Appendicular "Googlies" – Googlies bowled at us by the human vermiform appendix and mimickers of its acute inflammation! – A case series with review of literature

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ABSTRACT

Background: Acute appendicitis (AA) is one of the common abdominal emergencies encountered in surgical practice. However, there are a host of other medical and surgical conditions that closely mimic it, clinically. The objective of this paper is to present a study and analysis of our burden of incidental encounters with such mimicking surgical conditions that were erroneously diagnosed as acute appendicitis, before surgery. **Materials and Methods:** Data were retrieved from the hospital's electronic medical records about all patients operated for AA, by a single surgeon, over a 14-year period, and was collected and reviewed for the case series. **Results:** A total of 450 patients were operated for AA from 2008 to 2022. Out of these, we identified 20 patients who had a normal appendix with some other mimicking surgical condition (incidence 4.44%). Thus, these 20 patients were thought to have AA, but turned out to have some other surgical condition. **Conclusion:** AA has many differential diagnoses, both common and rare. At times, some of these are confirmed "on table," as seen in this case series. A sound, reliable, and fool proof palpatory assessment of the abdomen is crucial in diagnosing its surgical conditions. It is interesting to note that although the initial diagnosis of AA made for all the subjects of this case series was erroneous, all still turned out to have alternate conditions which merited surgery.

Key words: *Acute appendicitis, Intraoperatively, Laparoscopic appendicectomy, Mimickers*

Acute appendicitis (AA) is one of the most common abdominal surgical emergencies that present to emergency rooms around the world. About 250,000 appendectomies are performed in the United States, for the same, every year [1]. It has traditionally been considered a clinical diagnosis. Laboratory investigations that are supportive/confirmatory are leukocytosis with neutrophilia. Ultrasonography (USG) and/or computed tomography (CT) scans of the abdomen are the commonly performed imaging investigations, for this condition. USG has a sensitivity of 78% and specificity of 83%, while CT scan has sensitivity of 97% and specificity of 98% for AA [1]. USG is the preferred imaging modality in pregnant patients and pediatric age group due to the radiation exposure associated with CT [1].

Although a much studied and published topic, every once in a while, clinicians deal with patients thought to have AA, but turn out to have some other condition. The aim of this paper is to share our analysis and experience regarding these patients.

CASE SERIES

Patients and Methods

Data were procured from the hospital electronic medical records about all patients who were diagnosed to have AA, preoperatively.

All the patients were operated on by a single surgeon in a tertiary care teaching corporate hospital over 14 years (2008–2022).

We do not advise contrast-enhanced CT (CECT) abdomen in all patients. If the laboratory report of leukocytosis coupled with neutrophilia matches the palpatory sign of rebound tenderness at McBurney's point, it is sufficient for us to make a clinical diagnosis of AA. We requested for a CECT abdomen only in the following clinical situations, where there is a diagnostic dilemma: (a) significant abdominal signs but normal white blood cell (WBC) count, (b) leukocytosis and neutrophilia with a relatively soft abdomen, and (c) severe pain but with relatively soft abdomen and normal WBC count.

All the patients of this series are patients who presented with acute severe right iliac fossa (RIF) pain with or without associated symptoms such as fever, nausea, and vomiting. All of them had significant abdominal signs, that is, rebound tenderness or guarding in the RIF at McBurney's point. All of them also had leukocytosis. None of them were subjected to a pre-operative CECT abdomen. All underwent a pre-operative USG abdomen and pelvis. All turned out to have some other surgical condition, other than appendicitis.

Although an account of all the patients of this case series is a candid confession of our erroneous diagnoses, it is interesting to note that all these patients turned out to have alternative conditions

mandatorily requiring surgical therapy. This is in accordance with the age-old surgical teaching that an abdomen with rebound tenderness/guarding is a surgical abdomen. Furthermore, every patient was, subsequent to final diagnosis at laparoscopy, managed totally laparoscopically through the very same port sites, without inserting any additional ports. This fact further begs to ask the question that inspite of these diagnostic failures, further to accurate clinical estimation of significant abdominal signs(rebound tenderness/guarding) in the RIF; is CECT really necessary in these patients ?

Surgical Procedure

All our patients were operated in the supine position with both upper limbs by the two sides of the patient. We prefer closed Veress' needle entry technique in all patients who do not have central scars of previous surgery. Our point of entry in these patients is the sub-umbilical trocar site. In those patients who have central scars of previous surgery, we prefer to insert a 5 mm trocar at the Palmer's point to first have a "bird's eye view" of the central abdomen, before safe insertion of the central trocars. The appendix was normal in all the patients of this case series. On finding a normal appendix at laparoscopy in a suspected case of AA, a systematic search is then initiated to find the actual pathology. The terminal two feet of small bowel is "walked" to look for Meckel's diverticulum or any other pathology. Greater omentum and the appendices epipoloicae in the vicinity are then carefully visualized. In females, a careful laparoscopic exploration of the internal genitalia is performed.

In the young male who had a band with ileum twisted around it, the band was lysed and excised (Fig. 1a-d). In patients having torsion-gangrene of omentum or appendix epiloica, the same were excised (Fig. 2a and b). The sole young female (age–27 years) with spontaneous torsion of fallopian tube and ovary, but without any obvious causative pathology (possible due to long mesentery) underwent a conservative procedure. A laparoscopic salpingo-oophoropexy was performed using 3–0 silk, with the right parietes (Fig. 2c-f). In the two patients having torsion of large ovarian cyst without gangrene, after performing de-torsion, the bulky ovarian cyst was excised (Fig. 3a). In the patients having torsion-gangrene of ovary and salpinx (either in ectopic pregnancy or bulky ovarian cysts, salpingectomy-oophorectomy was performed (Fig. 3b), Fig. 3c shows laparoscopic retrieval of the products of conception in a case of the right tubal abortion. In patients having ruptured corpus luteal cysts, the same were excised and hemostasis achieved (Fig. 3d).

RESULTS

Out of 450 patients operated for AA over a 14-year period, our burden of cases with a normal appendix with a mimicking alternative surgical condition was 20 patients (incidence of 4.44%). The patient demographics, pre-, intra-, and post-operative details of these 20 patients, are summarized in Table 1. A majority
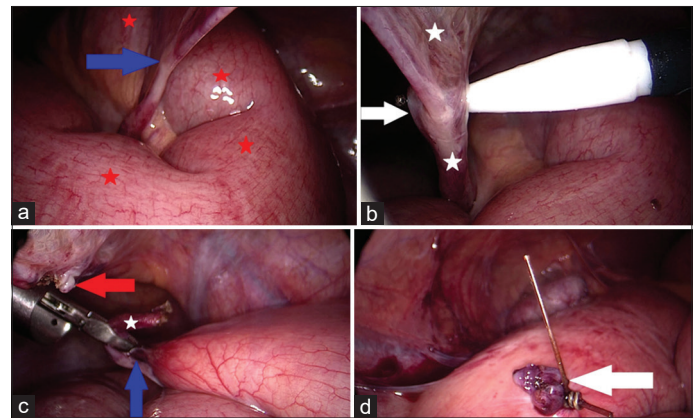
Figure 1: (a) Small bowel (red asterisks) volvulus around a fibrofatty band (blue arrow) connecting the lateral umbilical ligament and serosa of ileum, (b) division (white arrow) of the band (white asterisks) in progress, (c) divided band (white asterisk) with its ileal serosal attachment (blue arrow) and point of attachment to right lateral umbilical ligament (red arrow), and (d) band excised after applying endo-loop over ileal serosal end (white arrow)
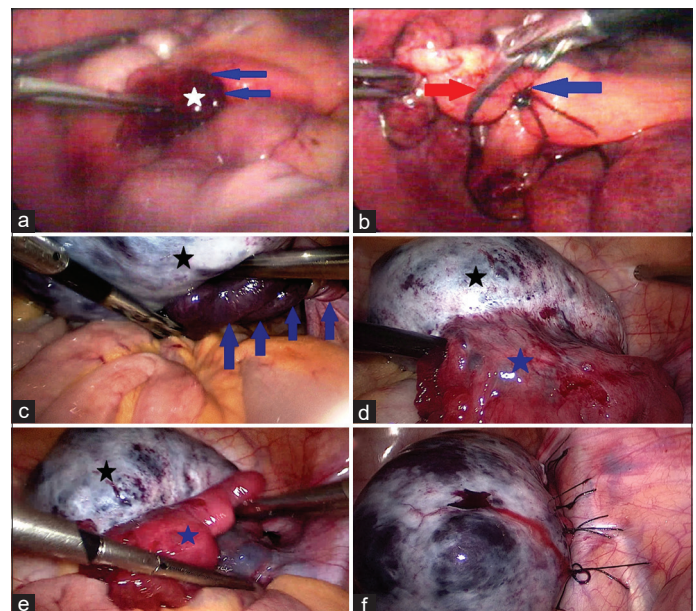
Figure 2: (a) Greater omentum in torsion in RIF with devitalized tip (white asterisk) and zone of demarcation/site of twist (blue arrows), (b) twisted devitalized omentum being cut and excised (red arrow) after proximal endloop ligation (blue arrow), and (c) spontaneous torsion of right ovary (black asterisk) and fallopian tube (blue arrows), (d and e) right ovary (black asterisk) and tube (blue asterisk) after de-torsion, and (f) right ovary and tube suture fixed to parietes after de-torsion(salpingo-oophoropexy)

of these patients (n=17, 85%) were female, while the remaining (15%) were male. The age-wise distribution of these patients was as follows: <20 years–n=5 (25%), 20–40 years–n=12 (60%), 40–60 years–n=3 (15%), and >60 years–n=0. Ruptured corpus luteal hematoma and torsion of ovarian cyst/ovary-fallopian tube complex were the most common diagnoses among the patients of this series (each with n=6). Pre-operative USG abdomen and pelvis diagnosed appendicitis in ten out of these 20 patients (50%). It was normal in five patients (25%) and revealed probe tenderness in the RIF in five patients (25%).

Table 1: Patient demographics and other operative details

| S. No.	Age/Sex	Pre-operative examination findings	Pre-operative TLC	USG findings	Post-operative diagnosis	Procedure performed
1	17 y/F	Rebound tenderness in RIF	12,000	Appendicitis	Right ruptured corpus luteal hematoma	Laparoscopic excision of cyst
2	26 y/F	Severe tenderness in RIF	11,000	Bowel gas in RIF	Torsion right ovarian cyst	Laparoscopic excision of cyst after de-torsion
3	25 y/F	Rebound tenderness in RIF	13,500	Appendicitis	Meckel's diverticulitis	Laparoscopic excision
4	21 y/F	Rebound tenderness in RIF	12,400	Appendicitis	Right ruptured corpus lutealhematoma	Laparoscopic excision of cyst
5	39 y/F	Rebound tenderness in RIF	14,000	Appendicitis	Torsion gangrene of appendix epiploica of redundant sigmoid colon	Laparoscopic excision
6	32 y/F	Guarding in RIF	13,000	Appendicitis	B/L ruptured corpus luteal hematomas	Laparoscopic excision of cysts
7	18 y/F	Guarding in RIF	14,500	Appendicitis	Torsion-gangrene of right. fallopian tube and ovary	Laparoscopic right salpingo-oophorectomy
8	24 y/M	Severe tenderness in RIF	11,500	Dilated small bowel in RIF	Torsion-gangrene of greater omentum	Laparoscopic excision of gangrenous omentum
9	27 y/F	Severe tenderness in RIF	12,000	Probe tenderness in RIF	Right ruptured corpus luteal hematoma	Laparoscopic excision of cyst
10	19 y/F	Rebound tenderness in RIF	15,000	Appendicitis	Torsion-gangrene of right fallopian tube and ovary	Laparoscopic right salpingo-oophorectomy
11	18 y/F	Severe tenderness in RIF	11,000	Probe tenderness in RIF	Tubal abortion	Laparoscopicexpression and retrieval of POCs
12	34 y/F	Severe tenderness in RIF	11,300	Appendicitis	Gangrenous cecal appendix epiploica	Laparoscopic excision
13	33 y/F	Rebound tenderness in RIF	12,200	Probe tenderness in RIF	Ruptured left corpus luteal hematoma	Laparoscopic excision of cyst
14	33 y/F	Severe tenderness in RIF	11,500	Normal	Torsion-gangrene of greater omentum	Laparoscopic excision of gangrenous omentum
15	42 y/F	Rebound tenderness in RIF	12,500	Probe tenderness and free fluid in RIF	Right ruptured corpus luteal hematoma	Laparoscopic excision of cyst
16	41 y/F	Severe tenderness in RIF	12,000	Normal	Torsion right ovarian cyst	Laparoscopic excision of cyst after de-torsion
17	22 y/F	Rebound tenderness in RIF	13,400	Probe tenderness in RIF	Torsion and borderline gangrene of right fallopian tube and ovary	Laparoscopic Salpingo-oophoropexy
18	27 y/M	Tenderness in RIF	13,000	Appendicitis	Torsion of cecal appendix epiploica+adhesive band	Laparoscopic excision+division of band
19	16 y/M	Tenderness in RIF	12,200	Normal	Fibrofatty band from ileal serosa to parietes with ileum twisted around it	Laparoscopicdivision of band
20	48/F	Tenderness in RIF	14,000	Appendicitis	2 fibrous bands at ileocecal junction+"tourniquet" of cecal appendices epiploicae over ileum	Laparoscopic division of multiple bands

RIF: Right iliac fossa, USG: Ultrasonography

DISCUSSION

It has been a time-honored surgical teaching to perfect the art of clinical examination of that perfect example of a Pandora's box – the abdomen. More often than not, this has made the process of reaching the diagnosis, easier. Indeed, this is very important even in the present-day evidence based "modern" era that we live in, wherein cutting edge imaging tools like CT are ordered routinely for patients who present with an acute abdomen. However, it was never more important than in the pre-CT era, when a classical palpatory sign like rebound tenderness at the McBurney's point coupled with a simple leukocytosis and neutrophilia found on a hemogram was considered virtually diagnostic of AA. Even in the present times, this holds true for most of the cases; but not all.

Differential diagnoses of AA include gastroenterological conditions such as inflammatory bowel disease, infectious
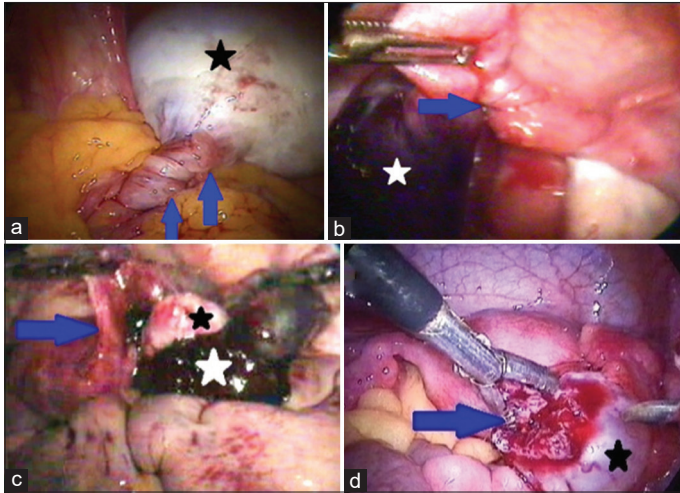
Figure 3: (a) Torsion (blue arrows) of the right ovarian cyst (black asterisk), (b) torsion-gangrene (blue arrow) of the right tubal ectopic pregnancy (white asterisk), (c) right tubal abortion (white asterisk)- also seen are right ovary (black asterisk) and proximal right tube (blue arrow), and (d) ruptured right corpus luteal cystic hematoma (blue arrow) within right ovary (black asterisk)

enterocolitis, radiation enteritis, neutropenic colitis, diverticular disease/diverticulitis, and Meckel's diverticulitis; vascular conditions such as abdominal aortic aneurysm, mesenteric ischemia, epiploic appendagitis, and omental infarction; urological conditions such as ureterolithiasis and pyelonephritis; and gynecologic conditions such as ectopic pregnancy, ovarian torsion, hemorrhagic ovarian cyst, and pelvic inflammatory disease [1,2].

A host of diagnostic clinical and clinical cum investigational scoring systems exists for AA. The Alvarado score, Lintula score, RIPASA score, Tzanakis score, MANTRELS score, Izbicki score, Christian score, Pediatric appendicitis score, Eskelinen score, Ohmann score, Fenyo – Lindberg score, AIR – Appendicitis Inflammatory Response score, AAS – Adult Appendicitis Score, etc., are examples of this [3-9]. No system is perfect for all the clinical scenarios. The RIPASA score has been reported to be better than the others for pregnant patients and better than the popular Alvarado score in the Asian population [10-12]. A consensus conference was held under the aegis of the World Society of Emergency Surgery (WSES) to study various diagnostic and therapeutic aspects of AA vis-à-vis previously published literature, in 2015. The WSES – Jerusalem guidelines (2015) and their subsequent update (2019) were the result of this effort [13,14].

The sensitivity and specificity of CECT in diagnosing AA is known to be superior to USG. However, we do not believe in subjecting every patient with suspicion of AA to CECT. This is due to three reasons: we still believe (regardless of the stories of patients in this case series) that AA is essentially a clinical diagnosis. Furthermore, CECT entails exposure to radiation and is avoidable in most clinical situations related to AA. The cost factor is also a significant argument against CECT, especially in third world countries. Furthermore, access to CT facilities is limited, in the interiors of these countries.

CONCLUSION

Every once, in a while, comes along a case which is wrongfully diagnosed as AA. As seen in this series, our incidence of this is low, even when CECT has not been done preoperatively. Furthermore, this series aptly demonstrates, that reliable estimation of the RIF of the abdomen vis-à-vis it's palpatory signs, invariably accurately diagnoses a surgical abdomen with AA or some other surgical condition. The ergonomic placement of trocars, purportedly for a laparoscopic appendectomy, also allows the surgeon to deal with a mimicking surgical condition, as seen in all the patients of this series.

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