

Feasibility and Outcomes of Ultrasound-Guided Percutaneous Drainage Performed by General Surgeons: A Retrospective Analytical Study in District Hospital - Temerloh, Pahang

DHAVA Mogen Raj^{1*}, CHE AMAN Che Jamal Abdillah¹, HASSAN Azmi¹

¹Department of General Surgery, Hospital Sultan Haji Ahmad Shah, 28000 Temerloh, Pahang, Malaysia

DOI: <https://doi.org/10.36347/sasjs.2026.v12i09.005>

| Received: 04.07.2026 | Accepted: 06.09.2026 | Published: 21.09.2026

*Corresponding author: DHAVA Mogen Raj

Department of General Surgery, Hospital Sultan Haji Ahmad Shah, 28000 Temerloh, Pahang, Malaysia

Abstract

Original Research Article

Image-guided percutaneous drainage has become an established minimally invasive alternative to conventional surgical drainage for the management of abdominal and retroperitoneal fluid collections. Ultrasound guidance offers several advantages, including real-time visualization, portability, absence of ionizing radiation, and bedside accessibility. With increasing availability of point-of-care ultrasonography, general surgeons are increasingly performing ultrasound-guided drainage procedures, particularly in resource-limited settings. This study aimed to evaluate the spectrum of procedures performed, clinical indications, safety, and outcomes of ultrasound-guided percutaneous drainage undertaken by general surgeons at Hospital Sultan Haji Ahmad Shah (HoSHAS), Temerloh, Pahang.

Keywords: Percutaneous Drainage, Cholecystostomy, Nephrostomy, Pigtail drainage, Ultrasound guided.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Abdominal collections are common sequelae of various disease processes and may involve visceral or non-visceral structures, occurring within the intra-peritoneal or retroperitoneal spaces. Traditionally, surgical drainage was considered the standard treatment for these conditions. However, open surgical drainage is associated with significant morbidity, longer hospital stays, and increased healthcare costs.

Over the past few decades, image-guided percutaneous drainage has emerged as a preferred minimally invasive alternative for the management of many abdominal collections. Percutaneous drainage techniques utilize imaging modalities such as ultrasound or computed tomography (CT) to guide catheter placement into fluid collections for drainage and infection control. Numerous studies have demonstrated that image-guided drainage is associated with high success rates, reduced morbidity, and shorter recovery times compared with surgical drainage.[1]

Among available imaging modalities, ultrasound guidance offers several advantages, including real time visualization, portability, absence of ionizing radiation, and lower cost. Ultrasound also allows bedside procedures in critically ill patients and facilitates

repeated assessment of fluid collections during follow-up.[2]

Historically, image-guided procedures have largely been performed by interventional radiologists. However, increasing availability of portable ultrasound machines and growing familiarity with point-of-care ultrasound have enabled general surgeons to perform ultrasound-guided interventions, particularly in emergency or resource-limited settings. Surgeon-performed ultrasound can facilitate earlier diagnosis and immediate therapeutic intervention, especially in patients presenting with abdominal sepsis or obstructive uropathy requiring urgent decompression.[3]

Several studies have demonstrated that surgeon-performed ultrasound-guided drainage is safe and effective, with outcomes comparable to procedures performed by interventional radiologists when appropriate training and patient selection are applied.[4]

Hospital Sultan Haji Ahmad Shah (HoSHAS), Temerloh, is a district hospital serving large population in Pahang and surrounding regions. In recent years, the general surgery department has increasingly utilized ultrasound-guided percutaneous drainage techniques for the management of various abdominal and retroperitoneal pathologies. This study aimed to evaluate

the spectrum of procedures performed, clinical indications, safety, and outcomes of ultrasound-guided percutaneous drainage undertaken by general surgeons at Hospital Sultan Haji Ahmad Shah (HoSHAS), Temerloh, Pahang.

METHODS

A retrospective analytical study to evaluate ultrasound-guided percutaneous drainage procedures performed by general surgeons. The study was carried out at Hospital Sultan Haji Ahmad Shah (HoSHAS), Temerloh, Pahang, Malaysia. The study included cases performed over a two-year period from January 2024 to December 2025. During this period, patients who underwent ultrasound-guided percutaneous drainage procedures performed by the general surgery department were identified and included in the analysis.

Patients were included in the study if they had undergone ultrasound-guided percutaneous drainage performed by a general surgeon within the defined study period. Exclusion criteria; procedures performed under other imaging modalities, such as computed tomography (CT)-guided drainage. In addition, procedures performed by departments other than the general surgery unit were not included in the study.

Data were collected retrospectively from electronic medical records, operative notes, and procedural documentation available within the hospital information system. Relevant clinical and procedural information was extracted for analysis. The variables collected included patient demographic data (age), type of drainage procedure performed, underlying clinical diagnosis, procedural success rate, procedure-related complications, duration of catheter drainage, and length of hospital stay.

The collected data were analyzed using descriptive statistical methods. Continuous variables were summarized using mean, median, and range, while categorical variables were expressed as frequencies and percentages. These analyses were used to describe the demographic characteristics of the study population, the types of procedures performed, and the procedural outcomes associated with ultrasound-guided percutaneous drainage performed by general surgeons.

RESULTS

A total of 95 patients underwent ultrasound-guided percutaneous drainage procedures performed by the general surgery team during the study period. The procedures were carried out for a variety of abdominal and retroperitoneal conditions, with hydronephrosis representing the most common indication, followed by intra-abdominal collections, gallbladder empyema, liver abscesses, and other fluid collections requiring minimally invasive intervention. The patient population included both male and female patients across a wide age

range, reflecting the broad applicability of the procedure in different clinical settings.

The overall procedural success rate was 94.7%, with successful catheter placement and adequate drainage achieved in the majority of cases. Most patients demonstrated significant clinical improvement following the procedure, including reduction in abdominal pain, fever, sepsis parameters, and improvement in laboratory and radiological findings. In patients with obstructive uropathy and hydronephrosis, decompression of the collecting system resulted in symptomatic relief and stabilization of renal function. Similarly, patients with intra-abdominal and hepatic collections showed reduction in collection size and improvement in systemic signs of infection after drainage.

Only 5.3% of patients experienced procedure-related complications, indicating a relatively low complication rate. The complications observed were generally minor and manageable with conservative treatment or simple interventions, without the need for major surgical procedures. No procedure-related mortality was recorded in this study. The low complication rate further supports the safety profile of ultrasound-guided percutaneous drainage when performed by trained general surgeons.

Most procedures were completed successfully under ultrasound guidance alone, without the need for conversion to open surgical drainage. Ultrasound imaging provided real-time visualization of the target collection and surrounding anatomical structures, allowing accurate catheter placement while minimizing injury to adjacent organs and vessels. The minimally invasive nature of the procedure also contributed to shorter recovery times and reduced postoperative morbidity compared to conventional surgical intervention.

The majority of patients responded well to a single drainage procedure. However, a small number of patients required repeat drainage or additional interventions due to persistent or recurrent collections. These cases were commonly associated with complex or multiloculated abscesses, thick purulent contents, or advanced underlying disease processes.

Length of hospital stay varied according to the underlying pathology and severity of illness, although patients who underwent successful drainage generally demonstrated earlier clinical improvement and avoidance of more invasive operative procedures. In several cases, ultrasound-guided drainage served either as definitive treatment or as a bridge to elective surgery after stabilization of the patient's condition.

Overall, the findings of this study demonstrate that ultrasound-guided percutaneous drainage performed by general surgeons is an effective and reliable

minimally invasive approach for the management of a wide spectrum of abdominal and retroperitoneal

pathologies, with high success rates and low complication rates.

Table 1: Patient Demographics

Variable	Result
Total number of patients	95
Age range	9-88 years
Mean age	56.1 years
Median age	59 years

Table 2: Types of Ultrasound-Guided Percutaneous Drainage Procedures

Procedure	Number of Cases (n)	Percentage (%)
Nephrostomy	33	34.7
Peritoneal drainage	26	27.4
Cholecystostomy	14	14.7
Liver abscess drainage	13	13.7
Retroperitoneal drainage	9	9.5
Total	95	100

Table 3: Procedural Outcomes

Outcome Parameter	Result
Procedural success rate	90/95 (94.7%)
Complication rate	5/95 (5.3%)
Duration of catheter drainage	Up to 1 month
Length of hospital stay	7-14 days

DISCUSSION

This study demonstrates that ultrasound-guided percutaneous drainage performed by general surgeons is a safe, effective, and minimally invasive procedure for the management of a broad spectrum of abdominal and retroperitoneal pathologies. The overall procedural success rate of 94.7% observed in this series is comparable with contemporary reports of image-guided drainage procedures, which consistently demonstrate success rates exceeding 85–95%.^[1,3] The findings support the increasing role of minimally invasive source-control procedures as an alternative to conventional open surgery, particularly in critically ill patients and those with significant comorbidities who may not tolerate major operative intervention. ^[1,2,4]

Percutaneous nephrostomy was the most commonly performed procedure, accounting for approximately one-third of all cases. This finding reflects the frequent presentation of patients with hydronephrosis and obstructive uropathy requiring urgent decompression to prevent progressive renal impairment and urosepsis. In this cohort, the causes of obstruction included both urinary calculi and malignant ureteric obstruction. Stone disease was more commonly associated with acute presentations, whereas malignant obstruction was frequently observed in patients with advanced pelvic or abdominal malignancies. Most patients demonstrated moderate to gross hydronephrosis on imaging, which facilitated successful catheter placement.

Microbiological analysis of urine obtained during nephrostomy demonstrated varying patterns, ranging from sterile cultures to monobacterial and polymicrobial infections. Patients with septic obstruction commonly yielded organisms such as *Escherichia coli* and *Klebsiella pneumoniae*, consistent with previously reported uropathogens in obstructive pyelonephritis.

Retrograde pyelography (RPG) stenting was not selected as the primary decompressive modality in several cases due to hemodynamic instability, ongoing sepsis, or anticipated technical difficulty during cystoscopic access. In critically ill patients, percutaneous nephrostomy provided a faster and safer method of decompression under local anaesthesia. In addition, pre-procedural CT imaging in certain patients demonstrated distorted anatomy or severe ureteric obstruction, making successful retrograde stenting less likely. In these situations, nephrostomy served either as definitive decompression or as a temporary bridge before definitive antegrade or retrograde stenting could be performed once the patient's clinical condition stabilised.

Peritoneal drainage represented the second most common procedure in this study. Image-guided drainage of intra-abdominal collections has become widely accepted as the first-line treatment for many abdominal abscesses, frequently avoiding the need for open surgical intervention.^[6] Previous studies have demonstrated high clinical success rates with ultrasound- or CT-guided drainage of abdominal collections, particularly in postoperative and localized abscesses. ^[5,6]

The indications for drainage in this cohort included infected ascites, postoperative intra-abdominal collections, and infected pancreatic collections secondary to necrotising pancreatitis. Patients with necrotising pancreatitis generally required prolonged drainage and intensive antibiotic therapy, although percutaneous drainage successfully controlled sepsis in selected cases and avoided emergency laparotomy.

Percutaneous cholecystostomy was performed primarily in patients with gallbladder empyema who were deemed high-risk surgical candidates due to significant comorbidities or poor physiological reserve. The diagnosis of gallbladder empyema was established based on clinical sepsis in combination with imaging findings such as a distended gallbladder, thickened gallbladder wall, intraluminal debris, and pericholecystic fluid. CT imaging was routinely utilised to assess suitability for drainage and to exclude features suggestive of gangrenous cholecystitis or perforation, as these conditions are generally considered less suitable for percutaneous management alone.

All procedures in this series were performed using the transhepatic approach, which is associated with lower risks of bile leakage and catheter dislodgement compared to the transperitoneal technique. Previous studies have demonstrated that percutaneous cholecystostomy can effectively control biliary sepsis and may serve either as a bridge to interval cholecystectomy or as definitive treatment in selected high-risk patients. [7,8] In this cohort, most patients demonstrated clinical resolution of sepsis following drainage, and many subsequently had catheter removal without requiring definitive surgery because they remained poor candidates for general anaesthesia.

Similarly, percutaneous drainage of liver abscesses has largely replaced open surgical drainage due to its minimally invasive nature and high success rates. [9] In the Malaysian setting, particularly in Pahang where melioidosis is endemic, *Burkholderia*

pseudomallei represents an important causative organism for liver abscess formation. Both pyogenic and melioidotic liver abscesses were encountered in this study. Pyogenic abscesses were frequently associated with biliary obstruction or intra-abdominal infection, whereas melioidosis-related abscesses often occurred in patients with diabetes mellitus or immunocompromised states.

Although ultrasonography was sufficient for initial detection and procedural guidance in many patients, CT imaging was necessary in selected cases to confirm the diagnosis, delineate the extent of collections, identify multiloculated abscesses, and exclude underlying hepatic malignancy prior to drainage. Lesions larger than approximately 3–5 cm or those associated with persistent sepsis were considered suitable candidates for percutaneous drainage. Patients with pyogenic liver abscesses generally required prolonged intravenous antibiotics followed by oral therapy, whereas melioidosis cases required a longer eradication phase in accordance with established treatment protocols.

The complication rate of 5.3% observed in this study was relatively low and comparable to rates reported in other studies on percutaneous drainage procedures. [5,9] Most complications were minor and included catheter blockage, displacement, or incomplete drainage requiring repositioning. No major procedure-related mortality was observed.

The findings of this study also highlight the expanding role of general surgeons in performing ultrasound-guided percutaneous procedures, particularly in centres where access to interventional radiology services may be limited. Early bedside intervention by trained surgeons can significantly improve outcomes in patients presenting with abdominal sepsis or obstructive uropathy by facilitating prompt source control and decompression while avoiding delays in treatment.



Figure 4 : Percutaneous drainage aspiration

CONCLUSION

Ultrasound-guided percutaneous drainage performed by general surgeons is a safe and effective

minimally invasive procedure with high technical and clinical success in the management of abdominal and retroperitoneal pathologies. In this study involving 95 patients, the procedure achieved an overall success rate

of 94.7% with a low complication rate of 5.3%, demonstrating outcomes comparable to those reported in established interventional radiology series.

Percutaneous drainage provided effective source control and decompression in patients with obstructive uropathy, intra-abdominal collections, gallbladder empyema, liver abscesses, and retroperitoneal abscesses, while avoiding emergency surgery in many high-risk or septic patients. Ultrasound guidance enabled rapid bedside intervention, reduced procedural invasiveness, and allowed treatment to be performed safely under local anaesthesia in selected cases.

The findings support the role of trained general surgeons in performing ultrasound-guided drainage procedures, particularly in district hospitals and centres with limited access to interventional radiology services. Early surgeon-performed intervention can shorten delays to treatment, facilitate prompt sepsis control, and potentially reduce morbidity associated with untreated abdominal sepsis and obstructive pathology.

Overall, ultrasound-guided percutaneous drainage should be considered an essential component of modern surgical practice in appropriately selected patients, particularly in resource-limited settings where timely access to minimally invasive intervention is crucial.

Acknowledgement

We would like to express our gratitude to the whole personnel at Department of General Surgery,

Hospital Sultan Haji Ahmad Shah, Temerloh for guidance and knowledge shared.

Conflict of Interest

The authors declare no conflict of interest

REFERENCES

1. vanSonnenberg E, Wittich GR, Casola G. Percutaneous abscess drainage: update. *World Journal of Surgery*. 2001.
2. Men S, Akhan O, Köroğlu M. Percutaneous drainage of abdominal abscess. *European Journal of Radiology*. 2002.
3. Moore CL, Copel JA. Point-of-care ultrasonography. *New England Journal of Medicine*. 2011.
4. Abu-Yousef MM, *et al.*, Percutaneous drainage of abdominal abscesses: success rate and complications. *AJR American Journal of Roentgenology*.
5. Zerem E, Hadzic A. Sonographically guided percutaneous catheter drainage versus needle aspiration in management of liver abscess. *AJR*.
6. Lorenz J, Thomas JL. Complications of percutaneous fluid drainage. *Seminars in Interventional Radiology*.
7. McKay A, Abulfaraj M. Percutaneous cholecystostomy for acute cholecystitis in high-risk patients. *Canadian Journal of Surgery*.
8. Rajak CL *et al.*, Percutaneous treatment of liver abscesses. *Radiology*.