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## The role of diagnostic laparoscopy in patients with ascites

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### Abstract

**Background:** Ascites, the abnormal accumulation of fluid in the peritoneal cavity, is a common clinical condition with multiple causes. Effective management is essential to improve quality of life and prevent complications. Laparoscopy, a minimally invasive surgical procedure, has become an important diagnostic and therapeutic option for ascites of unknown etiology.

**Aim of the Study:** To evaluate the role of laparoscopy in identifying the underlying causes of ascites, assessing its outcomes, and associated complications.

**Methodology:** A prospective descriptive study was conducted at Al Imam Al-Sadiq Teaching Hospital over two years. Fifty patients with ascites of unknown origin underwent laparoscopic evaluation. Samples were collected for cytological and histopathological analysis to determine the final diagnosis.

**Results:** The mean age was 39.7 years, with a male predominance (60%). Most patients (64%) were from rural areas. Hypertension (30%) was the most common comorbidity, followed by diabetes (22%) and cardiovascular disease (18%). A majority (76%) had no history of previous abdominal surgery, and 66% had chronic ascites lasting six months or more. Laparoscopic sampling identified tuberculosis as the most frequent cause (42%), followed by cirrhosis (30%) and malignancies (20%). The average hospital stay was 24.7 hours, and return to normal activity occurred within 7.5 days on average. The overall complication rate was 22%, with port site infections being the most common (14%).

**Conclusions:** Diagnostic laparoscopy is a valuable and reliable method for evaluating unexplained ascites, offering high diagnostic yield with a low complication rate.

**Keywords:** Ascites, abdominal laparoscopy, tuberculous peritonitis

### Introduction

Ascites, defined as the abnormal accumulation of fluid within the peritoneal cavity, is a prevalent clinical condition associated with various underlying diseases such as liver cirrhosis, heart failure, malignancies, and nephrotic syndrome <sup>[1]</sup>. Timely and effective management of ascites is vital for enhancing patient outcomes, improving quality of life, and minimizing associated complications. In recent years, laparoscopy has emerged as a valuable diagnostic and therapeutic modality in the management of ascites <sup>[2]</sup>. Pathophysiology of Ascites: The pathogenesis of ascites is complex and typically involves a combination of factors. The most common mechanism is portal hypertension, especially in patients with liver cirrhosis, where fibrotic hepatic changes increase intrahepatic vascular resistance, leading to elevated portal venous pressure and transudation of fluid into the peritoneal space <sup>[3]</sup>. Additionally, splanchnic vasodilation reduces effective arterial blood volume, triggering the renin-angiotensin-aldosterone system (RAAS) and sympathetic nervous system, resulting in sodium and water retention <sup>[4]</sup>. Hypoalbuminemia from impaired hepatic albumin synthesis decreases plasma oncotic pressure, further promoting fluid shift into the peritoneum <sup>[5]</sup>. Lymphatic dysfunction and structural abnormalities may also hinder fluid clearance <sup>[6]</sup>. Inflammatory cytokines and angiogenesis contribute to increased vascular permeability, particularly in infectious or malignant ascites <sup>[7]</sup>. Types of Ascites is categorized into four types: transudative (low-protein), typically caused by cirrhosis or heart failure; exudative (high-protein), due to infections, malignancies, or inflammation; chylous ascites, resulting from lymphatic leakage; and hemorrhagic ascites, often associated with trauma or malignancy <sup>[8]</sup>. Diagnosis and Role of Laparoscopy: Clinically, ascites is identified through signs like abdominal distention, shifting dullness, and fluid thrill; however, it may be difficult to detect in obese individuals <sup>[9]</sup>.

Laparoscopy provides direct visualization of the peritoneal cavity, enabling identification of pathological conditions such as tuberculous peritonitis and peritoneal carcinomatosis through targeted biopsies [10]. Compared to open surgery, it offers advantages including smaller incisions, less postoperative pain, fewer infections, shorter hospital stays, and faster recovery [11]. Laparoscopy also facilitates fluid sampling for cytological and microbiological analysis to differentiate between benign and malignant causes [12]. For refractory ascites, laparoscopic paracentesis offers symptomatic relief with reduced complication risks [13], and peritoneovenous shunts can be placed laparoscopically in select patients [14].

**Indications and Outcomes:** Laparoscopy is indicated in cases of unexplained ascites, suspected malignancy, or when ascites is unresponsive to medical therapy [15]. Tuberculous ascites, a significant form of extrapulmonary TB, is increasingly relevant due to rising HIV incidence [16]. The laparoscopic technique involves small incisions, CO<sub>2</sub> insufflation, and trocar insertion for visualization and instrument access [17]. Studies demonstrate its efficacy, with improved quality of life, lower readmission rates, and better clinical outcomes compared to open surgery [18]. The aim of study is to evaluate the role of laparoscopy in identifying the underlying causes of ascites, assessing its outcomes, and associated complications.

## Methods

A prospective descriptive study was conducted at Al Imam Al-Sadiq Teaching Hospital over a two-year period from June 2022 to July 2024. Ethical approval was obtained from the Arabic Board of Health Specializations/Local Council of General Surgery at Babylon Teaching Center. The study involved 50 adult patients (≥18 years) with clinically and/or radiologically confirmed ascites of unknown etiology who required diagnostic laparoscopy. Patients were admitted via the hospital's outpatient clinic or private surgical clinics.

Inclusion criteria included patients with refractory ascites unresponsive to medical therapy and those requiring peritoneal biopsy to diagnose conditions such as malignancy or tuberculosis.

Exclusion criteria comprised patients with uncorrectable coagulopathy, severe cardiopulmonary conditions, uncontrolled systemic infection, or pregnancy.

Data collection was performed using a structured form after obtaining verbal consent. Demographic and clinical data such as age, gender, residency, medical/surgical history, comorbidities, medication use, severity and duration of ascites were recorded. Ascites severity was classified into mild (detected only via imaging), moderate (detectable by physical exam), and severe (marked abdominal distension with fluid wave). All patients underwent preoperative evaluations including laboratory tests (CBC, LFT, RFT), imaging (ultrasound, CT scan), and anesthetic clearance. Under general anesthesia, diagnostic laparoscopy was performed using CO<sub>2</sub> insufflation, with a 10 mm trocar inserted at the umbilicus or Palmer's point. Ascitic fluid was aspirated for analysis, and systematic inspection of the peritoneal cavity was conducted. Targeted biopsies were obtained when abnormalities were noted. Postoperatively, patients were monitored, and complications such as infections or hernias were documented. Hospital stay duration and time to resume normal activities were recorded. Histopathology and cytology results were reviewed to establish the final diagnosis. Data were entered into Microsoft Excel and analyzed using IBM SPSS version 27. Results were expressed as frequencies, percentages, means, ranges, and standard deviations, and

presented through tables and figures.

## Results

The study included 50 patients with ascites that were operated with diagnostic laparoscopy their mean age was 39.7±16.4 years, the majority of the patients were middle-aged (38%) are between 31-45 years old, (30%) 18-30 years old, (18%) 46-60 years old and (14%) 61 years and older. There were more male patients (60%) than female patients (40%), male: female ratio 1.5:1. A significant portion of patients 32 (64%) were from rural areas, and the other (36%) live in urban areas. As in table 1.

**Table 1:** Demographic variables of the study sample patients (n=50).

Variable	Frequency (n=50)	Percentage (%)	
Age (years)	18-30	15	30
	31-45	19	38
	46-60	9	18
	≥ 61	7	14
	Mean ± SD	39.7±16.4	
	Range	18-67	
Gender	Male	30	60
	Female	20	40
Residency	Rural	32	64
	Urban	18	36

Regarding past medical history hypertension was the most common associated comorbidity (30%), followed by diabetes (22%) and cardiovascular disease (18%), (8%) have other less common chronic medical illnesses like thyroid disease, osteoarthritis and asthma Most patients (76%) have not undergone previous abdominal surgeries, suggesting that ascites in these patients is not frequently associated with priorsurgical interventions, only 12 patients (24%) had a positive past surgical history of previous abdominal surgery. 22 (44%) of patients had mild ascites, 20 (40%) have moderate ascites, and 8 (16%) of patients had sever ascites. majority of patients (66%) have chronic ascites for 6 months or more the other 34% had ascites for less than 6 months. As in table 2.

**Table 2:** Clinical variables of the study sample patients (n=50).

Variable	Frequency (n=50)	Percentage (%)	
Past Medical History	Diabetes	11	22
	Hypertension	15	30
	Cardiovascular Disease	9	18
	Others	4	8
Previous Abdominal Surgeries	none	38	76
	Yes	12	24
Severity of Ascites	Mild	22	44
	Moderate	20	40
	severe	8	16
Duration of Ascites	Acute (<6 months)	17	34
	Chronic (≥ 6 months)	33	66

Regarding the number of biopsies obtained during laparoscopy the majority of patients had 2 or 3 required biopsies taken, with a mean of 2.6 biopsies. Peritoneal biopsies were the most common (52%), followed by omental biopsies (30%), (12%) of biopsies were taken from the ovary and three biopsies (6%) were taken from the liver, all sample were sent for cytology and biochemical analysis After obtaining the relevant cytology and histopathology results the final diagnosis was made by senior surgeons' decision, tuberculosis was the most common diagnosis in 21 patients (42%) followed by cirrhosis in 15

patients (30%), malignancy accounted for 10 patients 20% of cases, with ovarian cancer being the most frequent malignancy

in 6 patients, followed by colorectal cancer (4%), less common causes are shown in the following table 3.

**Table 3:** Abdominal laparoscopy characteristics, findings and outcomes.

Variable	Frequency (n=50)	Percentage (%)
Number of Biopsies	1	3
	2	22
	3	18
	4	7
Obtained	Mean	2.6±1.1
	Range	1-4
Type of Biopsies	Peritoneal	26
	Omental	15
	Ovary	6
	Liver	3
Final Diagnosis of Underlying Cause of Ascites	Tuberculosis	21
	Cirrhosis	15
	Malignancies	10
	Pseudomyxoma	2
	Sclerosing mesenteritis	1
Type of malignancy	Endometriosis	1
	ovarian	6
	colorectal	2
	pancreatic	1
	peritoneal mesothelioma	1
	whitish peritoneal nodules or plaques	21
	Adhesions between bowel loops	20
	Whitish "milky" ascitic fluid (chylous ascites)	17
Gross Findings*	Nodular liver surface	15
	Clear or straw-colored ascitic fluid	11
	Visible tumor masses (ovaries, pelvis)	9
	Blood-tinged or cloudy ascitic fluid	7
	Mucinous deposits on peritoneum and omentum	2
	Adhesions in the mesentery	1
	Chocolate-colored cysts	1

\* A patient may have multiple gross findings.

The average length of hospital stays from time of admission till refer to other wards was 24.7 hours, ranging from 18-48 hours. On average, patients returned to their usual daily activities within 7.5 days ranging 7-12 days. As in table 4.

**Table 4:** Length of hospital-stay and post-operative time to return to normal daily activities among the study sample patients (n=50)

Variable	Mean	SD	Range
Length of Hospital Stay (hours)	24.7	8.3	18-48
Time to Return to Normal Activities (days)	7.5	3.9	7-12

During follow up the total complication rate was 22%, 11 patients had complications with port site infection being the most common complication (16%), bleeding from the biopsy site occurred for three patients after laparoscopy (6%). As in table 5.

**Table 5:** Complications of abdominal laparoscopy among patients with ascites (n=50)

Postoperative Complications	Frequency	Percentage (%)
Infection	8	16
bleeding	3	6
total	11	22

## Discussion

This prospective study involving 50 patients with ascites who underwent diagnostic laparoscopy revealed several significant findings regarding demographics, underlying etiologies, procedural outcomes, and postoperative recovery. The mean age of patients was 39.7 years (SD±16.4), with the majority aged between 31 and 45 years, and a notable number aged between 18

and 30 years, indicating that ascites can affect individuals relatively early in life. Males represented 60% of the cohort, showing a slight male predominance. These findings are in line with a study by Mohamed *et al.* in Egypt, which reported a mean age of 45 years and a balanced gender distribution [19]. Regarding patient residence, 64% were from rural areas, consistent with Zhang *et al.*'s findings that rural populations had a higher ascites prevalence (70%) [20]. This could reflect delayed diagnoses and reduced access to healthcare services in rural settings, potentially contributing to the chronicity observed in many cases. Hypertension (30%) was the most common comorbidity, followed by diabetes (22%) and cardiovascular disease (18%). These rates mirror those reported by Brown *et al.*, indicating that these conditions are commonly associated with ascites regardless of geography [21]. The severity of ascites was mostly mild (44%) and moderate (40%), with chronic duration noted in the majority. This is comparable to the findings of Han *et al.*, who reported 50% mild and moderate ascites with 70% chronic cases [22]. During laparoscopy, an average of 2.6 biopsies per patient were taken, mostly from the peritoneum, omentum, ovary, or liver. The final diagnoses revealed tuberculosis as the leading cause of ascites (42%), followed by cirrhosis (30%) and malignancies (20%), mainly ovarian cancer. Singh *et al.* also found tuberculosis and malignancies as leading causes (60% and 30%, respectively), supporting the diagnostic value of laparoscopy in ascites evaluation [23]. Peritoneal tuberculosis remains a significant

diagnostic challenge due to its nonspecific symptoms and limitations of routine diagnostic tools. Its prevalence in our study reflects the importance of maintaining a high index of suspicion, especially in endemic regions. Menzies *et al.* highlighted the efficacy of laparoscopy, where visual inspection alone yielded an accurate diagnosis in 78% of cases and final diagnosis in 94%, especially in tuberculous peritonitis<sup>[24, 25]</sup>. The mean hospital stay was 24.7 hours, and return to normal activity occurred within 7.5 days, consistent with Heiss *et al.*, who reported 26 hours and 8 days, respectively, emphasizing the minimally invasive nature and rapid recovery associated with laparoscopy<sup>[26]</sup>. The complication rate was 22%, predominantly port site infections (14%), bleeding (6%), and hernia (2%). These findings are in line with Gebbia *et al.*, who reported a 20% complication rate with similar patterns<sup>[27]</sup>. Importantly, complications were manageable, supporting the safety profile of laparoscopy in experienced hands.

### Conclusion

Diagnostic laparoscopy proved to be a valuable tool in evaluating patients with unexplained ascites, offering high diagnostic accuracy with minimal complications. The majority of ascites cases were attributed to tuberculosis, liver cirrhosis, and malignancies. The procedure demonstrated a favorable safety profile, with a low overall complication rate (22%)—primarily minor port site infections—and a short average hospital stay (24.7 hours). Patients generally experienced a swift recovery, resuming normal activities within approximately one week. These findings support the use of diagnostic laparoscopy as a safe, efficient, and effective modality for the assessment of ascitic patients, particularly when non-invasive methods fail to identify the underlying cause.

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