
Procedures in Family Practice

Peritoneal Lavage as a Diagnostic Procedure for Intra-Abdominal Trauma

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Peritoneal lavage is an established emergency diagnostic tool in cases of suspected damage inside the abdomen due to blunt and occasionally penetrating abdominal trauma. This is a relatively safe procedure which is often useful in recognizing intra-abdominal bleeding requiring surgical exploration. The procedure requires careful patient selection and technique, together with awareness of the limitations of the procedure and the ability to interpret the returns of peritoneal lavage.

The catheter irrigation method of peritoneal lavage is a useful tool to detect problems in the abdomen. Many a clinician has been surprised to find fresh blood in what was thought to be a normal abdomen. Likewise, there is real relief on testing the suspicious abdomen and being reassured that probably all is well. This article will review the indications, specific techniques, limitations,

and recognized complications of this procedure.

Blood in the abdomen is not a very potent irritant. If blood has been there for some time or is contaminated by bacteria, there may be only mild peritoneal signs. The use of needles and trocars to sample the closed peritoneal space has intrigued clinicians for decades. The advent of readily available peritoneal dialysis catheters in the early 1960s led to a natural adaptive technique. The use of these catheters to sample for blood was first described by Root et al in 1964.¹ Irrigation techniques increased the sensitivity of the test. Experience from all sources suggests that complications from the procedure occur infrequently. In comparison, there is a great utility in making an early diagnosis before hypovolemia develops. In addition, problems other than bleeding are occasionally identified through sampling the abdominal contents.

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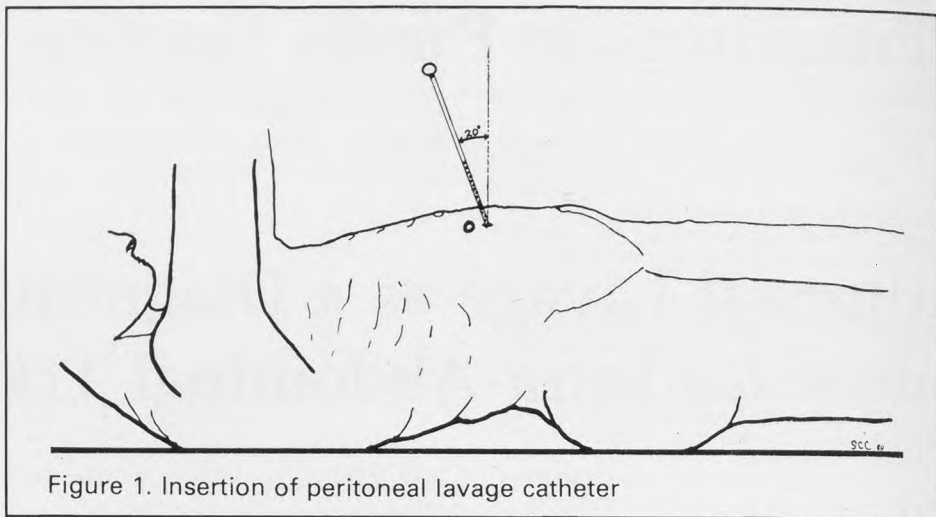


Figure 1. Insertion of peritoneal lavage catheter

Indications

In emergency treatment areas, reasonable suspicion constitutes a clear indication to apply the technique. Any patient who has been a victim of major deceleration injury is a candidate. In trauma victims, the comatose state with associated hypotension or hypovolemia is almost an obligatory indication for placement of the dialysis catheter. The traumatized conscious child or acute paraplegic in spinal shock may need the procedure for diagnosis.²⁻⁶ Clearly, an occasional patient should be triaged to the operating room. The described procedure should never delay a needed or planned laparotomy.

Although it is not recommended as the primary diagnostic tool, the peritoneal lavage technique can occasionally help in cases of penetrating injuries to the abdomen. The gunshot injury barely entering into the abdominal viscera or the stab wound that penetrates deeper than suspected might be recognized by the presence of blood in the irrigation returns.

Occasionally, the catheter placement may help detect unsuspected disease such as ruptured ectopic pregnancy, torn mesenteric vessels, or even

leaking abdominal aortic aneurysm. Surprises such as fluid returns with pus cells, bacteria, colon gas, or fluid with elevated amylase content do happen. In all these cases the correct diagnosis should be made on clinical grounds rather than on peritoneal lavage alone.

Technique

Initial evaluation of the patient should include treatment by establishing an airway, initiating intravenous fluid replacement, drawing the necessary blood samples, and, especially, placing a Foley catheter, if peritoneal lavage is indicated.

The skin is shaved and prepped with povidone-iodine solution. After infiltrating the subcuticular and peritoneal layers using a local anesthetic with epinephrine, a small vertical incision is made approximately 2 cm below the umbilicus. If the patient has a lower midline scar the incision can be made above the umbilicus.⁷ This is also the preferred location in the advanced pregnant patient or

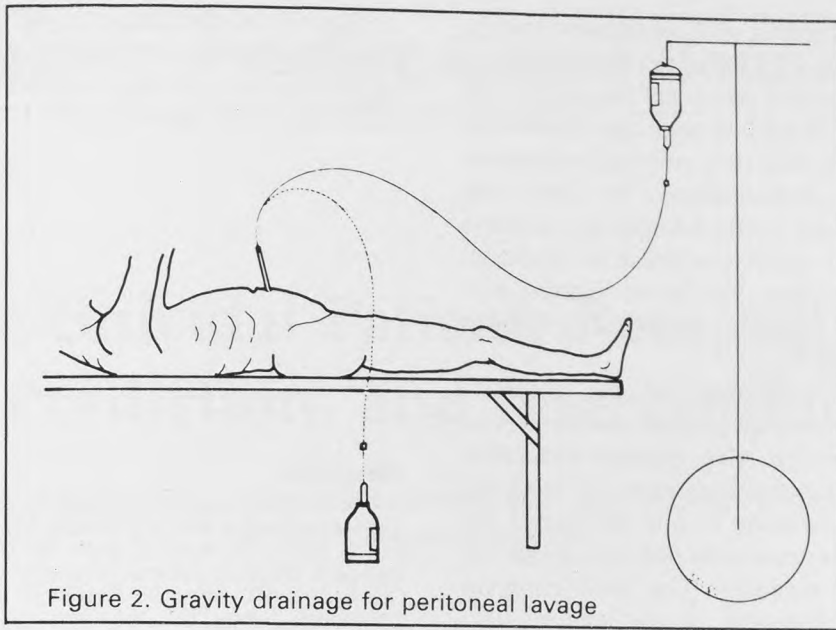


Figure 2. Gravity drainage for peritoneal lavage

patient with severe retroperitoneal bleeding secondary to pelvic fractures. Other off center locations have been used for the occasional patient with scar tissue spanning the entire midline.⁸

I use a peritoneal dialysis catheter with metal stylet. The major resistance to thrust is encountered in the fascia of the midline. The catheter is angled 20 degrees toward the pelvis (Figure 1). The conscious patient will complain of pain as the catheter goes through the peritoneum. There is a free feeling to the movement of the catheter after it is in the abdomen and the stylet should then be removed.

The catheter is advanced until all the side holes are inside the abdomen continuing in the same direction as the angle of placement. Usually there is little resistance to this advancement. If resistance is felt, it may be better to start all over again with the initial puncture. Occasionally, the catheter should be placed through the peritoneum under direct vision using an enlarged skin incision.^{3,6,8-13}

If non-clotting blood wells up in the catheter immediately and at least 10 cc can be aspirated, the diagnostic tool has served its purpose and exploration is usually indicated. If no blood is aspirated, then one liter Ringers lactate (or peritoneal dialysis fluid) is instilled into the abdo-

men. The infusion bottles are dropped below patient level to allow for gravity drainage (Figure 2). Occasionally, the position of the catheter must be rotated or changed to allow drainage to return. Borderline pink returns can be analyzed. Useful tests include red blood cell count, white blood cell count, amylase, bile, and cultures if purulent fluid is withdrawn.

For the special situation when no fluid returns after one liter instillation, the catheter first should be checked for location. If there is no other explanation for lack of return, a second liter can be instilled. Once the diagnostic test is completed, the catheter is withdrawn. The stab wound method seldom requires more than a skin suture or strip.

Limitations and Complications

Peritoneal lavage has the advantage of giving a quick, fairly definitive answer to the question of whether blood is present in the abdomen. However, as a static test the sample process can not

predict dynamic bleeding such as delayed splenic rupture or impending rupture of devitalized bowel. The negative test helps in the care of the patient with multiple traumas. The medical team can concentrate on other systems rather than relying on frequent repeat abdominal examinations. As time continues, the first lavage results become less and less valid and clinical examination must be reconsidered. Ruptured bladders, pancreatic injuries, ruptured diaphragms, and other non-bleeding injuries can be missed.^{3,6,9,12-16}

Extraperitoneal placement of the catheter, especially in the grossly fat patient, can easily lead to false negative results. Also, patients with adhesions and previous operations may not have the situations where sampling of one portion of the abdominal cavity is accurately portraying signs of other sequestered bleeding. The most common example is liver bleeding in the cholecystectomized patient. Blood may never appear in the main abdominal cavity.

For most clinicians, the really difficult interpretation of this test occurs when the returns are "salmon pink" in color. The large indeterminate range between red blood cell counts of 20,000/cu mm and 100,000/cu mm includes a significant number of patients that need operation. If the red blood cell count is below 20,000/cu mm, less than 15 percent of the patients with blunt trauma and less than 45 percent of patients with penetrating trauma will be positive at exploration. If red blood cell counts are between 50,000/cu mm and 100,000/cu mm, then over 75 percent of patients with either blunt or penetrating trauma will have positive findings at exploration.¹⁶ Error due to abdominal wall bleeding may be suspected if the irrigation fluid returns become progressively lighter. In large series the complication rate of this method is less than six percent.¹⁷

At least one half of common complications are considered serious injuries such as small bowel laceration, colon perforation, and an occasional inadvertent iliac artery or vein cannulation.¹⁸ The latter are immediately obvious but the former require high clinical acuity. Newer techniques utilizing softer catheters and guide wires are described with claims of decreasing the chances for these complications.^{2,16,17,19} Even if blood is not apparent in the original tap, if internal catheter damage is suspected, early consideration for operation is the proper decision.

The risk of abdominal exploration is low. The use of the peritoneal lavage has provided us with a rapid relatively safe tool to detect the patient who needs that early operation.²⁰

References

1. Root HD, Hauser CW, McKinley CR, et al: Diagnostic peritoneal lavage. *Surgery* 57:633, 1965
2. Bivins BA, Jona JZ, Belin RP: Diagnostic peritoneal lavage in pediatric trauma. *J Trauma* 16:739, 1976
3. Drew R, Perry JF, Fischer RP: The expediency of peritoneal lavage for blunt trauma in children. *Surg Gynecol Obstet* 145:885, 1977
4. Wilson CB, Vidrine A, Rives JD: Unrecognized abdominal trauma in patients with head injuries. *Ann Surg* 161:608, 1965
5. Tibbs PA, Young AB, Bivans BA, et al: Diagnosis of acute abdominal injuries in patients with spinal shock: Value of diagnostic peritoneal lavage. *J Trauma* 20:55, 1980
6. Powell RW, Smith DE, Zarins CK, et al: Peritoneal lavage in children with blunt abdominal trauma. *J Pediatr Surg* 11:973, 1976
7. Parvin S, Smith DE, Asher M, et al: Effectiveness of peritoneal lavage in blunt abdominal trauma. *Ann Surg* 181:255, 1975
8. DuPriest RW Jr, Khanejá SC, Rodriguez A, et al: A technique for open diagnostic peritoneal lavage. *Surg Gynecol Obstet* 147:241, 1978
9. Engrav LH, Benjamin CI, Strate RG, et al: Diagnostic peritoneal lavage in blunt abdominal trauma. *J Trauma* 15:854, 1975
10. Sachatello CR, Bivins BA: Technique for peritoneal dialysis and diagnostic peritoneal lavage. *Am J Surg* 131:637, 1976
11. Rothenberger DA, Quattlebaum FW, Zabel J, et al: Diagnostic peritoneal lavage for blunt trauma in pregnant women. *Am J Obstet Gynecol* 129:479, 1977
12. Perry JF Jr, Strate RG: Diagnostic peritoneal lavage in blunt abdominal trauma: Indications and results. *Surgery* 71:898, 1972
13. Fischer RP, Beverlin BC, Engrav LH, et al: Diagnostic peritoneal lavage: Fourteen years and 2,586 patients later. *Am J Surg* 136:701, 1978
14. Strauch GO: Major abdominal trauma in 1971. *Am J Surg* 125:413, 1973
15. Diagnostic peritoneal lavage in blunt trauma. *Lancet* 1:541, 1978
16. Hornyak SW, Shaftan GW: Value of "inconclusive lavage" in abdominal trauma management. *J Trauma* 19:329, 1979
17. Lazarus HM, Nelson JA: Peritoneal lavage with low morbidity. *J Am Coll Emerg Physicians* 8:316, 1979
18. Olsen WR, Redman HC, Hildreth DH: Quantitative peritoneal lavage in blunt abdominal trauma. *Arch Surg* 104:536, 1972
19. Lazarus HM, Nelson JA: A technique for peritoneal lavage without risk or complication. *Surg Gynecol Obstet* 149:889, 1979
20. Jergens ME: Peritoneal lavage. *Am J Surg* 133:365, 1977