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## ORIGINAL ARTICLE

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# Image-guided Drainage Using the Trocar Technique

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### ABSTRACT

**Objective:** To investigate the safety profile of image-guided drainage using the trocar technique.

**Methods:** The medical records of 93 patients undergoing image-guided drainage procedures using the trocar technique at a local regional hospital from September 2004 to December 2006 were reviewed.

**Results:** There were no incidences of significant neurovascular or adjacent organ damage.

**Conclusion:** In experienced hands, the trocar technique is safe for image-guided drainage.

**Key Words:** Drainage, Surgery, computer-assisted, Surgical instruments

### INTRODUCTION

Image-guided drainage of fluid collection is a commonly performed interventional procedure. There are 2 main methods of fluid collection drainage: the Seldinger technique with guide-wire manipulation and coaxial dilatation, and the trocar technique. Each technique has its own advantages and disadvantages. The major disadvantages of the trocar technique are the potential for neurovascular or adjacent organ damage. However, the potential for these complications has not been studied. A retrospective review of the image-guided drainage procedure using the trocar method was performed in a local regional hospital to elucidate the risks associated with the technique.

### METHODS

This was a retrospective review of image-guided procedures using the trocar technique performed from September 2004 to December 2006. All procedures were performed by 2 experienced radiologists at a regional hospital.

Size 7.0 to 8.3 Fr catheters (Cook, Bloomington, USA, and InterV, Stenlose, Denmark) were used, depending on the clinical situation, and availability at the time of

the procedure. All patients' medical records and clinical case notes were reviewed retrospectively to ascertain the clinical outcome and presence of complications, particularly severe vascular injuries. Serious vascular complications were defined as those requiring intervention, including blood transfusion or haemostasis. Any procedure-related complication was recorded.

### RESULTS

Ninety three procedures were performed for 80 patients. There were 46 men and 34 women, with a mean age of 66 years (SD, 14.5 years; range, 32 to 93 years). The types of procedure are shown in Table 1. Most of the procedures (n = 83; 89.2%) were performed by using ultrasound guidance alone; 6 procedures (6.5%) were performed by using computed tomography (CT) guidance alone; and 4 procedures (4.3%) were performed by using a combination of ultrasound and fluoroscopic guidance, all of which were percutaneous nephrostomies. Ninety one procedures were accomplished using 1 needle pass, and 2 procedures were completed using 2 needle passes. Size 7.0 Fr catheters were used for 55 procedures and size 8.0 or 8.3 Fr catheters were used for 38 procedures.

The overall success rate of the drainage procedure was 82.7% (77 of 93 procedures). Catheter dislodgement within 1 week of insertion occurred in 5 procedures (5.4%).

There were no serious vascular complications or nerve damage.

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**Table 1.** Image-guided drainage procedures using the trocar technique.

Procedure	Number of patients (n = 93)
Percutaneous transhepatic drainage	
Loculated collection drainage	15
Biliary drainage	1
Percutaneous cholecystostomy	12
Percutaneous drainage of renal and perinephric collections, including nephrostomy	15
Percutaneous drainage of peritoneal and retroperitoneal fluid collections	32
Percutaneous pleural drainage	12
Percutaneous lung abscess drainage	1
Percutaneous shoulder joint drainage	1
Transvaginal drainage of pelvic collection	2
Transgluteal drainage of pelvic collection	2

## DISCUSSION

The trocar technique for image-guided drainage procedures is performed by direct puncture of the fluid collection using a trocar needle and insertion of a catheter. The trocar is removed after the catheter position has been optimised under image guidance. The Seldinger technique is performed by first puncturing the collection using small caliber needles (20 G to 22 G). A guide wire is inserted through the needle into the fluid collection. The needle is then removed leaving the guide wire in situ. The needle tract is serially dilated by exchange of dilators/guide wires. Finally, a drainage catheter of suitable size is inserted into the fluid collection over the guide wire.

As the Seldinger technique uses a small caliber puncture needle, this procedure is theoretically less traumatic than the trocar needle technique that uses a large needle size, similar to the drainage catheter. The risk for injury to the vessels, nerves, and organs in the vicinity of the needle path is theoretically higher with the trocar technique than with the Seldinger technique. However, this study has shown that the risk is low in experienced hands.

As there is no guide-wire/dilator exchange, the trocar technique is easier and faster to perform than the Seldinger technique, which is important when treating a critically ill patient. In this study, the trocar technique was selected to expedite the procedure for 1 patient who had fast atrial fibrillation with low blood pressure and grossly dilated intrahepatic ducts. The procedure was quickly performed and was successful. Drainage was easily accomplished by 1 needle stick under ultrasound guidance and the patient was promptly returned to the ward for further medical treatment. As the technique is simple to perform, there is no need for an experienced assistant, which is an advantage in emergency situations.

The trocar technique is the method of choice for certain procedures, such as transvaginal drainage.<sup>1</sup> The trocar procedure is preferred for transvaginal puncture because of the difficult access. Kinking of the guide wire or loss of needle tract occurs more commonly for transvaginal drainage than with the percutaneous procedure.

For procedures such as transgluteal drainage, the stiffness of the catheter-cannula-stylet combination enables directional control of the catheter when traversing the large gluteal muscle mass (Figure 1).

As the Seldinger technique requires the manipulation of guide wires and catheters, it is associated with a higher incidence of spillage of body fluid than the trocar technique.<sup>2,3</sup> Using commercially available drainage needle sets, drainage using the trocar technique can be accomplished in a closed system. Risk of cross infection or contamination of the examination room due to spillage of body fluid is minimised.

The Seldinger technique usually causes more pain than the trocar technique. The serial dilatations of the body



**Figure 1.** A 79-year-old man with carcinoma of the rectum developed a pelvic abscess after low anterior resection due to anastomotic leakage. An 8 Fr pigtail catheter was inserted using the trocar technique via the transgluteal approach.

wall are painful, especially if the intercostal muscles and the gluteal muscles are involved in the procedure. The spillage of fluid into the peritoneum during dilator exchange for intra-abdominal abscess drainage can be painful for patients.

When using the Seldinger technique for empyema drainage, it can be difficult to advance the catheter intercostally through the chest wall muscles and thickened pleura without buckling the guide wire or catheter. Moreover, the Seldinger technique is more likely to introduce air, causing pneumothorax, than the trocar technique. However, manipulation of the guide wire within the cavity during the Seldinger procedure may have the advantage of breaking down the septae of multiloculated collections. This benefit of the Seldinger technique over the trocar technique needs further evaluation.

Most procedures done using the trocar technique can be performed using ultrasound guidance alone, without the need for fluoroscopy. This can obviate the need for patient transfer during the procedure, and avoids the radiation dose from fluoroscopy.

One disadvantage of the trocar technique is the limited choice of drainage catheters. The pigtail catheter has a limited number of side-holes concentrated in the pigtail portion of the catheter.

In this study, all procedures were accomplished in 1 or 2 needle passes, which is likely to have contributed to the absence of neurovascular trauma. For difficult procedures, where multiple needle punctures may be

required, the Seldinger technique using small caliber needles may be a more prudent method.

Size 7.0 to 8.3 Fr catheters were used in this study, as larger catheters could cause greater discomfort with no additional benefits. Studies have demonstrated that small-bore catheters are as effective as large-bore catheters.<sup>4,5</sup>

In summary, this study has shown that the trocar method is a simple and safe technique for performing common image-guided drainage procedures, when performed by experienced radiologists. For procedures such as percutaneous cholecystostomy, empyema drainage, transgluteal drainage, and transvaginal drainage, the trocar technique is the method of choice. Radiologists with heavy service demands for image-guided drainage procedures should learn the trocar technique.

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