combination of luminal obstruction –appendicular diverticula have been reported as concomitant with carcinoids, cystadenomas and mucocoeles– and active muscle contraction. Therefore, these diverticula result from pulsion and include only mucosa (1,5,7).

In our case series we only report pseudodiverticula, with an incidence of 13 (0.8%), which is similar to that in the literature.

True or congenital diverticula (fewer than 50 cases in the whole literature) result –according to the most widely accepted theory– from abnormal bowel repermeabilization during the intestine's solid phase. They have been on occa-

Table I. Clinical and epidemiological characteristics of appendicular diverticula

Types according to Lipton et al.	Age (years) Gender	Imaging technique	Perforation
Type II (Appendicitis + diverticulitis)			
	60/F*	Ultrasounds	Yes
	52/M**	Ultrasounds	Yes
	41/F	Ultrasounds	Yes
	55/M	No	Yes
	27/M	No	Yes
	52/M	No	Yes
	31/F	Ultrasounds	No
	59/M	No	No
Type III (Appendicitis + diverticulosis)			
	62/M	CT***	No
	58/M	No	No
	19/M	No	No
	87/F	No	Yes
	45/M	No	No

*F: female. **M: male; ***CT: computerized tomography.

sion associated with trisomy D 13-15 or pancreatic cystic fibrosis (1,5,7,9).

Diverticula may be single or multiple, most commonly occur within the distal third of the appendix (60%), on its mesenteric side (60%), and their size is usually smaller than 0.5 cm (5,10,11).

Lipton et al. classified appendicular diverticulosis into four morphological types (5,6,9-12):

- Type 1: acute diverticulitis in a non-inflamed appendix.
- Type 2: diverticulitis and acute appendicitis.
- Type 3: non-complicated diverticulum and acute appendicitis.
- Type 4: non-complicated diverticulum and normal appendix.

They also added various subtypes according to the presence or absence of appendicular perforation.

Appendicular diverticulosis is usually asymptomatic. Most common complications such as perforation and inflammation cause abdominal pain that mimics acute appendicitis. Insidious, intermittent, prolonged pain usually in the absence of nausea, vomiting or anorexia, and more common in males in their forties, are characteristics considered to be differential from acute appendicitis by some authors (1,5-7,8,13).

In our department, as in the literature, the condition was more prevalent in males (9, 69.2%) with a mean age of 49.8 years at presentation. In all cases patients sought help for abdominal pain lasting from 12 hours to 10 days. Data such as presence of low fever and mild leukocytosis were common, not so gastrointestinal symptoms such as nausea and vomiting.

Appendicular perforation in the presence of diverticulitis is four times as common as in its absence (66% of cases), with patient mortality increasing by 30% as compared to simple acute appendicitis (1,2,6,7,9-15). In our case, in the presence of appendicular diverticulitis the percentage of perforations was approximately twice as high as in its absence, with one case of perforation with diverticulosis—a finding less common in the literature (< 10% of cases) (10).

Other complications of appendicular diverticulosis, including diverticular mouth edema, acute bleeding from appendicular artery rupture, appendicular pseudomyxoma, and periappendicular fibrosis are reported less frequently (7).

The diagnosis is usually incidental following the pathological study of the surgical specimen, and proportional to the pathologist's efforts in its search. They have also been described as incidental radiographic findings (barium enema, ultrasounds, computerized tomography) and as findings during laparotomy (1,3,5,7,8,10-12,14,16-21). In our series preoperative imaging techniques did not contribute to definitive diagnoses. A diagnosis was mostly arrived at by histology, except for an intraoperative case.

The management of complicated diverticular disease does not differ from that for acute appendicitis, namely

appendectomy. Prophylactic appendectomy is recommended for asymptomatic cases incidentally diagnosed either radiographically or during laparotomy (1,4,5,7,9,10,12,14,22) given the higher risk of appendicular perforation and mortality associated with this condition's complicated form.

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