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PERCUTANEOUS DRAINAGE OF ABDOMINAL ABSCESSES AND FLUID COLLECTIONS

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ABSTRACT

This report summarizes the results of 64 percutaneous catheter drainage of abdominal abscesses and fluid collections in 56 patients. Aspiration and drainage was guided with computed tomography in 34 patients and with ultrasound in 30 patients. Success rate was 90%. Infected collections were successfully drained in 94% and noninfected collections in 72% . Partial success was achieved in two patients. Three patients failed to respond to percutaneous drainage. Recurrence occurred in one. Complications occurred in nine patients, two of which were major (3%) and seven were minor (11%). Image-guided percutaneous drainage appears to be the treatment of choice for most of the intraabdominal collections.

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INTRODUCTION

The advent of ultrasound and computed tomography has significantly changed the diagnostic and investigative approach to intraabdominal abscesses and fluid collections. Following an initial report by Gronvell, et al,[1] of four cases drained under ultrasound guidance in 1977, Gerzof, et al,[2] developed the technique using combined computed tomography and ultrasound guidance. The technique has now been described as the treatment of choice for intraabdominal abscesses and fluid collections.[3,5]

MATERIAL AND METHODS

During a four year period from May 1986 to May 1990, 64 percutaneous drainages of abdominal abscesses and fluid collections in 56 patients were performed in the department of radiology at the Immam Khomeini Hospital affiliated to Tehran University of Medical Sciences. There were 34 male and 22 female patients. The average age was 38 years, ranging from 12 to 72. 16 of 64 procedures were performed in hospitalized patients, and the rest on an outpatient basis. The cases were detected initially with CTin 34 patients, and with ultrasound in 30 patients. At first the trajectory of the needle was determined. After preparation and draping, a 18G, 15 cm needle was inserted in the collection. After confirmation of the intracollection position of the needle by diagnostic aspiration, a multi-side hole large lumen (10-12 French) abscess drainage catheter was inserted by the Seldinger method. Technique for percutaneous drainage of abscesses and fluid collections have been described by others.[6,7] Samples obtained through this catheter were sent for Biochemical analysis, as well as for aerobic and

TABLE I. Type of collections

Type	Numbers	Success
Pyogenic abscess	51	48
Amebic abscess	2	2
Hematoma	3	2
Pancreatic pseudocyst	2	1
Biloma	2	1
Urinoma	2	2
Lymphocele	1	1
Seroma	1	1
Total	64	58

TABLE II. Location of Pyogenic Abscesses

Location	Numbers
Hepatic	13
Subphrenic and subhepatic	11
Lesser sac	3
Interloop	5
Paracolic	3
Splenic	1
Renal and Perirenal	3
Pancreatic	1
Retroperitoneal and Psoas	4
Pelvic	5
Appendiceal	2
Total	51

anaerobic cultures of organisms. In five patients two or more catheters were used for drainage of multiple abscesses.

All catheters placed in this series were irrigated with sterile normal saline. Routine sinograms were obtained 24 hours after initial catheter drainage to document the actual size of the cavity and the presence of any fistula.

Follow up of the patients were done by computed tomography, ultrasound, and fluoroscopic control sinograms. The catheters were removed when cavity was tightly shrunken around the draining system or when catheter drainage was minimal.

RESULTS

64 abscesses and fluid collections were drained in 59 patients. Overall, 58(90%) of the collections were successfully drained in 50(94%) of 53 lesions. Complete recovery was also achieved in 8(72%) of 11 noninfected collections.

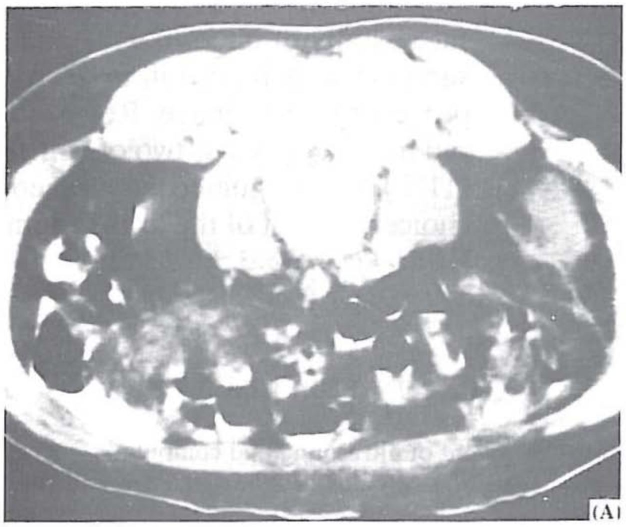
The amount of purulent material drained after the initial catheter placement was 30-2000 ml. Nearly all patients showed signs of improvement after initial catheter placement. The fever subsided within a few days. Irrigation and drainage was continued for an average length of 11 days (range 2-60 days).

Three patients failed to respond to percutaneous drainage. Causes of failures were thick undrainable pelvic hematoma, improper catheter placement in a subdiaphragmatic abscess, and continuing drainage due to bile leakage in a hepatic abscess. These three patients underwent surgical drainage. Recurrence occurred in one patient due to traumatic splenic rupture during the war associated with perisplenic abscess and fistula of splenic flexure of the colon. The abscess recurred three weeks later after catheter removal. Eventually, the patient underwent a definitive splenectomy. In one patient despite adequate local drainage of a periappendicular abscess, surgical intervention was performed 24 hours after successful percutaneous drainage of a postsurgical bile collection, due to massive pulmonary embolism that was not related to percutaneous procedure.

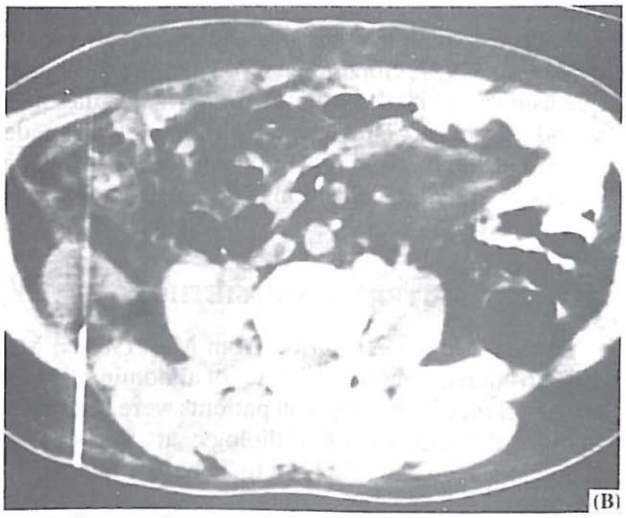
TABLE III. Results of percutaneous drainage of abdominal collections.

	Infected	Noninfected	Total
Number of collections	53	11	64
Successful drainage	50(94%)	8(72%)	58(90%)
Complications			
Major	1	1	2(3%)
Minor	6	1	7(11%)

There were two (3%) major complications and seven (11%) minor complications. The major complications included pleural effusion development due to transgression of the pleura in a left subphrenic abscess, and peritoneal spreading of the contents of a



(A)



(B)

Fig. 1. Computed tomography-guided diagnostic needle aspiration. (A) Prone computed tomography demonstrates the right posterior pararenal space abscess adjacent to a missile. (B) The needle has been advanced across the muscles into the collection.

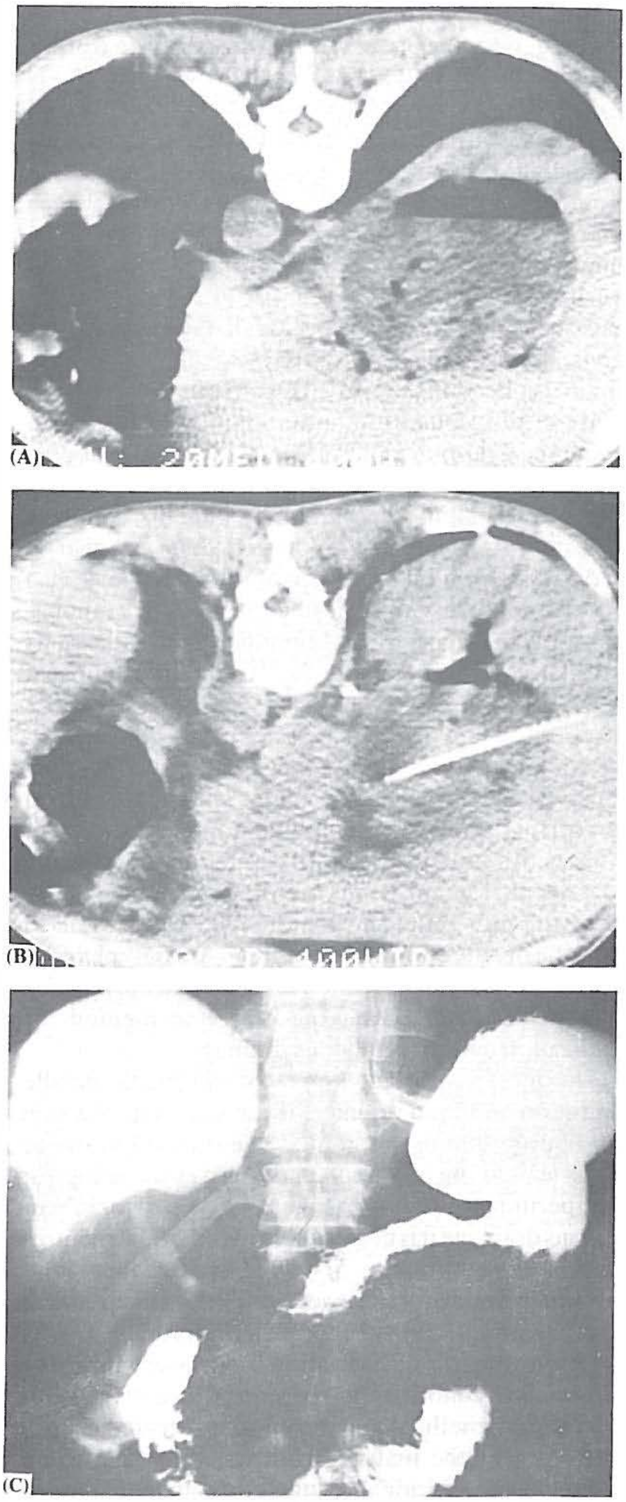


Fig. 2. Computed tomography pictures are not impaired by air. (A) Prone computed tomography scan showing gas-containing liver abscess near the diaphragmatic surface of the right lobe. (B) Successful catheter placement within the abscess cavity. (C) Sinogram through the catheter showing the full extent of the lesion and its communication with common bile duct.

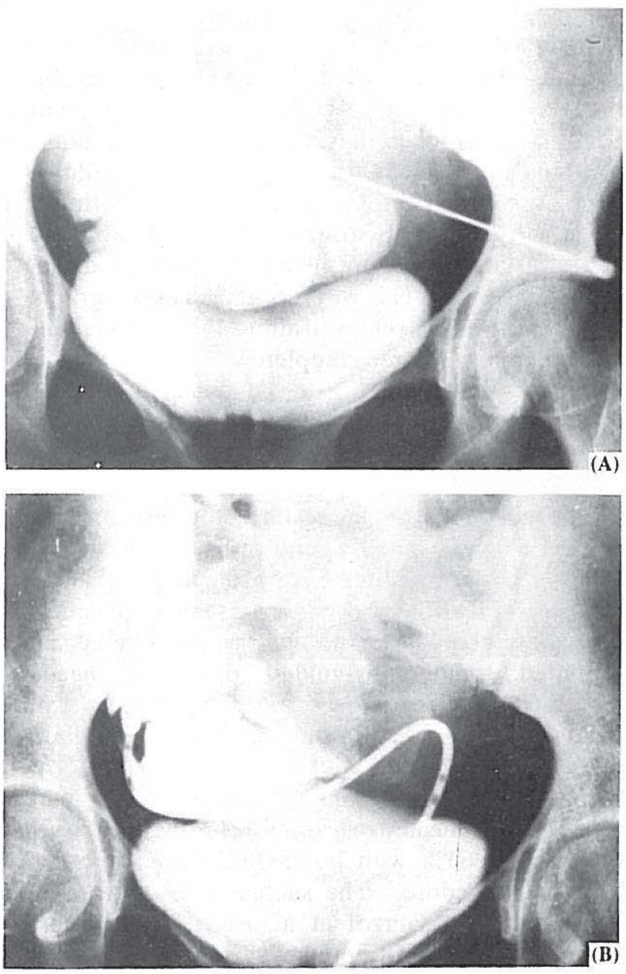


Fig. 3. Transperitoneal drainage of a centrally located pelvic abscess following appendectomy. (A) Diagnostic puncture from the left side with contrast injection showing the abscess cavity cephalad to the bladder. (B) Demonstrates proper catheter position within the cavity.

pancreatic pseudocyst due to catheter malplacement. The patients eventually were operated. Minor complications included catheter displacement in two patients, skin irritation in three patients, and inadvertant puncture of the ileal loop in three collections that was recognized at sinography. The patients were managed conservatively and all recovered uneventfully. There were no complications during catheter placement or drainage and no blockage of catheters occurred. No patients required immediate operation as a complication of percutaneous drainage.

CASE REPORT

Multiple abdominal abscess drainage:

A 51-year-old man was referred to our radiologic department for assessing of the cause of fever three weeks following a near- total gastrectomy associated with splenectomy due to gastric carcinoma. Abdominal computed tomography and abdominopelvic ultrasound demonstrated at least seven considerable abscesses in different parts of the peritoneal cavity including left subdiaphragmatic, lesser sac, interloop, paracolic, and pelvic. All abscesses were drained percutaneously on an outpatient basis during a period of one month using 10 F straight and pigtail catheters. There was an inadvertant ileal loop puncture during catheter insertion. This was recognized at sinography and the catheter was removed after 24 hours. Eventually the patient recovered completely.

DISCUSSION

In recent years the indications for percutaneous methods has expanded significantly. The results of percutaneous procedures have been so good and so widely accepted that the indications and applications have continued to expand. Ultrasound-guided and computed tomography-guided diagnostic needle aspiration and percutaneous catheter drainage permit a definitive diagnosis of fluid collection in the abdomen(Figure 1).

In the study performed by Van Waes, et al, for unusually complicated cases they were able to achieve a cure rate of 64% with no fatalities related to the drainage procedure.[8] The success rate depends on selection criteria. Gerzof et al, used a liberal criteria so about 90% of all patients were drainable with a cure rate of 70% . The cure rate will be higher up to 90% if one uses more conservative guidelines.[7-9] In the study represented here an overall cure rate of 90% was achieved in 64 procedures. The cure rate in infected collections was 94% and in noninfected collections, 72% .

Percutaneous catheter drainage has become the treatment of choice for intraabdominal fluid collections. The advantages of catheter drainage over surgical drainage include avoiding general anesthesia, easier nursing care, less morbidity with shortened hospital stay, and less cost.[10,12] Using a combination of cross-sectional imaging and fluoroscopic control, precise catheter positioning can be a more precise technique than visual inspection of a surgical operating field, especially when collections are multiloculated or extend widely into adjacent anatomic spaces. In one of my patients with a liver abscess which was detected by computed tomography, abdominal surgery was performed but no collection was found during surgical manipulation. The patient then referred for reassessment. In the second abdominal computed tomography, the collection was again detected and drained percutaneously. Patients recovering from radiologic catheter drainage usually have less pain and respiratory inhibition than patients recovering from general anesthesia. Many of the procedures can be performed on an outpatient basis. In this study only 16 of 64 collections were drained in hospitalized patients.

Abscesses and other fluid collections may be drained under radiologic guidance by using ultrasound, computed tomography, fluoroscopy, or a combination of these methods. Each is useful at various points in the procedure. Ultrasound is extremely sensitive in detecting fluid collections in the subphrenic spaces, the subhepatic space, the liver, and the true pelvis. Ultrasound allows a rapid searching of intraabdominal collections even in extremely ill patients. The ability of ultrasound to scan in multiple planes is an advantage over most other imaging modalities. Interventional procedure with ultrasound guidance is more rapid than computed tomography guidance and the trajectory of the needle into the collection can also be followed realtime. Computed tomography has also proven to be an accurate, fast, cost-effective examination for the diagnosis of abdominal fluid collections with a success rate of up to 96%.[13] Computed tomography pictures are not impaired by air. Abscesses in the retroperitoneum and pancreas are easily detected using computed tomography (Figure 2). In my study aspiration and drainage was guided with ultrasound in 30 patients and with computed tomography in 34 patients. As a rule, if the fluid is large and superficially located, ultrasound is the preferred method for the initial attempts at fluid aspiration. If ultrasound fails to place the needle correctly, computed tomography may then be used. If the collection is small or deeply placed computed tomography is the preferred method for localization and percutaneous drainage.

The most important aspect of diagnostic needle aspiration and fluid drainage is the selection of a safe and appropriate access route. The optimal drainage route should be a direct and short way using an extraperitoneal approach (Figure 1). Indeed for percutaneous drainage it is necessary to avoid vital structures and sterile pleural space. Some believe that there is no difference in outcome between a peritoneal approach from an extraperitoneal approach (Figure 3).[9]

Diagnostic needle aspiration is necessary for three purposes: It confirms the presence of a collection, it determines whether the collection is infected, and it determines if the material is liquified enough to be drainable. The depth and angulation of needle insertion is calculated from the sonographic or computed tomography images. I use an 18-gauge needle to perform diagnostic aspiration because the larger needle permits aspiration of thick purulent material. This needle also permits insertion of an angiographic wire without a second puncture. If purulent material is recovered, a few milliliters are aspirated and submitted for an immediate Gram stain and culture.

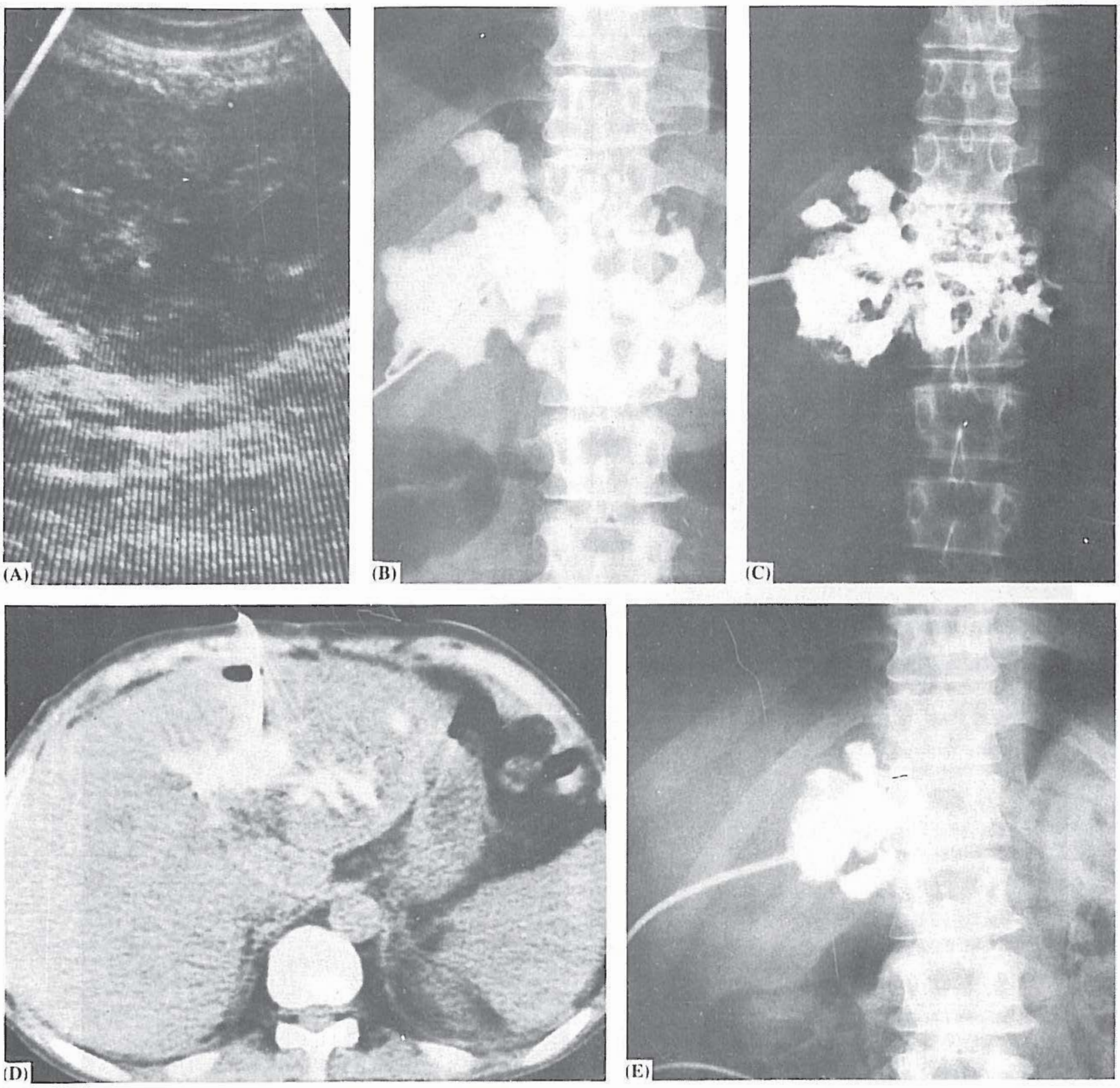


Fig. 4. Resolution of abscess cavity. (A) Transverse ultrasound shows multiloculated abscess involving the left lobe of the liver. (B) Sinogram demonstrates the true extent and loculated appearance of the lesion. (C), (D), and (E) Follow-up contrast sinograms and post-drainage computed tomography with contrast injection showing the resolution of the cavity.

There are different types of catheters available for drainage. Sizes range from 6 to 14 French. Catheter selection depends on the size of the collection and the nature of the fluid to be drained. The best configuration to use is the pigtail shape. Following catheter placement, all contents are removed. Subsequently the cavity is irrigated with normal saline unless the collection is noninfected. Contrast material is then injected under fluoroscopic control to assess size of the cavity, proper catheter positioning, and prescence of fistulous communications. Body temperature should turn to normal within 48 hours after percutaneous drainage. If the fever does not respond to drainage, another abscess may be present and reassessment is neccessary. The catheter should not be removed until the size of the cavity shrinks significantly as a result of healing (Figure 4). Clinical response of the patient is another important factor for catheter removal. Before final removal of the catheter a final ultrasound or computed tomography is useful to ensure that all areas of the abscess are drained.

Patients who have a well-defined abscess are good candidates for drainage if a clear anatomical pathway is

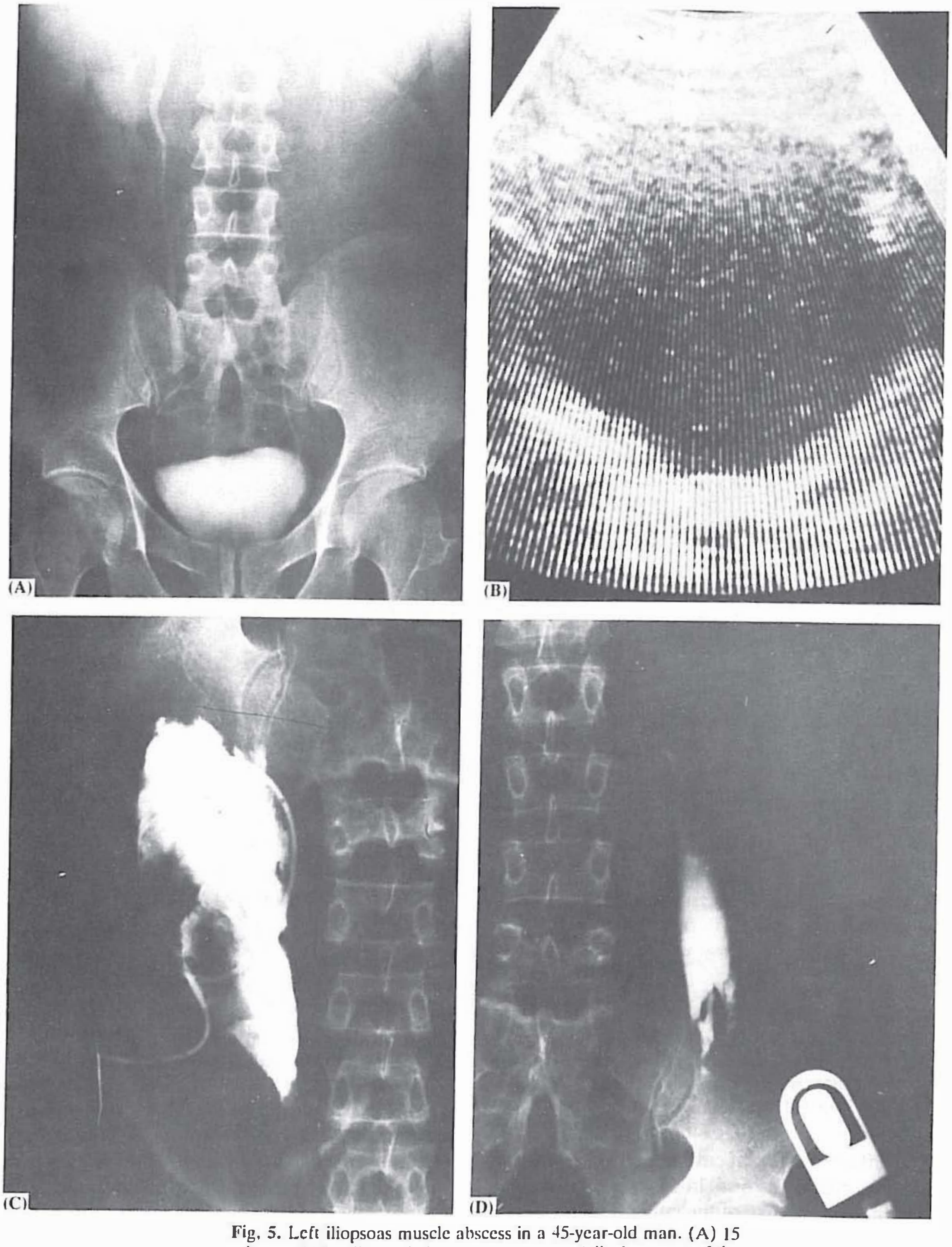


Fig. 5. Left iliopsoas muscle abscess in a 45-year-old man. (A) 15 minutes IVP radiograph demonstrates upward displacement of the left kidney and medial displacement of the left ureter due to a mass obscuring left iliopsoas shadow. (B) Right decubitus longitudinal sinogram demonstrates a large anechoic mass with increased through transmission. (c) Percutaneous catheter drainage with contrast sinogram showing the collection confined to the iliopsoas muscle. (D) Two weeks follow up sinogram shows complete resolution of the cavity.

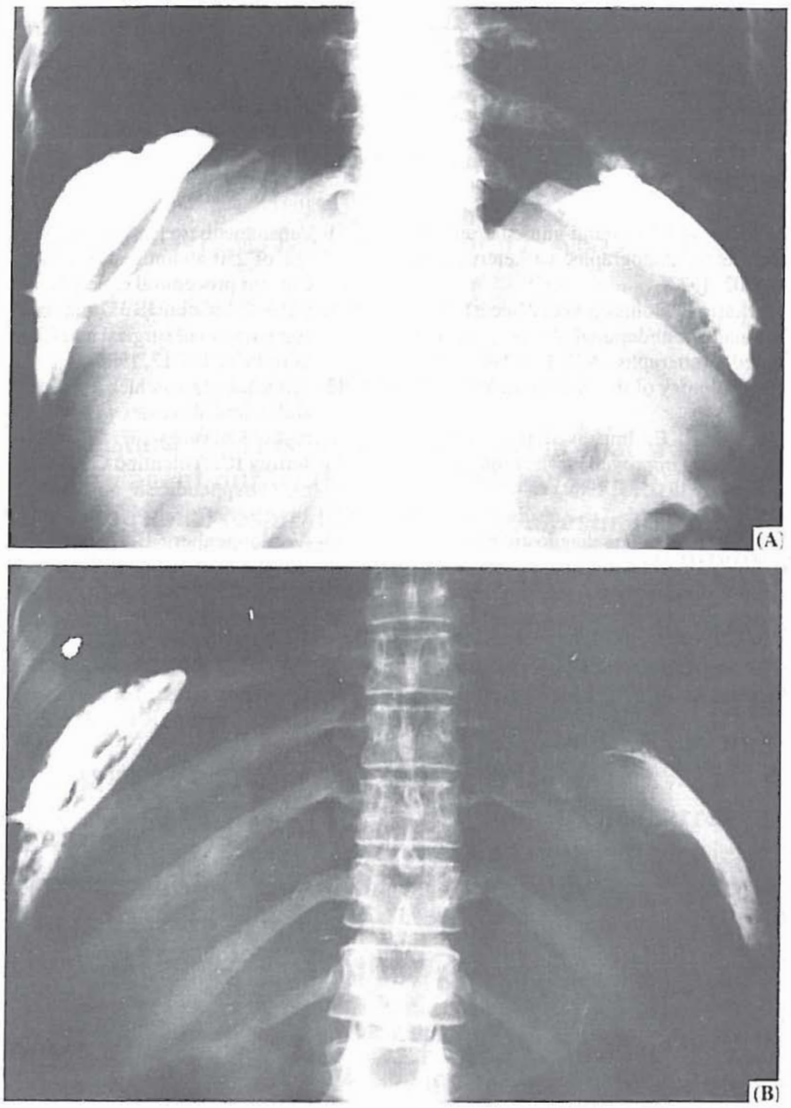


Fig. 6. Postcholecystectomy left and right subphrenic abscess. (A) Sinograms through the drainage catheters demonstrate the extent and location of the collections. (B) Follow up contrast sinograms showing the resolution of the cavities. The catheters were removed after seven days drainage with uneventful recovery of the patient.

available. Approximately 25% of intraabdominal abscesses are multiple, with a second collection occurring at some remote location within the abdominal cavity.[3] Experience in recent years has shown that in most cases the multiple abscesses or an abscess with multiple septations can be effectively drained (Figure 5).[8,9] Percutaneous drainage has also been useful with periappendiceal and diverticular abscesses.[14,15] The abscesses that communicated with enteric and biliary tracts, abscesses in which drainage proved difficult due to presence of viscous fluid and necrotic material, primary splenic abscesses, fungal infections, infected hematoma, and pancreatic abscesses were considered unsuitable for percutaneous drainage procedures. Urinary, lymphatic, pancreatic communications are also among other reasons for recurrent abdominal collections. Successful treatment generally requires long-term (2-4 weeks) drainage for communications to close (Figure 6). Phlegmons, especially pancreatic, usually are not amenable to catheter drainage. Some of the failures are techniqual and usually are both predictable and avoidable. These include premature withdrawal of the catheter, pleural contamination, and inappropriate entrance site selection.

Complications of abscess and fluid drainage are infrequent if proper technique is followed.[16,17] Most large series report complications varying from 0% to 15% overall.[3] I had two major complications in my experience with a rate of 3% which is in accordance with other reports. Although death, hemorrhage, and pneumothorax have been occasionally reported, they are uncommon when care is exercised. Minor complications occurred in 11% of my patients and treated conservatively with good results.

REFERENCES

1- Gronvell J, Gronvell S, Hegedus V: Ultrasound-guided drainage of fluid-containing masses using angiographic catheterization technique. AJR 129:997-1002, 1977.
2- Gerzof SG, Robbins AH, Birkett DH, Johnson WC, Vincent ME: Percutaneous catheter drainage of abdominal abscesses guided by ultrasound and computed tomography. AJR 133: 1-8, 1979.
3- Ferrucci JT: Interventional radiology of the abdomen: Williams and Wilkins, 108-144, 1985.
4- Deveney CW, Lurie K, Deveney KE: Improved treatment of intraabdominal abscess: a result of improved localization, drainage, and patient care. Radiology 171:585, 1989.
5- Vansonnenberg E, Wittich GR, Edwards DK, Casola G, Hilton SW, Self TW, Keightley A: Percutaneous diagnostic and therapeutic interventional radiologic procedures in children: experience in 100 patients. Radiology 162: 601-605, 1987.
6- Vansonnenberg E: Interventional Ultrasound: Churchill Livingstone, 151-172, 1987.
7- Gerzof SG, et al: Percutaneous catheter drainage of abdominal abscesses. A five year experience. N Engl J Med 305: 653-657, 1981.
8- Van Waes PM, Feldberg MM, Mali WP: Management of loculated abscesses that are difficult to drain: A new approach. Radiology 147: 57-63, 1983.
9- Haage JR, Alfidi RJ: Computed tomography of the whole body. Mosby 1988.
10- Vansonnenberg E, Mueller PR, Ferrucci JT: Percutaneous drainage of 250 abdominal abscesses and fluid collections. Part 1: Results, failures, and complications. Radiology 151: 337-341, 1984.
11- Vansonnenberg E, Mueller PR, Ferrucci JT: Percutaneous drainage of 250 abdominal abscesses and fluid collections. Part 2: Current procedural concepts. Radiology 151: 343-346, 1984.
12- Glass CA, Cohn JR: Drainage of intraabdominal abscesses: A comparision of surgical and CT-guided catheter drainage. Am J Surg 147: 315-317, 1984.
13- Knochel JQ, Koehler PR, Lee TG, Welch DM: Diagnosis of abdominal abscesses with CT, ultrasound, and in 111 leukocyte scans. Radiology 137: 425-432, 1980.
14- Jeffrey RB, Tolentino CS, Federle MP: Percutaneous draainage of periappendiceal abscesses: Review of 20 patients. AJR 149:59, 1987.
15- Vansonnenberg E, Wittich GR, Casola G, Neff CC, Hoyt DB: Periappendiceal abscess: Percutaneous drainage. Radiology 163: 23-25, 1987.
16- Johnson RD, et al. : Percutaneous drainage of pyogenic liver abscesses. AJR 144: 463-467, 1985.
17- Mueller PR, Ferrucci JT, Wittenberg J, Simeone JF, Butch RJ: Iliopsoas abscess: Treatment by CT-guided percutaneous catheter drainage. AJR 142: 359-362, 1984.