

## Incidentally diagnosed appendix diverticulosis after appendectomy

### *Appendektomi sonrası insidental olarak saptanan apendiks divertikülü*

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#### Abstract

Appendix diverticulitis was first described by Kelyneck in 1893. Appendix diverticulosis is a rare clinical manifestation of the appendix with a changing rate of 0.004 to 2.1% of all appendectomies. Generally diagnosed in males, and the mean age is 38. Appendix diverticulosis may be inflamed and result in appendix diverticulitis or can be incidentally diagnosed by acute appendicitis. Clinical presentation of appendix diverticulitis may be similar to acute appendicitis but clinical signs may occur slowly and mildly.

The thirty-five-year-old male patient was admitted to the emergency department with right lower quadrant pain. The patient has abdominal tenderness, rebound, and defense reactions with other intraabdominal infections signs. Abdominal ultrasonography was performed and appendix diameter was measured enlarged, and inflammation signs were observed in the surrounding tissue in favor of acute appendicitis. A laparoscopic appendectomy was performed. During the operation, three small herniated tissue was observed on the anti-mesenteric surface of the appendix. Acute phlegmonous appendicitis and appendix diverticulosis diagnosis were confirmed with the histopathological examination.

Appendix diverticulosis may occur either acquired or congenital. The congenital diverticulosis is generally located on the anti-mesenteric edge and contains all layers of the appendix wall. Diagnosed appendix diverticulosis is acquired type predominantly. Appendix diverticulosis is diagnosed more commonly in patient who has cystic fibrosis or Hirschsprung disease. However, no relationship between colon diverticular disease and appendix diverticula has been found. There is a high risk of appendiceal neoplasms such as carcinoid tumors and mucinous adenomas. The gold standard to diagnose appendix diverticula is histopathological examination. The treatment of the appendix diverticula is appendectomy in case of diagnosis.

**Keywords:** Appendix diverticulosis, diverticular disease, laparoscopic appendectomy.

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#### Öz

Apendiks divertikülitisi ilk olarak 1893'te Kelyneck tarafından tanımlanmıştır. Sıklığı tüm appendektomilerin %0,004 ile 2,1 i arasında değişen nadir bir klinik tablodur. Genellikle erkeklerde teşhis edilir ve ortalama yaş 38'dir. Apendiks divertikülü inflamasyona sekonder apendiks divertikülitisi ile sonuçlanabilir veya tesadüfen akut apandisit ile teşhis edilebilir. Apendiks divertikülitinin klinik prezentasyonu akut apandisit benzerdir, ancak klinik bulgular daha yavaş ve hafif bir şekilde ortaya çıkar.

Otuz beş yaşında erkek hasta, sağ alt kadranda ağrısı şikayetleri ile acil servise başvurması sonucu değerlendirildi. Yapılan fizik muayenede diğer karın içi enfeksiyon bulguları ile birlikte batın sağ alt kadranda hassasiyet, defans ve rebound bulguları olduğu görüldü. Yapılan abdominal ultrasonografide apendiks lümen çapının arttığı, duvarı kalınlığı artmış ve çevre dokuda inflamasyon bulgularının olduğu görüldü ve akut apandisit lehine değerlendirildi. Laparoskopik apendektomi uygulandı. Ameliyat sırasında apendiks anti-mezenterik yüzeyinde üç adet küçük divertikül yapısı olduğu görüldü. Histopatolojik değerlendirme sonucu akut flegmonöz apandisit ve apendiks divertiküler hastalığı olarak raporlandı.

Apendiks divertikülü, konjenital veya edinsel olabilir. Konjenital divertiküller genellikle apendiks duvarının anti-mezenterik kenarında yerleşimlidir ve lümenin tüm katlarını içerir. Teşhis edilen apendiks divertikülleri ağırlıklı olarak edinsel tiptedir. Apendiks divertikülü, kistik fibroz veya Hirschsprung hastalığı olanlarda daha sık görülmektedir. Ancak apendiks divertikülü ile kolonun divertiküler hastalığı arasında bir ilişki bulunmamıştır. Apendiks divertikülü olgularında karsinoid tümörler ve müsinöz adenomlar gibi apendiks neoplazmaları riski yüksektir. Tanıda altın standart histopatolojik incelemedir. Apendiks divertiküllerinin tespit edilmesi halinde ise tedavisi apendektomidir.

**Anahtar kelimeler:** Apendiks divertikülü, divertiküler hastalık, laparoskopik apendektomi.

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## Introduction

Acute appendicitis is the most common cause of acute abdomen. Gokce and Aren [1] stated that the diverticular disease of the appendix is a rare clinical condition. Chia et al. [2] reported that the appendix diverticulitis was first described by Kelynack in 1893. Sohn et al. [3] stated that that appendix diverticulosis is a rare manifestation, and it was only reported as case reports or case series in the literature. According to those clinical trials, the frequency of this disease changes between 0.004% and 2.1 among all appendectomies. Frade et al. [4] described the clinical signs of appendix diverticulitis generally mimic acute appendicitis but it has indolent progress than acute appendicitis. John et al. [5] found that the etiology of the disease is not clear but, it can occur as congenital or acquired. The appendicular diverticular disease remains asymptomatic unless inflammation presents, thus it can be only diagnosed if acute appendicitis clinic or appendicular diverticulitis occurs. Gokce and Aren [1], Chia et al. [2] stated that it is not possible to diagnose appendicular diverticulosis radiologically generally, histopathological examination is required most commonly. We aimed to present a diverticular disease of the appendix secondary to an acute appendicitis clinic.

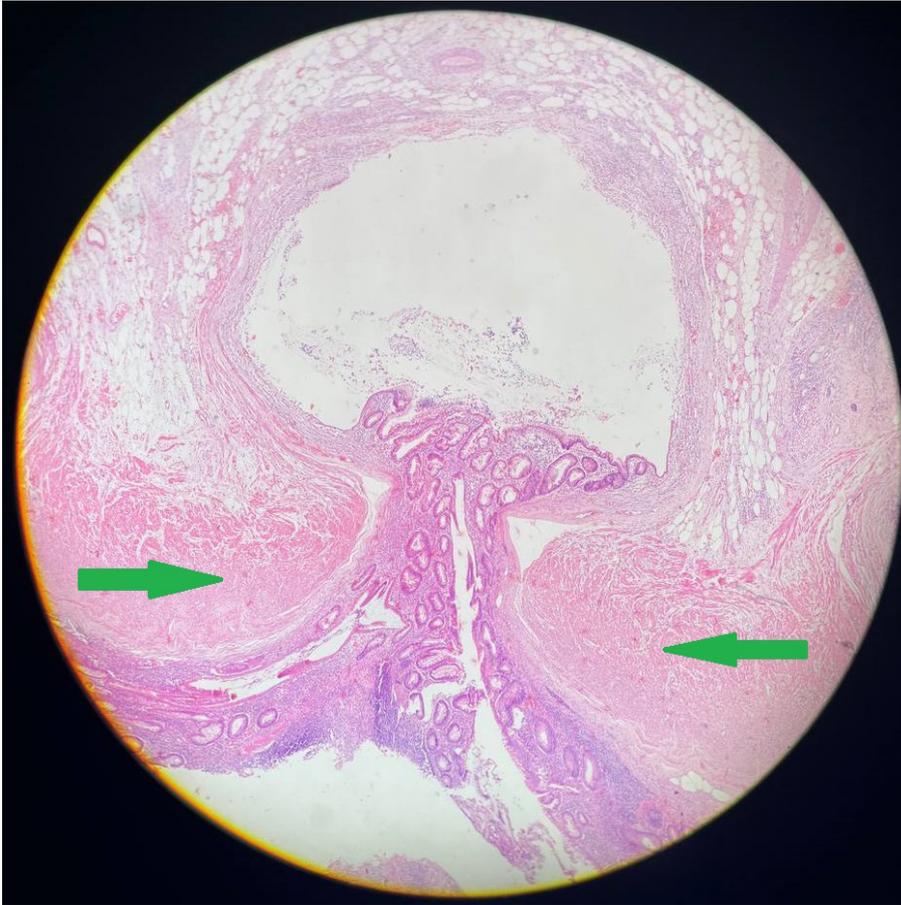
## Case report

The thirty-five-year-old male patient was admitted to the emergency department with right

lower quadrant pain and vomiting and nausea. Abdominal tenderness, rebound, and defense reactions were observed on his abdominal examination. The patient's White Blood Cell (WBC):  $15.000 \cdot 10^3/\mu\text{L}$ , and C-Reactive Protein (CRP): 22 mg/L have resulted in his laboratory tests. Abdominal ultrasonography was performed and appendix diameter was measured at 8 mm, and inflammation signs were observed in the surrounding tissue in favor of acute appendicitis. Therefore, appendectomy operation was planned with a preliminary diagnosis of acute appendicitis, and the patient was informed, and hospitalized. A laparoscopic appendectomy was performed. During the operation, the appendix was observed as erected hypervascularized and inflamed, and surrounded with omental tissue adhesions. After the omental adhesions were dissected with surgical instruments, three small herniated tissue was observed on the anti-mesenteric surface of the appendix (Figure 1). Appendectomy was performed properly without any complications and the patient was discharged on postoperative day 1. In the histopathological examination, acute phlegmonous appendicitis and numerous diverticulum structures were observed on the mesenteric and anti – mesenteric surfaces of the appendix wall. The diverticula structures were defined as pseudodiverticula due to mucosa and submucosa layers extending beyond the muscularis propria, without containing muscularis propria layers (Figure 2).



**Figure 1.** Appendix diverticulosis



**Figure 2.** Histological image of pseudodiverticula located on the anti – mesenteric surface of the appendix wall, muscularis propria layer shown by marks. (HE x4)

## Discussion

Appendix diverticulosis may occur either acquired or congenital. Frade et al. [4], and Lesi et al. [6] stated that diagnosed appendix diverticulosis cases are acquired type predominantly. Congenital diverticulosis of the appendix is rare. Albeeshi et al. [7] reported that the congenital diverticulosis is generally located on the anti-mesenteric edge and contains all four layers (mucosa, submucosa, muscular, serosa) of the bowel wall. Chia et al. [2] stated that acquired diverticulosis includes only the mucosa or submucosa layer, and both of them may be single or multiple. Sohn et al. [3], and Lesi et al. [6] reported that acquired type of diverticula occurs generally secondary to increased pressure of the appendix from the weakened point of the lumen wall caused by inflammation or atrophy of the muscular layer. Chia et al. [2], and Lesi et al. [6] described the risk factors of diverticular disease of the appendix are; male gender, age over 30, Hirschprung's Disease, and cystic fibrosis. Congenital diverticulosis

may be related to Patau syndrome. However, no relationship between colon diverticular disease and appendix diverticula has been reported by Frade et al. [4]. Syed Muhammad Hammad [8] stated that the diverticular disease of the appendix may be associated with or without acute appendicitis, but diverticulitis is not an etiological factor for acute appendicitis. Chia et al. [2] stated that the diagnosis of appendix diverticulosis is still not exactly possible with preoperative imaging systems. Sohn et al.[3] reported that lower WBC count and higher CRP levels were found in appendix diverticulitis at laboratory test results compared to acute appendicitis. Lesi et al. [6] described the ultrasonographic findings of appendicular diverticulosis as hypoechoic inflamed diverticula surrounded by echogenic fatty tissue. In appendix diverticulosis, all the appendix wall layers are inflamed and visualized as thickened not only the mucosal and submucosal layers as different from acute appendicitis. Albeeshi et al. [7] stated that even though Ultrasonography

and Computer Tomography (CT) imaging might be helpful to diagnose preoperatively in some cases, histopathological examination is the gold standard for diagnosis. Lesi et al. [6] defined five types of appendix diverticulosis; Type 1 defines primary acute diverticulitis, with or without peridiverticulitis, type 2 defines acute diverticulitis secondary to acute appendicitis, type 3 defines diverticulum without inflammation, type 4 defines diverticulum with acute appendicitis, type 5 defines chronic peridiverticulitis with acute appendicitis. Our case is a type 4 appendix diverticulosis case according to this classification. Type I is the most frequently diagnosed type, with a prevalence of 40-50%. Lesi et al. [6] stated that due to the mildly and slowly progression of the appendix divertilitis may cause delayed diagnosis. Thus, it may cause several complications, such as perforation, intraabdominal abscess, pelvic pseudocyst, and vesicocaecal fistula. Chia et al. [2] reported that the perforation risk at the diverticular disease of appendix is four time higher than acute appendicitis. Therefore this is a reason of higher mortality and morbidity. John et al. [5] stated that there is a high risk of pseudomyxoma peritonei and appendiceal neoplasms such as carcinoid tumors and mucinous adenomas tubular adenomas, and primary appendiceal adenocarcinomas. Phillips and Perry [9] stated that the treatment of appendix diverticulosis is similar to acute appendicitis; appenedectomy. Gokce and Aren [1] recommended appendectomy as a treatment even if appendicular diverticulosis is diagnosed incidentally during the laparotomy for some other reasons except acute appendicitis.

In conclusion, appendicular diverticulosis is a rare clinical condition that is not foreseen at first sight, and hard to diagnose before the surgical intervention, is hard to manage the complications, and requires longer hospital stay and treatment duration. This clinical situation is also related to malignancy with a higher rate than acute appendicitis. The treatment modality is the same as acute appendicitis, but it is generally either delayed or diagnosed incidentally secondary to acute appendicitis. That's why it is important to suspect appendix diverticulosis if symptoms are similar to acute appendicitis but slowly and mildly.

**Conflict of interest:** No conflict of interest was declared by the authors.

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**Informed consent:** The patient consent that all information about this clinical condition may be published in an anonymous electronic journal or stored on the website

## Authors' contributions to the article

M.B.K. constructed the main idea and hypothesis of the study. M.B.K. and N.B. developed the theory and arranged/edited the material and method section. N.B. has done the evaluation of the data in the Results section. Discussion section of the article was written by M.B.K.

M.B.K. and N.B. reviewed, corrected and approved. In addition, all authors discussed the entire study and approved the final version.