Original Article

Diagnostic Value of Mini-laparoscopy in Patients with Abdominal Neoplasm

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DOI: 10.1007/s11670-011-0214-0

ABSTRACT

Objective: Blood biochemistry, ascites tests, and imaging examinations have low sensitivities in abdominal neoplasm diagnoses. In addition, exploratory laparotomy is not suitable for final stage patients. Mini-laparoscopy has recently emerged as a new diagnostic technology for abdominal disease. The aim of this research was to evaluate the value of mini-laparoscopy in diagnosing abdominal neoplasms.

Methods: Clinical and operational data were retrospectively analyzed in 20 cases with pathologically confirmed abdominal malignancies. Of these, 10 cases were each diagnosed by mini-laparoscopy and exploratory laparotomy. The surgical and anesthesia expenses, perioperative nursing, monitoring and treating charges, postoperative hospital stay and complications were compared between groups.

Results: The surgical and anesthesia costs were statistically lower in patients who received a mini-laparoscopy ($P<0.01$). Perioperative drug expenses and nursing and monitoring charges were also significantly decreased ($P<0.05$ and $P<0.01$, respectively). Further, the gastrointestinal function recovery time and postoperative hospital stay were significantly reduced in the mini-laparoscopy group. There was no significant difference between the two groups regarding the preoperative hospital stay and postoperative complications.

Conclusion: Mini-laparoscopy effectively reduces surgical injury and treatment costs, and is capable of safely diagnosing abdominal tumors. Moreover, the procedure is also easy to perform.

Key words: Laparoscopy; Abdominal neoplasms; Diagnosis

INTRODUCTION

On September 21, 1901, which is considered the birth date of the laparoscopy technique, Georg Kelling, a surgeon from Dresden, Germany, described his new technique as ''coelioscopy'' and used pneumoperitoneum to create visual intra-abdominal space in dogs[1]. Years later, Jacobaeus[2] named the procedure "laparoscopy" and initiated its clinical use. Kalk, who was an internist in Frankfurt, Germany, ''reinvented'' laparoscopy for the fourth time in the 1920s, ushering in the modern era of laparoscopy, which was dominated by gastroenterologists for more than six decades[3]. Kalk developed the modern instrumentation, specifically foroblique optics (135-degree side-viewing), which facilitated a panoramic view of the abdominal cavity and its organs through rotation. Laparoscopy became an important diagnostic tool, especially in the differential diagnosis of liver disease with guided biopsy and the staging of intra-abdominal malignancies. Over the years, laparoscopy has undergone multiple rediscoveries, coming full circle with its current use predominantly by surgeons for minimally invasive surgery; however, in comparison to therapeutic laparoscopic techniques, laparoscopic exploration has been relatively ignored. The traditional laparoscopic technique that is applied by surgeons is often not easily mastered by physicians. With the emergence of non-invasive imaging techniques, such as ultrasound (US), computer tomography (CT), and magnetic resonance imaging (MRI), physicians have come to believe that comparable laparoscopic exploration results could be obtained with these methods; thus, the use of laparoscopy by gastroenterologists has dramatically declined since the 1980s[4, 5].

Clinically, small metastatic foci in the peritoneum or liver, or primary retinal and peritoneal malignancy cannot be accurately diagnosed using traditional US, CT or MRI in some cases. The accuracy rates of routine blood biochemistry, ascites testing and imaging examinations have been reported to be no more than 40% to 41.2%, whereas the accuracy rate of peritoneal biopsy and percutaneous liver biopsy was merely 5% to 57%[6-8]. Meanwhile, patients with rapidly growing disease might miss the opportunity for an open abdominal exploration. Finally, the open abdominal diagnosis rates of difficult and complicated cases were only 10% to 40%, whereas diagnostic laparotomy or a combination of diagnostic laparotomy with laparoscopic ultrasound correctly diagnosed 43% to 65% of patients using the open abdominal exploration[9].

For decades, diagnostic laparoscopy in internal medicine has been performed using laparoscopes that are

Received 2011–05–23; **Accepted** 2011–07–15
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similar to those used in surgery, with diameters of approximately 10 mm. In late 2007, OLYMPUS small-caliber laparoscopic instrumentation was introduced for application in mini-laparoscopy, and this instrumentation has been used by physicians in the Zhong-Shan Hospital Endoscopy Center of Fudan University. Using this instrumentation, fifty patients underwent laparoscopic exploration, of whom ten patients were diagnosed with an abdominal malignancy. These patients were compared to ten other patients who had been confirmed with an abdominal malignancy by open exploration to explore the clinical value and safety of mini-laparoscopy in diagnosing abdominal malignancy.

MATERIALS AND METHODS

General Information

From Jan 2007 to Jun 2008, 20 consecutive inpatients were pathologically diagnosed with primary or metastatic abdominal malignancy. Of these, ten patients were diagnosed with a mini-laparoscopy (LAP group), whereas the rest were diagnosed with an open abdominal exploration (OPEN group). All 20 patients had complete clinical and laboratory tests (physical examination, blood biochemistry, ascites test and endoscopy) and imaging results (US, CT and MRI), and all the results were negative.

Equipment and Methods

The OLYMPUS high-definition mini-laparoscopy instrumentation, high-flow automatic pneumoperitoneum machine (UHI-3, Olympus Surgical & Industrial America Inc., Center Valley, PA, USA) and high-brightness xenon lamps (CLV-S40, Olympus Surgical & Industrial America Inc.) were used for the mini-laparoscopy in the present study. The selection of anesthetic techniques (regional anesthesia with or without intravenous anesthesia and general anesthesia) followed the patients' conditions. The supine position was also used. The skin was incised in the left upper quadrant of the abdomen at 3-5 cm away from the ventral line, and two fingers' width above the navel. The artificial pneumoperitoneum was made, and an intra-abdominal pressure of 8-12 mmHg was maintained. The entire abdominal cavity was explored using mini-laparoscopy. At least 6 points of biopsy tissue at the most suspicious site for pathological examination were taken, and the total exploration time lasted at least 15-45 minutes. For patients with moderate or greater volumes of ascites, a layer-by-layer suture was performed, whereas no suturing was needed for patients with low volumes of or without ascites. If needed, an open abdominal exploration was performed.

Statistical Analysis

The demographic data, laboratory data, and clinical and economic parameters for each patient were recorded. For the statistical analyses, *t*-tests and Fisher's exact tests were performed with a cut-off point of $P<0.05$ using the SPSS statistical analysis program, version 13.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

The sex ratio was the same in LAP group and OPEN group (3:2). The mean age in the LAP group and the OPEN group was 53.60±11.59 years and 59.90±13.35 years, respectively, and no statistical difference was found between the two groups. No statistical differences were found in the laboratory data, including hemoglobin (Hb), alanine aminotransferase (ALT), creatinine (Cr), carcinoembryonic antigen (CEA), CA199, CA125, endoscopy results, ascites tests or CT and MRI imaging (Table 1). In the LAP group, there were two cases of malignant mesothelioma, five cases of metastatic adenocarcinoma, two cases of mucinous cystadenocarcinoma and one case of epithelial malignancy, whereas in the OPEN group, there were five cases of metastatic adenocarcinoma, one case of malignant mesothelioma, two cases of mucinous cystadenocarcinoma, one case of metastatic neuroendocrine tumors, and one case of rhabdomyosarcoma.

Table 1. Comparison of demographic and laboratory data between the LAP and OPEN groups

Indices	LAP (n=10)	OPEN (n=10)	*P*
Sex (Male:Female)	3:2	3:2	1.000[a]
Age	53.60±11.59	59.90±13.36	0.275[b]
Hb <110 g	30%	10%	0.264[a]
ALT >70 U/L	0	10%	0.305[a]
Cr >110 μmol/L	0	0	-
Positive exfoliated cells in ascites	0	0	-
Positive endoscopy results	0	0	-
Abnormal CEA	30%	50%	0.361[a]
Abnormal CA199	10%	30%	0.264[a]
Abnormal CA125	30%	20%	0.606[a]
Abnormality in CT or MRI results			
Ascites	100%	80%	0.136[a]
Omentum thickening	60%	40%	0.371[a]
Retroperitoneum lymph node enlargement	30%	50%	0.361[a]

[a]Chi square test, [b]*t*-test.