

# The role of peritoneoscopy in the diagnosis of acute abdominal conditions

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During its 70-year history, peritoneoscopy has been widely used in the diagnosis and treatment of pelvic disorders and has been shown to be an accurate diagnostic procedure associated with low morbidity and a high degree of acceptance by the patient. It has recently become popular as a direct means of studying patients with suspected intraabdominal malignancy and as a valuable diagnostic adjunct in assessing the patient with hepatobiliary disease. Despite its usefulness, peritoneoscopy has not played a prominent role in evaluating the patient with acute abdominal pathology.

Our interest was stimulated by the reports of Carnevale et al<sup>1</sup> and Gazzaniga et al<sup>2</sup> on the use of peritoneoscopy in the evaluation of abdominal injuries. We report our experience with the procedure and the indications for its use in patients with blunt abdominal trauma and patients with suspected acute appendicitis.

## Patients and methods

The technique of peritoneoscopy may be mastered with relative ease. In our series the procedure was performed in the operating room with full aseptic technique with the patient under general anesthesia. The procedure may be done under local anesthesia in the intensive care unit or even in the

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emergency room as described by Sherwood et al.<sup>3</sup> A 1-cm infraumbilical skin incision was used for introduction of the spring-loaded pneumoneedle and subsequent placement of the peritoneoscope. Pneumoperitoneum was established with carbon dioxide gas. Adverse respiratory and hemodynamic effects of overinsufflation were avoided by keeping intraabdominal pressure below 20 mm Hg. Visualization of various structures was facilitated through positioning of the patient and with the introduction of a manipulative probe through a separate incision in the abdominal wall. In this fashion the diaphragmatic and ventral surface of the liver, gallbladder, spleen, the anterior surface of the stomach, small bowel, colon, and the pelvic organs may be visualized. Contraindications to peritoneoscopy include extensive prior abdominal surgery, tense ascites, marked distention of the hollow abdominal viscera, and the presence of a diaphragmatic defect such as a hiatal hernia.

During the 2-year period ending in November 1980, 25 patients examined on the surgical service at Hillcrest Hospital had peritoneoscopy performed as part of their diagnostic evaluation. Twenty of these patients were selected from a group of 96 patients admitted with a diagnosis of acute appendicitis. Selection was based on clinical presenting features and laboratory findings that were inadequate to confirm the diagnosis. This group was composed of 12 women and eight men in an age range from 15 to 76 years. Only three patients had abdominal guarding, none had rebound tenderness, and all patients had abdominal pain. Four patients had been symptomatic more than 72 hours and had no definitive abdominal findings. Seven patients had a white

blood cell count (WBC)  $<10,000/\text{mm}^3$  and five patients had rectal temperatures less than 38 C. Three of these five patients had been taking antibiotics. Two patients had associated Crohn's disease, a third patient had chronic lymphocytic leukemia, and a fourth patient had had an appendectomy.

The remaining five patients, two women and three men from 28 to 60 years old, were admitted with blunt abdominal trauma. These patients were selected for peritoneoscopy from a group of 19 patients admitted with blunt abdominal trauma based on clinical and laboratory findings that did not clearly indicate a need for immediate laparotomy. All five patients were hemodynamically stable following crystalloid or colloid resuscitation. All had abdominal pain and tenderness to palpation, but only one patient had abdominal guarding and rebound tenderness. Peritoneal lavage was performed in all five patients; the results were negative in four patients and weakly positive in one patient, red blood cell count (RBC)  $100,000/\text{mm}^3$ . Peritoneoscopy was performed in all five patients within 4 hours of admission to the emergency room.

### Case reports

**Case 1.** This 28-year-old woman with blunt abdominal trauma following a motor vehicle accident was examined in the emergency room. The patient was alert on admission and complained of mild epigastric pain without back or chest pain. She was afebrile and had a mean arterial pressure of 100 mm Hg and a slight tachycardia of 100 beats/min. Abdominal examination revealed epigastric and right upper quadrant tenderness with guarding but without rebound tenderness. Urinalysis, serum electrolytes, and roentgenograms of the abdomen and chest were normal. The WBC was  $14,000/\text{mm}^3$  and hematocrit, 40%. Peritoneal lavage was performed and the findings

were negative including an amylase determination. Because of physical findings, peritoneoscopic examination was performed, which revealed a contusion and hematoma of the hepatic flexure of the colon and the hepatoduodenal ligament. Retroperitoneal injury was suspected and laparotomy performed. An avulsion injury of the descending portion of the duodenum and a crush injury of the uncinate process of the pancreas was found. A seromuscular tear of the colon was repaired followed by a cholecystocholangiogram that revealed an intact but narrowed terminal common bile duct. A decompressive gastrojejunostomy and T-tube drainage of the common bile duct was accomplished along with external drainage of the pancreatic injury. The postoperative course was complicated by development of a pancreatic fistula that closed spontaneously. There was no evidence of development of a pancreatic pseudocyst. The patient was discharged on the 24th hospital day.

**Case 2.** A 31-year-old man was examined in the emergency room after a motor vehicle accident with facial injuries and blunt trauma to the abdomen. The patient was alert, oriented, and complained of upper abdominal pain. The mean arterial blood pressure was 95 mm Hg and pulse was 80 beats/min. Bilateral naso-orbital fractures were palpated. Vision and extraocular movements were intact. No neurologic deficit was noted. Abdominal examination revealed moderate right upper quadrant tenderness without rigidity or rebound tenderness. Roentgenograms of the chest, bilateral ribs and sternum, abdomen, and an intravenous pyelogram were normal. Skull roentgenograms were normal and facial roentgenograms revealed LeFort I and II fractures of the maxilla with bilateral naso-orbital fractures. Serum electrolytes, amylase, and blood count were normal. Peritoneal lavage returned a pink fluid with RBC  $<100,000/\text{mm}^3$ . Because of the weakly positive lavage and the abdominal findings peritoneoscopy was performed, which revealed a 3-cm linear fracture of the right lobe of the liver; there was no active bleeding. The spleen was carefully visualized and found to be intact. Fol-

lowing repair of multiple facial lacerations he was taken to the intensive care unit for observation. The postoperative course was without complication and following repair of facial fractures, the patient was discharged on the tenth hospital day.

**Case 3.** A 28-year-old woman with a 24-hour history of epigastric and right lower quadrant pain with nausea and diarrhea was examined in the emergency room. There was no history of emesis or rectal bleeding. Her temperature was 38.6 C; mean arterial blood pressure, 100 mm Hg; and pulse rate, 120 beats/min. Examination of the heart and lungs was unremarkable. Abdominal examination revealed a right lower quadrant tender mass with guarding but without rebound tenderness. Rectal and pelvic examination was positive for a right-sided mass and tenderness. The hematocrit was 36.6% and WBC was  $13,500/\text{mm}^3$  with a normal differential count. Urinalysis, serum electrolytes, and a chest roentgenogram were normal. The abdominal roentgenogram revealed minimal distention of the small bowel with scattered air-fluid levels. Peritoneoscopy was performed and revealed inflammation of the terminal ileum consistent with Crohn's disease and a normal appendix. Follow-up barium studies of the small bowel were consistent with Crohn's disease. She was treated with sulfasalazine (Azulfidine), antispasmodics, and a low-residue diet and was discharged asymptomatic on the fifth hospital day.

## Results

There were no false-positive or false-negative peritoneoscopic examinations in our series and no complications resulting directly from the procedure. In patients who underwent laparotomy, peritoneoscopy was responsible for only 15 minutes of additional anesthesia time. Of the 20 patients with suspected appendicitis, the diagnosis was confirmed in 14, all of whom underwent subsequent appendectomy. An inflamed appendix was visualized in ten patients.

In three patients, the appendix was not visualized because of adherent omentum, and all three were found to have appendicitis at operation. In one patient a right lower quadrant abscess was found at peritoneoscopy. This patient had had an appendectomy in 1952 and at operation had inflammation and perforation of the appendiceal stump. She was treated with drainage of the abscess and tube cecostomy. Of the remaining six patients, a normal appendix was found in five at peritoneoscopy. Three of these six patients had no associated abdominal or pelvic pathology visualized, and all subsequently improved and were discharged from the hospital. In the remaining three patients another pathologic condition was diagnosed. One patient had ileal Crohn's disease, a second patient had a right salpingitis, and the third patient had a right lower quadrant inflammatory mass secondary to collection of gastroduodenal secretions from a duodenal perforation. Sealing off the perforation had minimized upper abdominal findings in this patient. Thus, of the 20 patients with suspected acute appendicitis, five were spared operation by peritoneoscopy.

Of the five patients with blunt abdominal trauma, two patients underwent laparotomy. Both patients had negative peritoneal lavage findings and on peritoneoscopy were found to have contusion of the colon and hepatoduodenal ligament. A retroperitoneal injury was suspected in each case, and on subsequent surgical exploration one patient was found to have sustained a pancreatic crush injury and the second patient, a duodenal avulsion and a pancreatic crush injury. Because of the findings at peritoneoscopy, both patients were operated on before peritonitis and its sequelae became established. Of the three patients who did not undergo op-

eration, two had negative peritoneoscopic examinations. One of these patients had a contused abdominal wall, which resulted in guarding and rebound tenderness. The third patient had a weakly positive peritoneal lavage and at peritoneoscopy was found to have a small laceration of the liver, which was not actively bleeding. He was observed, and he recovered without difficulty.

Patients who had peritoneoscopy without laparotomy remained in the hospital an average of 2 days; whereas those requiring laparotomy were hospitalized an average of 8 days. Peritoneoscopy added little to the hospital costs of patients requiring laparotomy and resulted in considerable savings for patients who did not require laparotomy. The overall hospital cost to patients who did not have laparotomy was only 40% of the cost incurred by those who required operations, mostly due to a reduction in the length of hospitalization.

## Discussion

Peritoneoscopy is an accurate means for direct visualization of the intraabdominal viscera, and has the potential for clarifying many complex diagnostic problems in patients with acute abdominal pathology. This procedure may be particularly useful in assessing the condition of the patients who have sustained abdominal injuries. Our experience with blunt abdominal trauma has been limited, but larger series reported by Carnevale et al,<sup>1</sup> Gazzaniga et al,<sup>2</sup> and Cortesi et al<sup>4</sup> have also shown that when properly applied, peritoneoscopy is effective in reducing the negative laparotomy rate and may reveal visceral injuries that were unsuspected clinically. Negative laparotomy rates range from 7% to 15% for all types of abdominal injuries. In studies of patients with blunt abdominal trauma selected for

surgery on the basis of peritoneal lavage, Krausz et al<sup>5</sup> and Engrav et al<sup>6</sup> reported unnecessary laparotomy rates of 7% to 9% respectively. Many of these unnecessary laparotomies were performed for trivial visceral injuries that resulted in a positive peritoneal lavage but would not have required definitive surgical repair. Carnevale et al,<sup>1</sup> in their series of 20 patients with abdominal injuries of all types, were able to avoid laparotomy in 12 patients through the use of peritoneoscopy. In stable patients with indeterminate clinical findings following abdominal trauma, peritoneoscopy is a definitive method for detecting visceral injury and for assessing minor visceral injuries that may not require surgical correction. The technique is useful for detecting peritoneal cavity penetration in abdominal stab injuries and for revealing unsuspected intraabdominal injury that may often accompany thoracic trauma. Peritoneoscopy may be particularly valuable in assessing the severity of intraabdominal injury in the patient with impaired mental status secondary to ethanol intoxication, drugs, or head trauma.

Acute appendicitis is one of many abdominal conditions in which peritoneoscopy may serve an important diagnostic function. An error rate of approximately 10% in the diagnosis of acute appendicitis is an accepted standard. In fact, if a surgeon has a negative appendectomy rate of less than 10% one wonders if his operative threshold for performing appendectomy is too high. It is within the group of patients with suspected appendicitis, with an atypical clinical presentation or laboratory findings, that most of the diagnostic errors occur and unnecessary appendectomies are performed. We were able to avoid operation in 5 of our group of 20 patients in this category through the use

of peritoneoscopy. Leape and Ranenofsky,<sup>7</sup> in their series of 32 patients with suspected acute appendicitis, were able to avoid operation in 12 patients with peritoneoscopy and reduce the negative appendectomy rate from 10% to 1%.

The value of peritoneoscopy has been proved in the diagnosis of other acute or subacute intraperitoneal disorders. Cortesi et al<sup>8,9</sup> have described its use in the diagnosis of acute pancreatitis, renal injuries, diverticulitis, ischemic bowel, tuberculous and carcinomatous peritonitis, and the acute gynecologic syndromes. Since a skilled peritoneoscopist may visualize approximately 70% of the hepatic surface, the evaluation of patients with cholecystitis, hepatitis, hepatic abscess, and primary as well as metastatic hepatic malignancy may be accomplished with this technique.

Many patients with acute peritonitis secondary to a perforated viscus or ischemic bowel may have atypical presenting features, particularly the aged, patients taking immunosuppressive medications, and patients with associated severe medical illness. In these patients delay in confirming a diagnosis of peritonitis or subjecting them to an unnecessary laparotomy may be disastrous. Under these circumstances peritoneoscopy performed with a local anesthetic is a most suitable method for determining the presence or absence of peritonitis and the need for laparotomy.

## Summary

We have reported our experience with peritoneoscopy in patients with blunt abdominal trauma and in patients with suspected acute appendicitis. In our experience, the technique was associated with negligible morbidity and was effective in avoiding unnecessary laparotomy when properly applied. We believe that

peritoneoscopy has not yet achieved its rightful place as a diagnostic procedure.

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