Evolution and Current Trends in the Management of Acute Appendicitis

Michel Wagner, MD[a,b,*], Dustin John Tubre, MD[c], Juan A. Asensio, MD, FCCM, FRCS (England), KM[d]

KEYWORDS

- Acute appendicitis • Alvarado score
- Nonoperative management of acute appendicitis
- Medical imaging in acute appendicitis • Epidemiology of acute appendicitis

KEY POINTS

- Since the first surgical appendectomy in the 18th century the treatment of appendicitis has changed.
- The use of scoring systems has helped refine the diagnosis of acute appendicitis.
- Medical imaging techniques, such as ultrasound, CT scans, and MRI, have assisted in the diagnosis of acute appendicitis.
- Nonoperative management is being investigated and may prove to be acceptable in most cases of acute appendicitis.
- The microbiome of the appendix is being investigated and may prove to have a role in the development of acute appendicitis; treatment in the future may focus on modifying the microbiome.

INTRODUCTION

The appendix is a vestigial organ of dubious utility; its function and normal physiology remain unclear. The appendix is notable in medicine because appendicitis (the inflammatory state of this organ) is the most common indication for emergent surgery

Disclosure Statement: The authors have nothing to disclose.
[a] Division of Trauma Surgery and Surgical Critical Care, Department of Surgery, Creighton University School of Medicine, Creighton University Medical Center, 7710 Mercy Road #2000, Omaha, NE 68124, USA; [b] Department of Translational Science, Creighton University School of Medicine, Creighton University Medical Center, 7500 Mercy Road, Omaha, NE 68124, USA; [c] General Surgery, Creighton University School of Medicine, Omaha, NE, USA; [d] Department of Translational Science, Creighton University School of Medicine, Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Walter Reed National Military Medical Center, Bethesda, MD, USA
* Corresponding author. Department of Translational Science, Creighton University School of Medicine, Creighton University Medical Center, 7500 Mercy Road, Suite 2871, Omaha, NE 68124.
E-mail addresses: michel.wagner@alegent.org; michelwagner@creighton.edu

Surg Clin N Am 98 (2018) 1005–1023
https://doi.org/10.1016/j.suc.2018.05.006 **surgical.theclinics.com**

worldwide[1]; it is the most common nonobstetric surgical emergency during pregnancy[2,3] and it is the most common surgical emergency in childhood.[4] A small organ located at the base of the cecum, the appendix has a unique position in history, is a medical oddity, and is even the subject of a beloved children's book.

A 27-year-old Leonid Rogozov performed an autoappendectomy on April 30, 1961, while isolated with a team of Soviets on an expedition to the Antarctic.[5] As medical officer, meteorologist, and driver he was the only one qualified to perform this surgical procedure. After a brief therapeutic attempt at unsuccessful nonoperative management he realized that his survival depended on a surgical intervention. Using his teammates as his surgical team, he directed them to carefully sterilize the instruments required, perform an appropriate surgical wash, and then assist him as he performed his own open appendectomy under local anesthetic. When asked to comment about this in later years Dr. Rogozov is recorded to have replied, "A job like any other, a life like any other."

In 1939, Ludwig Bemelmans published the first in his series of *Madeline* books, a favorite of children, describing the heroine's travails with acute appendicitis.[6] An additional oddity, Dr Jeffrey Sedlack founded a virtual online museum of the appendix and appendicitis (www.appendicitis.pro).[7] Because of the prevalence of acute appendicitis, Sir Alexander Cope, in his classic treatise *Early Diagnosis of the Acute Abdomen*,[8] stated that "appendicitis should never be lower than second" when considering the differential diagnosis of abdominal pain.

Since the first documented appendectomy in 1735 by Claudius Amyand there have been many changes in the management of the appendix and its surgical pathology. The appendectomy performed by Amyand was on an 11-year-old boy with a fecal fistula through an inguinal hernia. After surgical intervention it was noted that the boy had an inguinal hernia that contained the appendix. He had swallowed a pin, and this led to the fistula formation. The eponymous Amyand hernia now defines the condition of an appendix in the inguinal canal.[9] The French physician, Mestier is credited with performing the first appendectomy for acute appendicitis in 1759.[10,11]

Although the works of Charles McBurney[12–14] and Reginald Fitz[15] are frequently quoted when discussing the history of acute appendicitis, perhaps the most famous case of acute appendicitis is the case of King Edward of England. King Edward developed symptoms of abdominal pain in late May 1902, a short time before his scheduled coronation on June 16, 1902. Tended by Sir Frederick Treves, Sir Joseph Lister, and other eminent surgeons of the era, the future King is said to have refused surgical intervention initially. He waxed and waned clinically and eventually underwent an incision and drainage of a large periappendicieal abscess by Treves just 2 days before his scheduled coronation. The coronation was delayed and eventually the King was crowned on August 8, 1902.[7,16]

EPIDEMIOLOGY

Inquiries as to the distribution of this pathology within the population have produced similar results globally.[17–25] These assessments are limited by their retrospective nature and because there is little or no controlled prospective evaluations. Additionally, there is a question as to the detail of the databases that are used to collect the data because these are often administrative databases.[24] Certain studies focus on limited populations, such as active duty or reserve military[18] or children.[21] The lifetime risk has been estimated to range from 8.6% to 12% in males and 6.7% to 23.1% in females.[1,19] When analyzed by age, the greatest frequency of appendicitis is seen in the age range of 10 to 19 years of age.[19,20,22,24] However, Andreu-Ballester and colleagues,[23] in a large study from Spain, found that the highest incidence was in the 1 to