Diagnostic laparoscopy in ascites of unknown origin

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Background
Determining the etiology of ascites is a challenge in some patients even after the advent of modern diagnostic tools. In this study, we assessed the extent of assistance laparoscopy adds to the other diagnostic tools in cases of ascites of obscure origin.
Patients and methods
In patients with ascites in whom diagnostic modalities failed to determine the etiology of ascites, a diagnostic laparoscopy was performed.
Results
In 43 patients, the etiology of ascites could not be determined, and they underwent diagnostic laparoscopy, where biopsies from suspected lesions, nodule, peritoneum, and masses were taken. Diagnostic laparoscopy outcome revealed abdominal mass in 7%, peritoneal nodules in 34.9%, histopathologic outcome positive for malignancy in 7%, tuberculosis in 51.1%, peritonitis in 34.9%, and unknown etiology in 7%.
Conclusion
Laparoscopy combined with biopsy can add to the diagnosis of ascites of unknown origin and can lead to the diagnosis in more than 90% of cases.

Keywords:
ascites, laparoscopy, unknown origin

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Introduction

Ascites of unknown origin is defined as the etiology of ascites that cannot be reached after doing routine laboratory examinations (including cell count, albumin level, total protein level, gram stain, culture, and cytology) and complementary imaging investigations [including ultrasound (US) and computed tomography (CT) scan].

The cause of ascites can be identified in most patients by clinical and conventional laboratory examinations but occasionally cannot be determined without further investigation. Many reports suggest imaging such as CT [1].

Diagnosis of tuberculous peritonitis by peritoneal biopsy is the gold standard as cultures of peritoneal fluid for tuberculosis may require 6 weeks and diagnostic paracentesis has no role in evaluating the dissemination or feasibility of surgery for cancer [1].

Diagnostic laparoscopy allows direct visualization of the peritoneum, intra-abdominal organs, and direct biopsy from suspected lesions, which add to the diagnostic accuracy of the procedure.

The advent of various noninvasive scanning techniques has affected routine utility of diagnostic laparoscopy in cases of ascites [2,3]. However, it is a reliable technique for the investigation of patients presenting with ascites and in whom the diagnosis remains obscure [4,5]. The diagnosis can be accurately made with selective biopsy specimens, and appropriate treatment can be instituted without delay [6]. The reported common complications after laparoscopy are abdominal pain and discomfort, whereas rare complications include bleeding, infection, and damage to intra-abdominal organs, besides anesthesia-related complications. In this report, we describe our experience using laparoscopy to determine the causes of unexplained ascites.

Patients and methods

All patients were subjected to the following:

(1) Complete history taking with stress on the onset, course, duration of illness, presence or absence of fever and its grade, presence of pain and abdominal swelling, anorexia, loss of weight, change in the bowel habits, and symptoms of anemia.
(2) Thorough clinical examination with stress on the presence of pallor, jaundice, fever, manifestations

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of hepatocellular failure, ascites and its amount, abdominal tenderness, palpable abdominal masses, and localized or generalized lymphadenopathy.

(3) Laboratory investigations, including complete blood count, liver function tests, prothrombin time, and erythrocyte sedimentation rate.

(4) Ascitic fluid analysis including physical appearance, total protein, albumin, calculation of serum ascites albumin gradient, and ascitic fluid cytology for types of cells. Staining of direct film from ascitic fluid by Ziehl–Nielsen stain searching for acid-fast bacilli.

(5) Abdominal US for the presence and amount of ascites, liver size, surface, echo pattern, focal lesions, presence of adhesions or adherent bowel loops or lymphadenopathy. Sometimes, ascetic fluid aspiration was done under US guidance.

(6) Multislice contrast-enhanced CT scan of the abdomen with special stress on the presence of adhesions, dilated bowel loops, lymphadenopathy, peritoneal thickening or deposits.

(7) Laparoscopy and laparoscopy-guided biopsies (4 in number) from peritoneal tubercles, suspected unhealthy omentum, peritoneal thickening, and intra-abdominal masses.

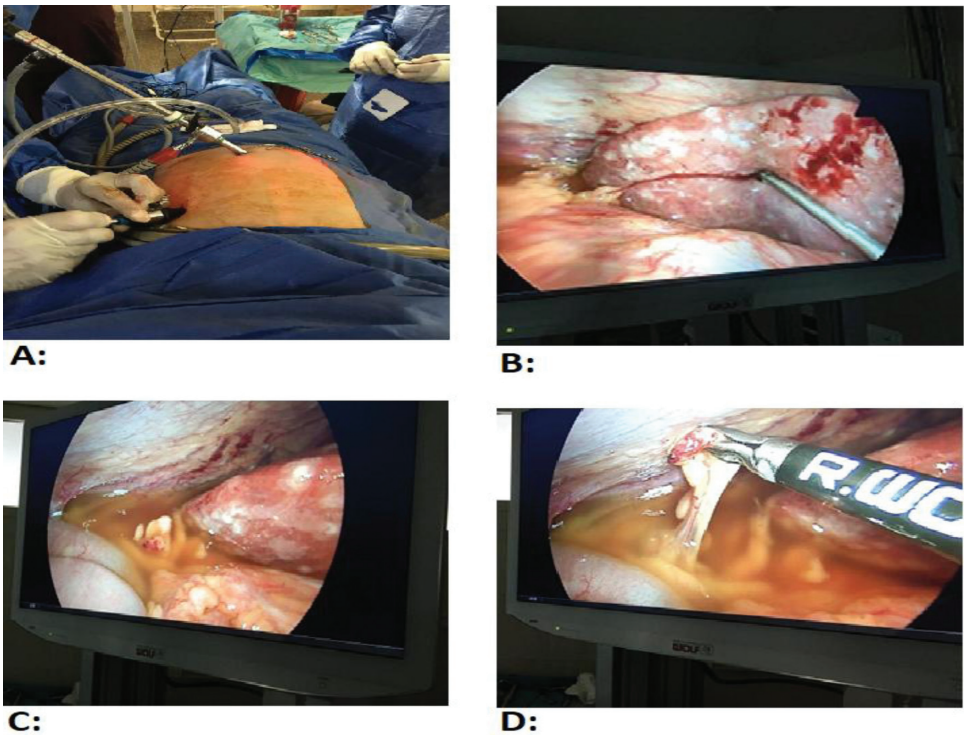
(8) Laparoscopy techniques:

The procedure was performed under general anesthesia. Infra-umbilical incision port (10 mm in diameter) was used for camera. Carbon dioxide was insufflated in the peritoneal cavity; meanwhile, the pressure within the pneumoperitoneum was maintained at 15 mmHg all over the procedure. Two ports in the midclavicular lines at right and left sides of abdomen 3 cm above the level of umbilicus for grasper and hook were used. Exploration of the whole abdomen was done. A systematic survey was undertaken by the laparoscopy operator for the presence of ascites and peritoneal adhesions. A carful note was made on the liver (size, color, nodularity, suspicious lesions, etc.) and on the degree of vascularity of the falciform ligament. The surface of gall bladder, spleen, intestine, colon, omentum, as well as the pelvic cavity (ovaries, fallopian tubes, and uterus in females) were examined. The presence of abdominal masses was reported. Laparoscopy-guided biopsies by grasping biopsy forceps (4 in number) were taken from peritoneal tubercles, suspected unhealthy omentum, peritoneal thickening, and intra-abdominal masses for histopathology. The wound was closed by one or two mattress sutures. Immediately after that, a report on the laparoscopic findings was written. The patients were observed for 24 h with regular check of blood pressure and pulse.

Ethical consideration

Approval from medical ethical committee of Assiut Faculty of Medicine was taken. Each patient gave his/her written consent to participate in the study.

Figure 1



(a) Sites of trocars. (b) Biopsy from tubercles. (c) Aspiration from ascetic fluid. (d) Biopsy from omentum.

Results

Complication during laparoscopy was bleeding at the trocar site, which was controlled by stitching in one (2.3%) patient, and wound infection in two (4.7%) patients, which was managed by broad-spectrum antibiotics (Fig. 1 and Tables 1–5).

Discussion

A very long list of pathological conditions that can cause ascites is self-evident or becomes elucidated after completion of a relatively simple and nonsurgical diagnostic workup. However, in a number of cases, routine tests fail to reach the cause of the fluid collection [7–9].

Conventionally, the type of ascites is either exudates or transudates according to ascitic protein concentration more than 2.5 g/dl or less than 2.5 g/dl, respectively. The purpose of this subdivision is to narrow the differential diagnosis of the etiology of ascites. The

Table 1 Demographic and clinical data of all patients with ascites

Variables	*n* (%)
Sex	
Male	20 (46.5)
Female	23 (53.5)
Age (mean±SD)	40±15.3
Abdominal findings	
Yes	40 (93)
No	3 (7)
Presence of fever (low grade)	
Yes	11 (25.6)
No	32 (74.4)
Loss of weight	
Yes	5 (11.6)
No	38 (88.4)
Other body swelling	
Yes	6 (14)
No	37 (86)
Associated medical disease	
Yes	15 (34.9)
No	28 (65.1)

Table 2 Baseline laboratory data of all patients with ascites

Total bilirubin (μmol/l)[a]	8.50 (0.8–76)
Serum protein (g/l)[b]	66.6±9.1
Serum albumin (g/l)[b]	31.8±6.3
AST (U/l)[a]	26 (10–123)
ALT (U/l)[a]	17.50 (8–58)
ALP (U/l)[a]	89 (31–185).
Prothrombin time (seconds)[b]	13.1±1.8
INR[b]	1.10±0.3
Hb (g/dl)[b]	10.7±1.8
WBCs ($\times 10^3$/μl)[b]	6.5±2.9
PLT ($\times 10^3$/μl)[a]	311 (88–590)
ESR (first hour)[a]	41.50 (4–105)
ESR (second hour)[a]	77.50 (10–115)
Aspect of ascitic fluid[c]	
Clear	12 (27.9)
Turbid	31 (72.1)
Types of ascitic fluid[c]	
Exudate	41 (95.4)
Transudate	2 (4.6)
Ascitic fluid protein (g/dl)[a]	4.80 (2.4–7.3)
Ascitic fluid albumin (g/dl)[a]	2.8 (1.50–3.8)
SAAG[c]	
Portal hypertensive ascites	2 (4.7)
None portal hypertensive ascites	41 (95.3)
Ascitic fluid cytology[c]	
Lymphocyte predominance.	33 (76.7)
Neutrophil predominance.	10 (23.3)
Positive Ziehl–Neelsen for acid-fast bacilli from ascitic fluid[c]	6/43 (14)
Culture from ascitic fluid (2) and or peritoneal biopsies (20) for TB	
Positive	2 (4.7)
Negative	41 (95.3)

ALP, alkaline phosphate; ALT, alanine aminotransferase; AST, aspartate aminotransferase; ESR, erythrocyte sedimentation rate; HB, hemoglobin; INR, international normalized ratio; PLT, platelet; SAAG, serum ascites albumin gradient; TB, tuberculosis; WBC, white blood cell. [a]Data were presented as median and range. [b]Data were presented as mean±SD. [c]Data were presented as number and percentage.

Table 3 Abdominal computed tomography findings

Variables	*n* (%)
Ascites with enlarged mesenteric LNS and dilated bowel loops	13 (30.2)
Nodular peritoneal thickening with ascites	10 (23.2)
Ascites with dirty mesenteric fat and upper abdominal lymphadenopathy	2 (4.7)
Ascites with stranding of omentum and adhesions	15 (34.9)
LC, ascites, mediastinal, and abdominal LNs	3 (7)

Table 4 Laparoscopic findings

Variables	*n* (%)
Ascites with extensive adhesions	3 (7)
Ascites only	22 (51.1)
Ascites with multiple tubercle (discrete or matted) studied the peritoneum, omentum with extensive adhesions	15 (34.9)
Intra-abdominal masses (exophytic gastric mass, right colonic mass, and appendicular mass)	3 (7)

Table 5 Pathological findings

Variables	*n* (%)
TB granuloma	22 (51.1)
Chronic nonspecific inflammation of the peritoneum with little reactive fibrosis	15 (34.9)
Omental fatty tissue with multiple small foci infiltrated with chronic inflammatory cells	3 (7)
Malignancy	3 (7)
Moderately differentiated adenocarcinoma of the stomach	
Poorly differentiated adenocarcinoma of the colon	
Carcinoid tumor of the appendix	

TB, tuberculosis.

Table 6 Comparison of our study with similar studies

Study by Luck *et al.* [16]	Study by Han *et al.* [17]	Study by Kulkarni *et al.* [18]	Study by Mohamed *et al.* [19]	Our study.
Cirrhosis in 4 (12.1%)	Cirrhosis in 19 (10.8%)	Cirrhosis in 4 (5.6%)	Peritonitis in 2 (6.25%)	Peritonitis in 15 (34.9%)
Malignancy in 7 (21.2%)	Malignancy in 99 (56.2%)	Malignancy in 18 (25%)	Malignancy in 24 (75%)	Malignancy in 3 (7%)
Granulomatous inflammation in 20 (60.6%)	Tuberculous peritonitis in 31 cases (17.6%)	Tuberculosis in 40 (55.5%)	Tuberculosis in 6 (18.75%)	Tuberculosis in 22 (51.1%)
Budd-Chiari syndrome in 1 (3%)	Miscellaneous causes in 27 (15.4%)	Peritonitis in 2 (2.8%)		Unknown in 3 (7%)
Unknown in 1 (3%)		Unknown in 8 (11.1%)		

exudative ascites include tuberculous and malignant ascites, whereas the transudative ascites include liver cirrhosis, heart failure, and renal failure. However, in rare situations, the diseases that are believed to cause exclusively exudative ascites may present with transudates and vice versa [10,11].

Laparoscopy offers a minimally invasive procedure for such obscured or doubtful cases and enables the surgeon to obtain biopsy specimens for histological diagnosis without causing any significant morbidity, even to elderly and frail patients [12,13].

The causes of ascites of unknown origin vary according to geographic area and ethnic origin. The study from the United States revealed that ~60% of 51 cases with undiagnosed ascites were shown to have chronic liver disease or intra-abdominal malignancy by laparoscopy [11]. Another study from Africa revealed that 40% of 92 cases with undiagnosed ascites proved to have tuberculous peritonitis [14]. Moreover, Makhlouf *et al.* [15], found 80% of cases of obscure ascites in our locality were owing to tuberculous peritonitis.

Our study matched with previous mentioned studies included in the previous table (Table 6), which conclude the laparoscopy can reach the diagnosis of unknown etiology in more than 90% of cases. In conclusion, laparoscopy is an important tool of assessing the peritoneal cavity in patients with

unexplained ascites when the etiology remains unclear. Complications of laparoscopy are rare provided that a careful and standardized technique of entry is established and the diagnosis can be accurately made with selective biopsy specimens, and appropriate treatment can then be instituted without delay.

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Conflicts of interest

There are no conflicts of interest.

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