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Appendiceal Diverticulitis and Epithelialization of the Serosal Surface

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Abstract. The appendix is a very common specimen in any pathology department because its disorders especially the benign ones are relatively common. Appendiceal diverticulitis can present acutely with a clinical picture resembling that of an acute appendicitis. This report is of two cases which were admitted to our hospital's Emergency Department with acute abdominal pain and in which reactive epithelium covering the appendiceal outer serosal surface was noticed on microscopic examination. This curious phenomenon might have been seen before by surgical pathologists, but it has not been reported so far.

Keywords: Appendix, Diverticula, Congenital, Acquired, Reactive epithelium.

Introduction

Although the vermiform appendix in humans is considered to be a rudimentary structure with no obvious function, its disorders are common, especially acute appendicitis. The clinical presentation and histological features of these disorders are well known to the practicing surgical pathologists. However, there are uncommon disorders that can

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affect the appendix, such as appendiceal mucoceles and diverticula. Appendiceal diverticula are usually of the acquired type, *i.e.* they lack the muscularis propria layer in their walls and are thought to arise from increased intra-luminal pressure with mucosal out-pouching through a weak spot in its wall. These weak spots are presumably sites of vascular penetration as seen in the remainder of the large bowel as there is no described preferential site in the wall for their development. Nearly 60% of the diverticula are located in the distal third of the appendix[1]. Appendiceal diverticula can have multiple etiologies[2]. However, the patients that are most likely to have appendiceal diverticulitis are those with cystic fibrosis. The total incidence of appendiceal diverticulosis in cystic fibrosis patients from autopsy data is 14%. For cystic fibrosis patients with abdominal surgery excluding laparotomy for meconium ileus, the incidence rises to 43%[3]. The diverticula are usually multiple and can be detected radiologically. The clinical presentation of acute appendiceal diverticulitis is indistinguishable from that of an acute appendicitis, but it can be suspected on gross examination and is confirmed histologically[4-6]. Not surprisingly, the perforation rate is higher than those resulting from acute appendicitis due to the absence of confining muscularis propria, and the close approximation of the subserosal peridiverticular inflammation to the peritoneum and the mesoappendix[7-9]. The appendiceal diverticulosis has also other different clinical presentations[10-14].

This report is of a peculiar histological phenomenon which is the presence of reactive epithelium on the appendiceal serosal surface that has been noticed in patients with appendiceal diverticulitis. To our knowledge this phenomenon has not been previously reported.

Report of Cases

The first patient is a 69-years-old gentleman who was admitted to the Mount Sinai Hospital's Emergency Department with clinical picture of acute appendicitis. Abdominal CT scan was performed and showed acute inflammatory changes in the right lower quadrant consistent with acute appendicitis with possible perforation. It also showed extensive diverticulosis involving the sigmoid colon with no evidence of inflammation. He underwent an appendectomy and the operation was uncomplicated.

Gross examination of the submitted appendix showed a congested mesoappendix with the presence of yellowish fibrinous exudate on its serosal surface. Serial sectioning revealed the presence of multiple diverticula. The appendiceal lumen was patent and not dilated. A rupture site was not identified grossly. Microscopic examination revealed the acquired nature of the diverticula as their wall lack the muscularis propria (Fig. 1a & 1b). The wall of the appendix and diverticula were both markedly infiltrated with a mixture of acute and chronic inflammatory cells.

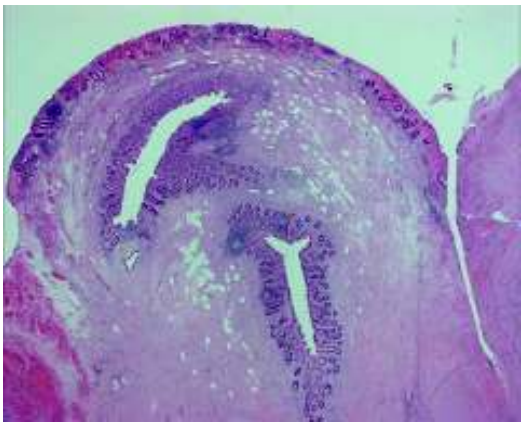

Fig. 1(a). This microscopic picture of a cross section of one of the appendiceal diverticula illustrates its acquired nature as it lacks muscularis propria in its wall (H&E stain).

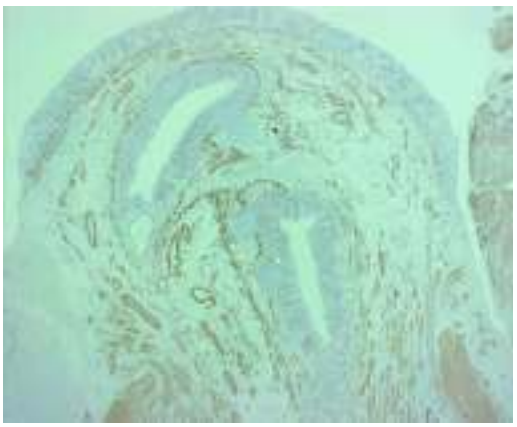

Fig. 1(b). The above picture of smooth muscle antigen "SMA" immunostain confirms the lack of the muscularis propria in the wall of the diverticulum.

There was focal epithelial hyperplasia of the mucosa, but there was no evidence of dysplastic or neoplastic epithelial changes. Reactive but non-dysplastic epithelium was present on the serosal surface of one of the diverticula (Fig. 1c).

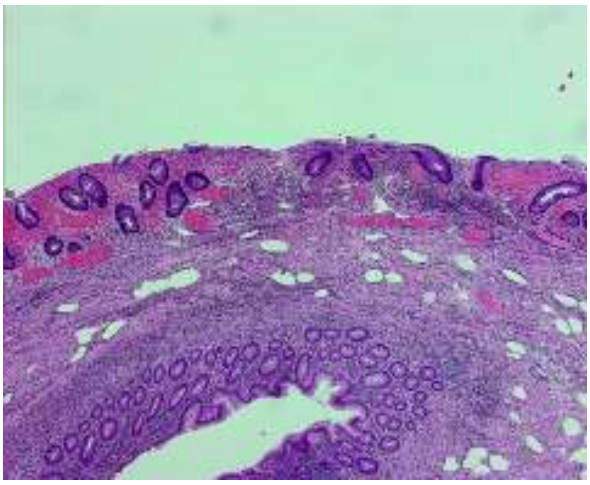

Fig. 1(c). Microscopic picture is showing the presence of reactive epithelium covering the serosal surface of the diverticulum (H&E stain).

The second patient is a 74-years-old gentleman who also was admitted to the Mount Sinai Hospital's Emergency Department with acute lower right abdominal pain consistent clinically with acute appendicitis. An abdominal CT scan was performed and showed nodular thickening of the base of the cecum with involvement of the terminal ileum and the presence of few small Ileocolic lymph nodes. The radiological appearance was concerning for cecal cancer. There was a small locule of intraperitoneal free air suggesting a perforation of the cecal mass. The appendix was dilated which was believed to be secondary to the cecal process rather than appendicitis. The patient was admitted and started on broad spectrum intravenous antibiotics to settle the lesion before deciding on the surgical approach. Over the next 48 hrs the patient developed symptoms of small bowel obstruction and the abdominal CT scan was repeated. It showed an increase in the right lower quadrant inflammation with the presence of periappendiceal as well as intraperitoneal fluid collection. There were also changes in this study which were highly suggestive of a perforated appendicitis with no abnormal cecal enhancement. Multiple dilated small bowel loops were

observed which gradually tapered in the distal terminal ileum. This picture is consistent with ileus. The periappendiceal collection was felt to be difficult to drain percutaneously. However, due to the previous suspicion of a cecal tumor**,** it was decided to carry-out right hemicolectomy. The operation was uncomplicated.

Gross examination of the submitted specimen showed marked congestion of the appendiceal serosa which was almost completely covered by tan-grey exudates only with no mucin. There were two defects in the wall of the appendix; one near its base and the other was located more distally. An abscess cavity measuring 1.0 × 0.5 × 0.3 cm was seen at the base of the appendix. This abscess cavity communicated with the proximal wall defect. The appendiceal lumen was not dilated and was devoid of contents. An apparent 0.8 cm long diverticulum was also seen at the tip of the appendix. The rest of the appendiceal wall was thickened and congested. The serosal surface of the adjacent terminal ileum and cecum was congested as well, and was covered by plaques of exudate. The colonic wall contained few diverticula and two small sessile polyps; the largest measured 1.5 cm in maximum diameter. Both of these polyps were located in the middle portion of the ascending colon far away from the appendiceal origin. No cecal masses were identified. Microscopic examination showed the presence of necrosis and neutrophilic collection at the site of the appendiceal base abscess cavity. The wall of the appendix and the appendiceal diverticulum was markedly infiltrated by acute inflammatory cells (Fig. 2a). The appendiceal diverticulum had no muscularis propria in its wall, and therefore it is also classified as an acquired diverticulum. The tip of the diverticulum was ruptured and its epithelial lining extended to cover the appendiceal serosal surface (Fig. 2b & 2c). A fibrinous exudate was seen on the serosal surface of the terminal ileum and the cecum. The appendiceal mucosa was focally ulcerated but had no evidence of hyperplasia, dysplasia or neoplasia in the remaining epithelium. The two cecal polyps turned out to be tubular adenomas.

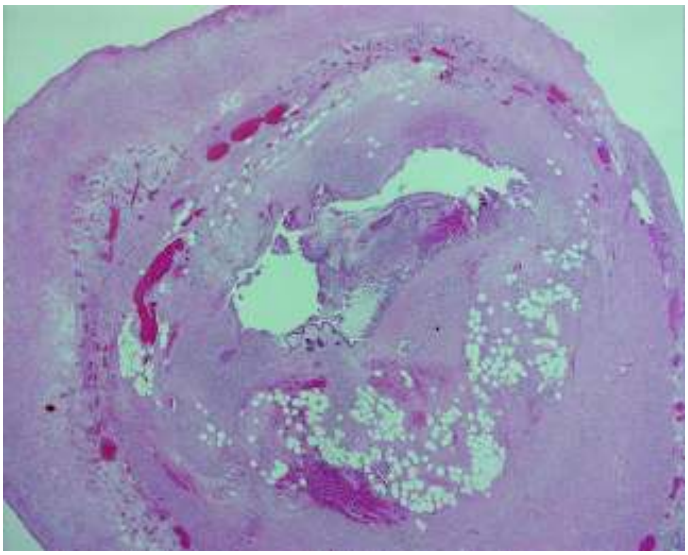

Fig. 2(a). This low-power microscopic view of a cross section of the appendix reveals the presence of erosion of the lining epithelium, and infiltration of the wall by inflammatory cells (H&E stain).

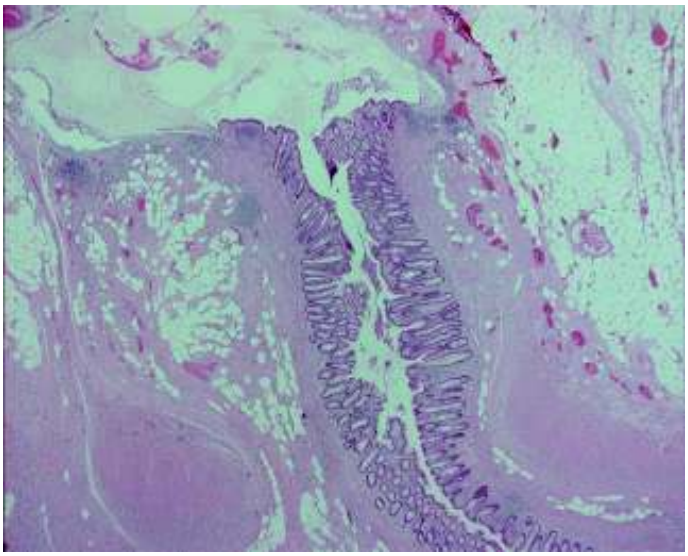

Fig. 2(b). This low-power microscopic picture of a longitudinal section of the appendiceal diverticulum reveals the lack of muscularis propria in its wall. It also reveals the site of rupture at its tip with partial serosal epithelialization (H&E stain).

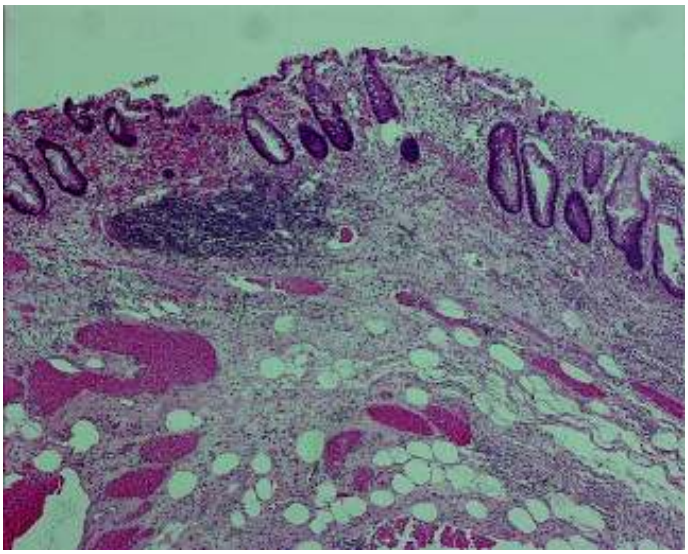

Fig. 2(c). This high-power microscopic picture shows the reactive epithelium covering the appendiceal diverticulum serosal surface (H&E stain).

Discussion

Both of our patients were of older age group and presented acutely with the clinical picture of acute appendicitis. Examination of their appendices revealed the presence of acquired diverticular disease in both of the cases. There was an acute inflammatory infiltrate involving the wall of the appendices as well as the diverticula. The lining mucosal epithelium of the appendix of the first case showed focal epithelial hyperplasia, but there was no evidence of dysplasia or neoplasia in either of the cases. There was an apparent rupture of the inflamed diverticula with extension of the reactive lining epithelium through the rupture site to cover the appendiceal serosal surface.

The presence of reactive epithelium covering the serosal surface of the appendix is a phenomenon that can be seen following rupture of an inflamed appendix or appendiceal diverticulum as part of the process of restitution and healing following the perforation**.** Therefore, it would be expected to be seen mainly in patients that are not operated upon immediately as seen in our two patients. The first patient presented to the Emergency Department with history of abdominal pain for more than 30 hrs, and the second patient was operated upon after 48 hrs of his presentation to the hospital. The appendiceal diverticula in both cases

were identified grossly. Microscopically, the wall of the diverticula was inflamed but not necrotic, and although they lack muscularis propria they have epithelial lining in their mucosa. Therefore, they were diagnosed as diverticulitis rather than transmural inflammation and perforation in regular appendicitis. Although the second patient's CT scan showed dilatation of the appendix, the gross examination did not reveal the presence of mucous within the lumen or the surface of the appendix. There is no evidence of mucocele in the first patient as well. Even if mucocele was present in either of the patients, the absence of a neoplastic process excludes the possibility of developing pseudomyxoma peritonei in the future and these patients are expected to have an excellent prognosis after surgery. If mucin is present in small amount, lacks epithelial cells, and is related to a non-neoplastic process (*i.e.* benign mucocele), then these features represent simple extravasation of mucin which will resolve spontaneously, as in the case of any benign appendiceal perforation that is treated conservatively[15].

References:

[1] **COLLINS DC.** Diverticula of the vermiform appendix: a study based on thirty cases. *Ann Surg* 1936; **104**(6): 1001-1012.

[2] **Medlicott SAC, Urbansi SJ.** Acquired diverticulosis of the vermiform appendix: a disease of multiple etiologies. *Int J Surg Pathol* 1998; **6**(1): 23-27.

[3] **George D.** Diverticulosis of the vermiform appendix in patients with cystic fibrosis. *Hum Pathol* 1987; **18**(1): 75-79.

[4] **Deschenes L, Couture J, Garneau R.** Diverticulitis of the appendix. Report of sixty-one cases. *Am J Surg* 1971; **121**(6): 706-709.

[5] **Lin CH, Chen TC.** Diverticulosis of the appendix with diverticulitis: case report. *Chang Gung Med J* 2000; **23**(11): 711-5.

[6] **Rabinovitch J.** Diverticulosis and diverticulitis of the vermiform appendix. *Ann Surg* 1962; **155**(3): 434-440.

[7] **Franke J, Tons C, Tietze L, Schumpelick V.** Perforated diverticulum of the vermiform appendix. *Chirurg* 1998; **69**(5): 574-576.

[8] **Lipton S, Estrin J, Glasser I.** Diverticular disease of the appendix. *Surg Gynecol Obstet* 1989; **168**(1): 13-16.

[9] **Wetzig NR.** Diverticulosis of the vermiform appendix. *Med J Aust* 1986; **145**(9): 464-465.

[10] **Barc RM, Rousset J, Maignien B, Lu M, Prime-Guitton CH, Garcia JF.** Diverticula of the appendix and their complications: value of sonography (review of 21 cases). *J Radiol* 2005; **86**(3): 299-309.

[11] **Majeski J.** Diverticulum of the vermiform appendix is associated with chronic abdominal pain. *Am J Surg* 2003; **186**(2): 129-131.

[12] **Simpson J, Lobo DN, Spiller RC, Scholefield JH.** Diverticular abscess of the appendix: report of a case and review of the literature. *Dis Colon Rectum* 2003; **46**(6): 832-834.

[13] **Steel MC, Jones IT, Webb D.** Appendicovesical fistula arising from appendiceal diverticulum suspected on barium enema. *ANZ J Surg* 2001; **71**(12): 769-770.

[14] **Thomsen JB, al-Suliman N, Kag L, Lindebjerg J.** Primary adenocarcinoma in appendiceal diverticulitis. *Ugeskr Laeger* 2000; **162**(21): 3051-302.

[15] **Carr NJ, Sobin LH.** Unusual tumors of the appendix and pseudomyxoma peritonei. *Semin Diagn Pathol* 1996; **13**(4): 314-325.

التهاب جيوب الزائدة الدودية والتغيرات التي تحدث في غشائها الخارجي

رنا يعقوب بخاري و روبرت ريدل[1]

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المستخلص . تعتبر الزائدة الدودية من العينات الشائعة جدا في أي مختبر أنسجة تشريحي، وذلك لأن الأمراض التي تصيبها وخصوصا الحميدة منها شائعة نسبيا. ومن الممكن أن تظهر أعراض التهاب جيوب الزائدة الدودية بشكل حاد مع صورة سريرية تشبه التهاب الزائدة الدودية الحاد. وفي هذا المقال الطبي نناقش حالتين أتت لقسم الطوارئ في المستشفى لدينا ولاحظنا عند الفحص المجهري لعيناتهما رد الفعل في النسيج الذي يغطي الطبقة الخارجية للزائدة الدودية. ربما تكون هذه الظاهرة الغريبة قد لوحظت من قبل بواسطة أطباء علم الأمراض، ولكنها لم توثق في المنشورات الطبية حتى الآن.