

Diagnostic Laparoscopy in Ascites of Unknown Origin: Chang Gung Memorial Hospital 20-year Experience

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Background: Ascites may appear with well-recognized disease but, in some situations, ascites is of unknown cause in spite of comprehensive study. The aim of this study was to assess the diagnostic accuracy of laparoscopy in patients with ascites of unknown origin, and evaluate the role of laparoscopy in this population after the advent of ultrasonography and computed tomography.

Methods: We collected 20 years' data of diagnostic laparoscopy from retrospective chart review at Chang Gung Memorial Hospital in Linkou and Taipei. We compared the first 10 years' data with the latter 10 years, in respect of surgical technique evolution and the different contributions of ascites.

Results: One hundred and seventy six patients who underwent laparoscopy for ascites of unknown origin were enrolled. They included: (1) carcinomatosis peritonei in 99 cases (56.2%); (2) tuberculous peritonitis in 31 cases (17.6%); (3) cirrhosis in 19 cases (10.8%); and (4) miscellaneous diagnoses in 27 cases (15.4%). Comparing the first 10 years' data with the latter 10 years', the distribution was nearly the same. Carcinomatosis peritonei accounted for the majority of cases and, with the evolution of anti-tuberculosis medicine, the number of tuberculosis cases is decreasing. Liver cirrhosis cases increased during the latter 10 years.

Conclusion: Laparoscopy in combination with biopsy can clarify the causes of unexplained ascites in the majority of cases: it failed to reveal any gross abnormality in only 15% of cases. Therefore, laparoscopy is a valuable tool for the detection of the cause of unexplained ascites.

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Key words: ascites, laparoscopy, carcinomatosis peritonei, tuberculous peritonitis, liver cirrhosis

Ascites is a consequence or combination of many different underlying diseases, such as liver cirrhosis, neoplasm, tuberculous peritonitis, pyogenic peritonitis, congestive heart failure, nephrosis and pancreatic ascites.^(1,2)

The standard procedure to access ascites

includes laboratory examinations (cell count, albumin level, total protein level, Gram stain, culture and cytology) and image investigations (chest and plain abdominal films, ultrasound and computed tomography (CT) scan). The cause of ascites can be identified in the majority of patients by clinical and con-

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ventional laboratory examinations but occasionally it cannot be determined without further investigation. Thus, we define ascites of unknown origin as the etiology of ascites that cannot be determined after conventional laboratory examinations (including cell count, albumin level, total protein level, Gram stain, culture and cytology) and further imaging investigations (including ultrasound and CT scan). This poses a major diagnostic challenge for clinicians.

Tuberculous peritonitis is best diagnosed by peritoneal biopsy since cultures of peritoneal fluid for tuberculosis may require 6 weeks. Diagnostic paracentesis may be part of the routine evaluation of patients with ascites but accuracy is always in doubt. Diagnostic paracentesis is incapable of evaluating the dissemination or feasibility of surgery for cancer. Accurate diagnosis allows accurate therapy to be started promptly.⁽³⁾

Laparoscopy as a minimally invasive technique has developed rapidly in recent years. Laparoscopy has long played an important role in the evaluation of ascites when its cause cannot be clarified clinically.⁽⁴⁾ Application of diagnostic laparoscopy allows direct visualization of the abdomino-pelvic peritoneum/organs, and may disclose peritoneal deposits of tumor, tuberculosis or disseminated metastatic cancer. Biopsy can be taken with direct vision, often adding to the diagnostic accuracy of the procedure. Although the utility of diagnostic laparoscopy has recently been questioned, possibly because of the advent of various non-invasive scanning techniques,^(5,6) it is a reliable technique for the investigation of patients presenting with ascites and in whom the diagnosis remains obscure.^(7,8) The diagnosis can be accurately made with selective biopsy specimens and appropriate treatment can be instituted without delay.⁽⁹⁾ In this report, we describe our experience using laparoscopy to determine causes of unexplained ascites in Taiwan.

METHODS

This is a retrospective study from chart review. We collected data on cases (both male and female) from a 20-year period, from 1985 to 2005, who underwent diagnostic laparoscopy to determine the causes of ascites at Chang Gung Memorial Hospital in Linkou and Taipei, Taiwan. All the patients underwent laparoscopy for the evaluation of ascites after

appropriate clinical and laboratory examinations, including ultrasonography or CT, had failed to reveal the cause. There are three major centers for these procedures: (1) the Liver Unit, Department of Hepato-Gastroenterology; (2) Minimally Invasive Surgery Center in Gynecology Endoscopy, and (3) Division of General Surgery.

Procedures took place under local anesthesia using 1% lidocaine and intravenous sedation, with varying doses of meperidine and diazepam, in the Liver Unit, Department of Hepato-Gastroenterology. The main trocar placement was often at a point 2 to 4 cm below the umbilicus and 2 cm to the right of the midline. Laparoscopic examination was performed with either a 10 mm 0° forward-viewing or a 10 mm 30° oblique-viewing Olympus telescope (Olympus Optical Co., Tokyo, Japan). Alternatively, procedures took place under general anesthesia in an operating room setting in the Division of Gynecology Endoscopy and in General Surgery. The main trocar was over the umbilicus when adequate pneumoperitoneum was reached by means of an insufflation needle. Then, a 5 or 10 mm 0° forward-viewing laparoscope was introduced for diagnosis, and biopsy of the suspicious lesion was performed through an assistant trocar.

In selected cases, lancet-shaped rigid biopsy forceps were used to sample peritoneal surface lesions.

The visual diagnosis of tuberculous peritonitis was based on the presence of multiple yellowish-white miliary tubercles of uniform size (usually < 5 mm) on the visceral and parietal peritoneum (Fig. 1A). Carcinomatosis peritonei was diagnosed by the presence of large nodules (1 to 5 cm in diameter) on the parietal peritoneum, omentum, falciform ligament or liver surface (Fig. 1B). Liver cirrhosis was diagnosed by the presence of irregular nodules with circumferential depression on the liver surface, and enlarged vessels on the falciform ligament and the greater omentum. The histological diagnosis of tuberculous peritonitis was based on the presence of caseating granulomas or non-caseating granulomas with Langhans giant cells or acid-fast bacilli.

RESULTS

The final diagnoses in the 176 patients who underwent laparoscopy for ascites of unknown origin are listed in Table 1 and included: (1) carcinomatosis

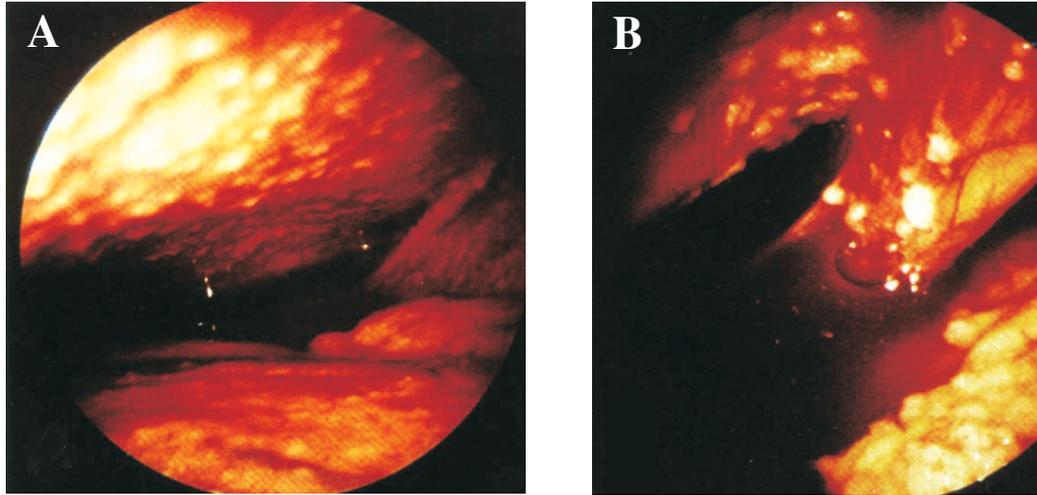


Fig. 1 (A) Tuberculous peritonitis: numerous small yellowish-white nodules of uniform size are present on the parietal peritoneum. (B) Carcinomatosis peritonei: large nodules of various sizes are present on the omentum.

peritonei in 99 cases (56.2%), of which 84 were verified by histology and 15 by cytology; (2) tuberculous peritonitis in 31 cases (17.6%), of which 27 were verified by histology and 4 were diagnosed by typical laparoscopic features, presence of an associated focus of tuberculosis elsewhere and response to chemotherapy; (3) cirrhosis in 19 cases (10.8%) (Histological examination of patients with cirrhosis and massive ascites was not regularly done in our practice, although ascites was not a contraindication for laparoscopic liver biopsy.); and (4) miscellaneous

diagnoses. Fourteen (72.2%) of the 27 patients without gross laparoscopic abnormality had underlying disease identified as a cause of ascites, as shown in Table 2.

Results of cytologic studies of ascitic fluid performed before laparoscopy were positive for malignancy in 43 (43.4%) of 99 patients with carcinomatosis peritonei. However, none of the patients with tuberculous peritonitis (n = 31), cirrhosis (n = 19) or other causes of ascites (n = 18) showed positive cytology before laparoscopic examination. Culture of ascitic fluid for tuberculosis bacilli was positive in only 9.6% (3/31) of patients with tuberculous peritonitis.

During laparoscopic examination, there were two major and seven minor complications. Two intestinal perforations occurred in patients with

Table 1. Laparoscopic Visual and Histological Diagnosis of Ascites of Unknown Origin

Visual diagnosis	No. of Cases	Histological diagnosis	No. of Cases
Tuberculous peritonitis	31	Tuberculosis	27
		Chronic peritonitis	2
		Biopsy failure	2
Carcinomatosis peritonei	99	Malignancy	84
		Adenocarcinoma (79)	
		Lymphoma (4)	
		Mesothelioma (1)	
		Tuberculosis	4
		No pathological diagnosis	9
Liver cirrhosis	19	Not done	
Normal	27	Not done	

*: Interference by multiple thick adhesions.

Table 2. Final Clinical Diagnosis of Ascites without Gross Laparoscopic Abnormality

Diagnosis	No. of Cases
Chronic renal failure	7
Systemic lupus erythematosus	3
Constrictive pericarditis	3
Chronic pancreatitis with chylous ascites	1
Retroperitoneal lymph node metastasis with chylous ascites	1
Unknown	12
Total	27

tuberculous peritonitis due to severe adhesion and were classified as major complications. Minor complications included leakage of ascites (n = 2), subcutaneous emphysema (n = 4) and one wound infection. No mortality related to the laparoscopic examination occurred.

The sensitivity and specificity of laparoscopic visual diagnosis for tuberculous peritonitis were 86% and 100%, respectively, and for carcinomatosis peritonei were 100% and 94%, respectively. Laparoscopic visual diagnosis combined with histological diagnosis accurately identified all patients with tuberculous peritonitis and carcinomatosis peritonei.

DISCUSSION

The causes of ascites include a very long list of pathological conditions that may arise primarily in several intraperitoneal or extraperitoneal organs. Despite this apparent difficulty when making the differential diagnosis of ascites, frequently its cause is self-evident or becomes elucidated after completion of a relatively simple and nonsurgical diagnostic work-up. Nevertheless, in a number of cases, the clinical picture appears more complex or the routine tests fail to disclose the source of the fluid collection. Frequently, in such cases, a malignant tumor or a rare and potentially fatal cause of ascites may be present within the peritoneal cavity.⁽¹⁰⁻¹²⁾

The use of ascitic protein in the differential diagnosis of the causes of ascites is much overrated and misinterpreted. Conventionally, the type of ascites is divided into exudates and transudates: ascitic protein concentration more than 2.5 g/dL or less than 2.5 g/dL, respectively. In our study, 154 (87.5%) had high protein (> 2.5 g/dL) ascites.

The purpose of this subdivision is to narrow the differential diagnosis of the causes of ascites. The nature of tuberculous peritonitis and carcinomatosis peritonei is exudate, while the ascites of liver cirrhosis, heart failure and renal failure is transudate. However, not infrequently diseases that are believed to cause exclusively exudative ascites may present with transudates and vice versa.^(15,16)

Laparoscopy offers a minimally invasive tool for the investigation of such undiagnosed or doubtful cases. It provides a thorough and magnified view of the peritoneal cavity, and enables the surgeon to

obtain biopsy specimens for histological diagnosis without causing any significant morbidity, even to elderly and frail patients.^(13,14)

Tuberculous peritonitis is best diagnosed by peritoneal biopsy since cultures of peritoneal fluid for tuberculosis may require 6 weeks. Diagnostic paracentesis may be part of the routine evaluation of patients with ascites but accuracy is always in doubt. Diagnostic paracentesis is incapable of evaluating the dissemination or feasibility of surgery for cancer. Accurate diagnosis allows appropriate therapy to be started promptly.

Application of diagnostic laparoscopy allows direct visualization of the abdomino-pelvic peritoneum/organs, and may disclose peritoneal deposits of tumor, tuberculosis or disseminated metastatic cancer. Biopsy can be taken with direct vision, often adding to the diagnostic accuracy of the procedure.

In this study, procedures that took place in the first 10 years (1985~1995) were performed mainly in the Liver Unit, Department of Hepato-Gastroenterology.⁽³⁾ For the latter 10 years (1996~2005), procedures shifted to the Minimal Invasive Surgery Center in Gynecology Endoscopy and the Division of General Surgery.

The causes of ascites of unknown origin appear to vary considerably with geographic area and ethnic origin. One laparoscopic study from the United States revealed that about 60% of 51 cases with undiagnosed ascites were shown to have chronic liver disease or intra-abdominal malignancy.⁽¹⁶⁾ Another study from Africa indicated that 40% of 92 cases with undiagnosed ascites proved to have tuberculous peritonitis.⁽¹⁸⁾

The latest study published concerns nine patients with undiagnosed ascites who were investigated with laparoscopy in Greece. Five of them had peritoneal carcinomatosis and three were found to have military peritoneal tuberculosis.⁽⁸⁾

Nineteen cases (10.8%) with ascites of unknown origin in this series were proved to have liver cirrhosis, which could not be diagnosed by CT or ultrasonography. These results seem to be compatible with the suggestion that laparoscopy is a much more reliable method of diagnosis in liver cirrhosis than are other imaging methods.⁽¹⁹⁻²²⁾

In our study, comparing the first 10 years' data with the latter 10 years', the distribution was nearly the same. Carcinomatosis peritonei accounted for the

majority of cases and, with the evolution of anti-tuberculosis medicine, the number of tuberculosis cases is decreasing. Liver cirrhosis cases increased during the latter 10 years (Table 3).

In conclusion, laparoscopy is a valuable means of assessing the peritoneal cavity in patients with unexplained ascites when the primary cause remains unclear. With a careful and standardized technique of entry, complications are rare, the diagnosis can be accurately made with selective biopsy specimens and appropriate treatment can then be instituted without delay, which is particularly important in patients with malignant ascites and widespread tumors.

Table 3. Comparison of the First 10 Years' Data with the Latter 10 Years' Data

Visual diagnosis	1985 ~ 1995	1996 ~ 2005
	No. of cases	No. of cases
Tuberculous peritonitis	31 (17.6%)	5 (10.6%)
Carcinomatosis peritonei	99 (56.3%)	21 (44.7%)
Liver cirrhosis	19 (10.8%)	12 (25.5%)
Normal	27 (15.3%)	9 (19.1%)

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診斷性腹腔鏡應用於不明原因之腹水： 長庚醫院二十年來的經驗

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背景： 某些腹腔內病灶，與一些源自腹膜外的疾病或腫瘤，甚至是全身性的疾病，皆會導致腹水的生成。在大多數的病例中，腹水可以找到明確的原因，但在一些病例中，雖然做了詳細的檢查，腹水還是不明原因。腹腔鏡是一種可以直接檢視肝臟及腹膜表面而且對懷疑的病灶作病理切片的微創檢查方式。

方法： 我們藉由回顧病歷的方式，收集了林口及台北長庚二十年來，對於不明原因之腹水採用診斷性腹腔鏡的經驗。同時比較前十年與後十年間手術方式的演進及不明原因腹水的成因與分布。

結果： 有176位病患在不明原因腹水的診斷上使用了腹腔鏡，其診斷結果如下：(1) 99位病患為癌症造成之腹膜擴散(佔56.2%)。(2) 有31位病例為結核性腹膜炎(佔17.6%)。(3) 19位病例是肝硬化(佔10.8%)。(4) 沒有明確的發現有27個病例(佔15.4%)。比較前後十年的資料可以發現這四種診斷結果分布大致上相同。癌症造成之腹膜擴散仍然佔了最大之比例。而由於結核病治療的進步，使得結核性腹膜炎有下降的趨勢。肝硬化的比例則有上升的情形。

結論： 腹腔鏡同時加上病理切片可以在大多數不明原因腹水的病患中找到成因，僅有約15%的病例無法得到診斷。因此，腹腔鏡的確是一個對不明原因腹水有利的診斷工具。

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關鍵詞： 腹水，腹腔鏡，癌症造成之腹膜擴散，結核性腹膜炎，肝硬化

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