

## ORIGINAL ARTICLE

# ROLE OF LAPAROSCOPY IN JUSTIFYING THE DIFFERENTIAL DIAGNOSIS OF ACUTE APPENDICITIS

**Hatem Soltan**

General Surgery Department, faculty of medicine, Menofiya University, Egypt

Email: hatemsoltan@hotmail.com

### Abstract

**Aim:** With advent of Laparoscopy it was widely used for the treatment of acute appendicitis, As Laparoscopy has more exploratory scope than open surgery, the diagnosis and treatment of different causes of acute right iliac fossa pain can be done easily. The aim of this study is to determine the role of laparoscopy in justifying the differential diagnosis of clinically diagnosed acute appendicitis.

**Methods:** Between September 2003 and December 2008, laparoscopic appendectomy was attempted for 198 patients complaining of right iliac fossa pain and diagnosed to have acute appendicitis, all data and operative findings were collected.

**Results:** There were 110 female and 88 male their ages ranged from 8-60 years old. Acute appendicitis was +ve in 155 patients (78.3%), it was +ve macroscopically in 116 patients, and was +ve histologically in another 39 patients. Gynecological cause of abdominal pain was found in 22 females (11.1%). Mesenteric lymphadenitis was found in 4 (2%) cases and mesenteric ischemia in one (0.5%) patient. Omental infarction was found in 4 patients, 3 of them was acute and represented the cause of acute abdominal pain (1.5%). Normal laparoscopy was found in 13 patients (6.6%).

**Conclusion:** These results emphasize the importance of considering omental infarction in the differential diagnosis of acute appendicitis.

**Keywords:** Laparoscopy, acute appendicitis, omental infarction.

### INTRODUCTION

Acute appendicitis is the most common cause of acute abdominal pain requiring surgery. More than 5% of the population develops appendicitis at some point. It is most common in the teens and 20s but may occur at any age.<sup>(1)</sup>

Open appendectomy, as described by Mc Burney in 1894, remained the gold standard for the treatment of acute appendicitis for more than a century. The advent and rapid acceptance of laparoscopic surgery had led to

the idea of performing laparoscopic appendectomy.<sup>(2)</sup>

The enormous continuous development of minimally invasive surgery is justified by the many advantages this method provides: Minimal surgical trauma, less postoperative pain, rapid postoperative recovery, exploration of whole abdominal cavity, management of unexpected findings, and better cosmetic results with rapid return to normal activities.<sup>(3)</sup>

Gynecological problems are a commoner cause of lower

abdominal pain in females and represent the main differential diagnosis of Acute appendicitis.<sup>(4)</sup> While renal problem, mesenteric lymphadenitis, meckel's diverticulitis and carcinoid tumors represent most of differential diagnosis in both sexes.<sup>(5)</sup>

Idiopathic segmental infarction of the greater omentum (ISIGO) is an acute vascular disturbance of the omentum precipitated by thrombosis of omental veins secondary to endothelial injury.<sup>(6)</sup> ISIGO is an uncommon cause of acute abdomen.<sup>(7)</sup> The clinical presentation is usually with acute or sub acute abdominal pain, mimic acute appendicitis. However its true incidence is still underestimated.<sup>(8)</sup>

There are several proposed causes of endothelial damage and thrombosis. These include stretching or primary rupture of the omental veins by a sudden increase of abdominal pressure as with coughing, sneezing or lifting, specially after ingestion of heavy meals;<sup>(6)</sup> gravitational pull of an extremely fatty omentum on the omental veins;<sup>(9)</sup> an anatomical peculiarity of the venous drainage of the omentum that predispose to thrombosis.<sup>(10)</sup>

## PATIENTS AND METHODS

In this prospective study, 198 patients diagnosed clinically to have acute appendicitis were enrolled in this study in the period from September 2003 to December 2008. This study was approved by ethics committee and after obtaining a clear informed consent, laparoscopy was done for all patients

The clinical diagnosis of acute appendicitis was based on (Migration of pain, Anorexia, Nausea – vomiting , Tenderness in right iliac fossa, Rebound pain, Raised temperature ( $\geq 37.3^{\circ}\text{C}$ ), Leucocytosis, Differential white cell count with neutrophils  $\geq 75\%$ ).

Preoperative U/S was done routinely for female patients to exclude gynecological causes and selectively for male patients to exclude renal causes.

For the laparoscopic approach, a 10 mm reusable trocar was placed at the supra-umbilical region by open technique and pneumoperitoneum created with carbon dioxide. Two additional ports were placed in lower abdomen one at right iliac fossa and other at left iliac fossa. The whole abdomen was thoroughly explored

especially pelvic structures in females, terminal ileum, mesentery, omentum, caecum In addition to the appendix.<sup>(11)</sup>

If the appendix was found inflamed (hyperemic, oedematous, dilated, reaction, mass or abscess) appendectomy was done.

If it was not inflamed and no other cause could explain the acute abdomen, the appendix was also removed and sent for histopathology for any microscopic pathology.

If there was other pathology rather than appendicitis could explain the cause of acute abdomen, laparoscopic or open management was done and appendix was not removed.

In female patients with gynecological pathology as ruptured ovarian cysts, a gynecologist was consulted and or assists in the rest of surgery while the procedure was completed by surgeon.

If ISIGO was discovered during laparoscopy it was resected using both electro-cautery and endoloop for securing haemostasis, and was retrieved via umbilical port through an endobag and sent for histopathology.

All data including demographic data, pathology found, conversion rate and post operative complication were recorded.

## RESULTS

There were 110 female and 88 male their ages ranged from 8-60 years old Table 1. Acute appendicitis was +ve in 155 patients (78.3 %), it was +ve macroscopically in 116 patients, 66 females and 50 males, and was +ve histologically in another 39 patients (out of 52 appendix removed with no gross picture of inflammation), 15 females and 24 males. Normal appendix histologically was found in 13 patients (6.6%) Table 2.

**Table 1. Demographic data.**

	NO	Age		
		Min	Max	Mean
Male	88	8	60	29±6.1
Female	110	10	52	22±8.3

**Table 2. DD of Acute AP.**

	Male	Female	Total	%
Total No	88	110	198	100%
Appendicitis	74	81	155	78.3%
Gynecological cause	-	22	22	11.1%
Mesenteric lymphadenitis	3	1	4	2%
Omental infarction	3	0	3	1.5%
Mesenteric ischemia	1	0	1	0.5%
Normal appendix	7	6	13	6.6%

Gynecological causes of abdominal pain were found in 22/110 (20%) females. Among them the pathology was found at left side in 7 cases; 6 cases of ruptured left ovarian cyst and one case of ruptured Ectopic pregnancy at left Side, 13 patients had rupture right ovarian cyst, the remaining 2 patients had pelvic inflammatory disease (PID). All these cases were managed laparoscopically by the same surgeon after Gynecological consultation.

Mesenteric lymphadenitis was found in 4 cases, three of them were males. All these patients were referred to gastroenterologists and managed medically. Also mesenteric vascular ischemia affecting short segment of small bowel was found in one male patient, so conversion to open surgery was done with resection anastomosis of ischemic bowel with uneventful recovery.

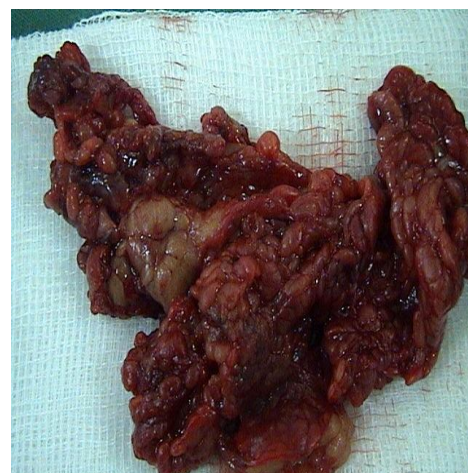
No cases of Meckel's diverticulitis, commonly estimated for differential diagnosis of acute appendicitis, were found in this study.

Omental infarction (the involved segment is well demarcated, dry or edematous, and hemorrhagic or gangrenous) (Fig. 1) was found in 4 patients, 3 males and one female. Three adult male patients (1.5%) had acute omental infarction (hemorrhagic with free serosanguineous peritoneal fluid was also present at exploration) and represented the cause of acute abdomen with normal appendix (the exact aetiology of those ISIGO was not known).



**Fig 1. Laparoscopic view of Omental infarction.**

Laparoscopic excision of infarcted omentum was done without appendectomy, (Fig. 2). The fourth case (female patient) had dry infarcted omentum and associated with acute appendicitis and laparoscopic appendectomy was done. Histopathological examination confirmed the diagnosis of omental infarction.



**Fig 2. Omental infarction after excision.**

Three cases were converted to open surgery; one case with ischemic bowel (not diagnosed either clinically or radiologically) and open surgery and resection anastomosis was done, two cases of appendicular mass with difficult laparoscopic management, so open appendectomy was done successfully.

No mortality or severe post operative complications were recorded apart from 4 cases of minor wound infection at umbilical wound which was the site of extraction of removed appendix.

## DISCUSSION

In the management of acute abdomen laparoscopy has both a diagnostic (proper exploration) and a therapeutic role. Recent studies have shown significant advantages of laparoscopic appendectomy with respect to the length of hospital stay, postoperative pain and infectious complications.<sup>(11,12)</sup>

One of the most important advantages of laparoscope is its exploratory power and ability to diagnose and treat unexpected causes of acute abdomen.

The overall incidence of pelvic disorders diagnosed in female patients in this study reached (20%) and represented the main differential diagnosis of acute appendicitis in female patients. And this agree with Gaitan et al.,<sup>(13)</sup> in their study the overall incidence of pelvic disorders reached 18.9% : 27.5% in both laparoscopic and open groups

Moreover in this study ruptured ovarian cyst was found at left side in 6 patients and ruptured Ectopic pregnancy also found at left side in one patient, all these patients were managed laparoscopically and avoided laparotomy if Mc Burney incision was done.

No cases of meckel's diverticulitis was found in this study inspite of it is commonly estimated for differential diagnosis of acute appendicitis.

ISIGO the result of impaired perfusion to the greater omentum is a rare entity. First described by Bush in 1896.<sup>(14)</sup> The etiology of omental infarction is unclear and the symptoms mimic acute appendicitis. As it is difficult to discover during open appendectomy, its true incidence is still underestimated.

In the majority of the published cases (about 400 cases in the literature), omental infarction is located to the right side probably due to the greater size and mobility of the right sided omentum in relation to the left side. Precipitating factors comprise trauma, increased intra-abdominal pressure following coughing, exertion, heavy meal and change in body position, which probably result in sudden misplacement of the omentum and compromised blood flow.<sup>(13)</sup>

In this study, 4 cases (out of 198 over 5 years) of omental infarction were diagnosed intraoperatively and treated by laparoscopy. Three cases (1.5%) were hemorrhagic and represented the cause of acute abdomen, and the fourth case was dry and associated with acute appendicitis. On the other hand no cases of ISIGO were reported during open surgery in the same period in the same hospital by different surgeons.

This higher incidence disagree with some authors who reported that the incidence of idiopathic segmental infarction of the greater omentum is estimated to be 0.1% (19 cases out of 20000 cases over 20 years period) of the total (open) laparotomies performed for acute abdomen.<sup>(15)</sup> and this difference suggest that the incidence is underestimated by open surgery.

In spite of controversy regarding the management option for ISIGO, either by surgical excision of infarcted omentum<sup>(16)</sup> or conservative surgery aiming for spontaneous resolution,<sup>(12)</sup> in this study all acute cases were managed surgically.

Some authors reported that, surgical intervention (resection) is associated with faster recovery, better pain control and prevents complications, such as adhesion, stricture formation, bowel obstruction, abscess formation and possibly sepsis.<sup>(16)</sup>

On the other hand the presence of dry omental infarction in association with acute appendicitis in one patient in this study may support the option of conservative surgery aiming for spontaneous resolution, and support the reports of effective non-operative treatment of omental torsion correctly diagnosed by imaging techniques (Ultrasound or CT scan), when the patient's condition is stable.<sup>(17)</sup>

In agreement with Battaglia et al,<sup>(6)</sup> this study showed the presence of old dry ISIGO in one patient in association with acute appendicitis, and this means that; if ISIGO not discovered during investigation or open surgery it will not probably harm the patient, and this may explain why the incidence is underestimated.

However the difficulty to start conservative surgery comes from the difficulties for preoperative diagnosis of ISIGO.

Although some radiological signs might suggest ISIGO, this rare clinical entity is mostly diagnosed intraoperatively during diagnostic laparoscopy.<sup>(18)</sup>

Role of imaging in diagnosis of omental infarction is unclear but some radiologists report an echogenic and non-compressible oval-shaped mass adherent to the abdominal wall in the region of maximum tenderness by ultrasound. At CT scan, the diagnosis is confirmed by the presence of a right-sided oval-shaped fatty mass with thin hyper dense peripheral rim underneath a thickened parietal peritoneum.<sup>(17)</sup>

In the present series all patients with ISIGO were not diagnosed preoperatively and discovered only intraoperatively by laparoscopy.

In Conclusion Omental infarction must be considered in the differential diagnosis of acute appendicitis. So inspection of the omentum should be a routine part of exploration if the appendix is normal.

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