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Ultrasound-guided percutaneous drainage of abdominal abscesses: early experience at a tertiary hospital in Southern Nigeria

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Abstract

Background and Objective: The traditional surgical management of abdominal abscesses is by laparotomy and open drainage. Minimal access drainage procedures have become a viable option for surgery. This paper chronicles the successes and challenges, so far, in the ultrasound-guided drainage of abdominal abscesses in 12 patients in a resource-poor setting. Method: Following sonographic diagnosis or confirmation of abdominal abscess, twelve patients were offered minimal access drainage of the collections under ultrasound guidance as an alternative to open surgical operation. Using the Seldinger technique under guidance with a 2D grey-scale ultrasound scanner, a catheter was advanced into the abscess cavity, and the contents were aspirated. This was done under local anaesthesia, while aseptic conditions were maintained. The cavity was thoroughly lavaged with warm normal saline. The catheter was connected to a pouch and left in place for passive drainage. Post-procedure analgesia was ensured. Results: There were twelve patients (3 males and 9 females), who had either intraperitoneal abscess, liver abscess, infected ovarian cyst, or extraperitoneal abscess, complete resolution was achieved in 9, in 1 patient the procedure was completely unsuccessful, while 1 patient (who had a pelvic abscess) developed peritonitis when the catheter tip dislodged into the peritoneal cavity. The immediate post-procedure condition was satisfactory in all the patients. Conclusion: The treatment of abdominal abscesses (and other fluid collections) by ultrasound-guided percutaneous drainage when performed with the correct technique, has been demonstrated to be a safe, effective, and relatively complication-free alternative to laparotomy, particularly in a resource-poor setting saving patients fund, avoiding the complications of general anaesthesia, and also providing the added advantage of reduced hospital stay.

***Keywords**: Ultrasound-guided; drainage; abdominal; abscess.*

Introduction

The practice of diagnostic radiology incorporates therapeutic procedures aimed at effecting cure for a specified pathology; this comes under interventional radiology and is achieved under image guidance. It could be said that interventional radiology first came into being on January 16, 1964, when Charles Dotter performed a vascular procedure, successfully dilating a localised stenosis of the superficial femoral artery in an 82-year-old woman who had painful leg ischaemia and was being planned by her surgeons for an amputation[1]. The patient's full use of her limbs was restored.

Interventional radiology as a new, rapidly expanding subspecialty is employed in angiography/ angioplasty; neurovascular procedures such as balloon angioplasty, coiling of aneurysms; embolisation of tumours; treatment of internal or concealed haemorrhages following trauma; biopsy; and drainage of abscesses and other fluid collections, among many others.

Traditionally, abdominal abscesses are evacuated by open surgery. But this is attended by various complications, including haemorrhage, infection, anaesthetic complications, in addition to significant

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financial cost and relatively long hospital stay. The introduction of minimal-access procedures, such as percutaneous drainage, has helped to reduce the incidence of these complications. In fact, in a national multicentric study of 520 patients in Spain, percutaneous drainage was found to be effective and safer than open surgery in many cases[2]. Ultrasound-guided drainage procedures have also led to reduced morbidity and mortality as well as a decrease in hospital stay and healthcare costs[3].

At the authors' centre, the first image-guided drainage of an abscess was carried out in the year 2011 on a 34-year-old male who had an intrahepatic abscess. A 16F intravenous canula was advanced under ultrasound guidance using a 2D Toshiba scanner. The procedure was repeated once, followed by saline lavage. Antibiotic cover, already instituted by the referring Surgeon, was continued, and by the 2-month follow-up scan, the absence had fully resolved.

Materials and Methods

Percutaneous drainage was carried out on patients who were referred to the radiology department for an ultrasound scan on the clinical impression of an abdominal abscess or cyst. This is a series comprising twelve (12) patients (3 male, 9 female), 4 of whom were inpatients already admitted either with acute febrile illness or for surgical operation, and the remaining 8 were outpatients and were managed as day cases.

Following sonographic confirmation of the diagnosis, the authors proposed image-guided percutaneous drainage (PCD) to the managing (referring) clinician(s). (This option was also offered to the patient with a due explanation).

Once accepted, the patient received a booking for the procedure; the authors reviewed the patient's clinical history, the results of other investigations, and all current medications.

At presentation for the procedure, informed consent was obtained from the patient, and pre-procedure vital signs were taken.

The procedure was performed under aseptic conditions. The patient lay supine, in most cases, or a position appropriate for the location of the lesion. Using a 2D Doppler ultrasound scanner Logiq P9, General Electric Company, equipped with a 3.5MHz convex probe, the abscess or cyst was located again. The distance of the near wall of the cyst or abscess from the skin was measured as a guide to the minimum depth of insertion of the needle and the dilator subsequently. The distance also to the middle of the collection was noted, as a guide to the maximum length of needle or dilator allowed in, to avoid the perforation of the far wall and other tissues.

The Central Venous Catheter pack with a size 7.5Fr or 8.5FR triple-lumen catheter was the usually available kit in our environment.

Under local anaesthesia, a transverse stab incision (5mm - 7mm long) was made in the skin, and using the Seldinger technique, an introducer needle was inserted under ultrasound visualization and at arrested respiration, until its tip was well within the collection. A guidewire was then threaded through the lumen of the needle curved end first to avoid the risk of perforating the opposite wall of the cyst or other tissues. The needle alone was now withdrawn, and a tissue dilator was passed over the guidewire (the straight external end of the guidewire being passed through the lumen of the hollow dilator) to a depth equal at least to the thickness of tissue plus the length of the tapered portion of the dilator. This ensured that the tract acquired a uniform diameter throughout its length, the same as the dilator. The catheter was introduced also over the guidewire following withdrawal of the dilator, always ensuring that the part of the catheter with all the side fenestrations were well within the cavity. *All insertions and withdrawals (of needle, dilator or catheter) were done under arrested respiration, (except for lesions such as pelvic collections or ovarian cysts which do not move with respiration) while the patients were allowed to breathe again in-between.*

Finally, the catheter was secured to the skin with the use of surgical suture material. The abscess was aspirated actively, and the cavity was copiously lavaged with warm normal saline. The catheter was connected to a pouch and left in place for continuous drainage under gravity. Post-procedure analgesia and antibiotic cover were always ensured.

Daily ultrasound checks were carried out to monitor any residual fluid. The catheter was discontinued if there had been no further drainage for twenty-four hours and the cavity was empty.

Result

Twelve (12) patients aged between 22 years and 65 years (mean age, 44 years), comprising 3 males (25%) and 9 females (75%) had percutaneous drainage of abscesses or cysts according to the protocol described. Four (4) of these were in-patients, and 8 were managed as day cases.

There were 10 cases of absence out of which 3 (30%) were intrahepatic, 5 (50%) intraperitoneal, 2 (20%) extraperitoneal; 1 case of a haemorrhagic pancreatic cyst, and 1 case of an intrahepatic cyst. In terms of identifiable causes, 3 cases (intrahepatic) were due to bacterial infection, 1 case of absence was due to secondary bacterial infection of a pre-existing (ovarian) cyst), 4 (40%) were post-operative complications; 1 occurred following perforation during an upper GI endoscopy, and 1 resulted from a perforated gastric ulcer.

The smallest volume of effluent drained was 230ml from a pelvic abscess, while the largest was 3,395ml from the intrahepatic cyst. In 2 cases (16.7%), there was incomplete drainage, and the patients eventually had laparotomy, the procedure was completely unsuccessful in 1 patient (8.4%) on account of inability to get access to the abscess, while complete drainage was achieved in 9 patients (75%). Complication was only recorded in 1 patient (9.1%) out of the eleven patients who had drainage, in form of peritonitis which occurred after the catheter tip dislodged into the peritoneal cavity. It resolved on oral antibiotic therapy. This was also one of the patients who eventually had laparotomy on account of incomplete drainage, the collection being multilocular (which might have required repeated puncture). The second patient who had laparotomy had haemorrhagic pancreatic pseudocyst which, following drainage, was found to be associated with a mass. The mass proved to be inflammatory on histology, and it resolved completely on antibiotic therapy.

The table below provides a summary of the cases with outcome.

Patient's Data	Diagnosis /Site	Cause/ Clinical Setting	Volume (ml)	Outcome/ Complications
M/34 yr.	Intrahepatic abscess	Bacterial infection	900	Complete resolution
F/42 yr.	Intrahepatic abscess	Bacterial infection	660	Complete resolution
F/22 yr.	Lt. Ovarian cyst	Super infection	420	Complete resolution
M/56 yr.	Intraperitoneal abscess	Post-op infection	1,050	Complete resolution
M/35 yr.	Intrahepatic abscess	Bacterial infection	920	Complete resolution
F/65 yr.	Intraperitoneal (Subphrenic) abscess	Post-endoscopy complication	580	Complete resolution
F/56 yr.	Intraperitoneal abscess	Perf. gastric ulcer	1,495	Complete resolution
F/39 yr.	Extraperitonea abscess	Post-op infection	2,530	Complete resolution
F/64 yr.	Intraperitoneal abscess	Post-op infection	230	Incomplete. Peritonitis. Had laparotomy
F/29 yr.	Intraperitoneal abscess	Post-op infection	Nil	Unsuccessful
F/23 yr.	Pancreatic cyst	Inflammation. Haemorrhage	1,890	Incomplete. Subsequently had laparotomy
F/64 yr.	Intrahepatic cyst	Undetermined	3,390	Complete resolution

Figure 1a. A 2D sonogram of an intrahepatic abscess in transverse and parasagittal planes. The dimensions are measured on these images.

Fig. 1b. A triple-lumen catheter in place with its tip well within the abscess cavity.

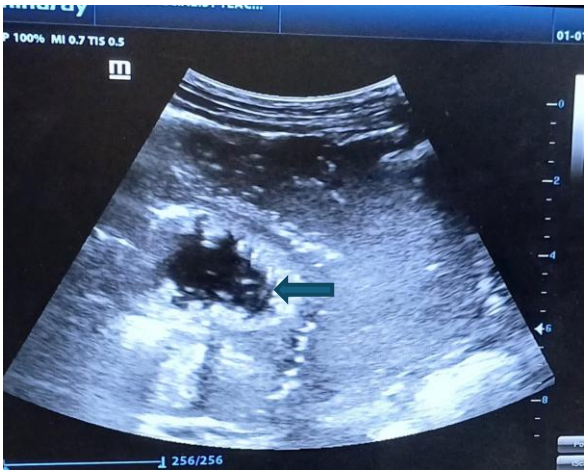

Fig 2a. 2D sonogram of another patient showing free intraperitoneal fluid collection with numerous debris (pus). A thickened loop of small bowel is demonstrated (arrow).

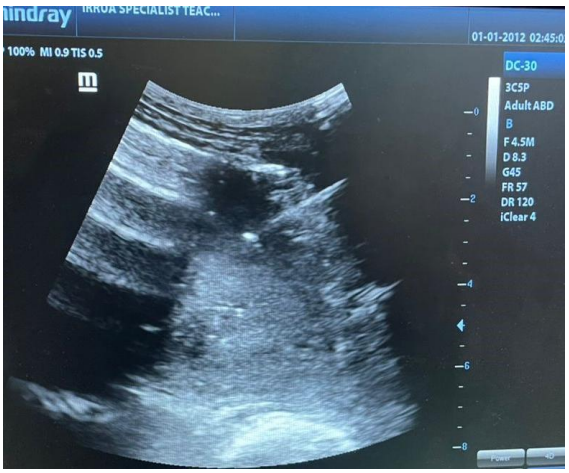

Fig. 2b. Sonogram showing the needle inserted through the left lateral abdominal wall till its tip is within the fluid collection

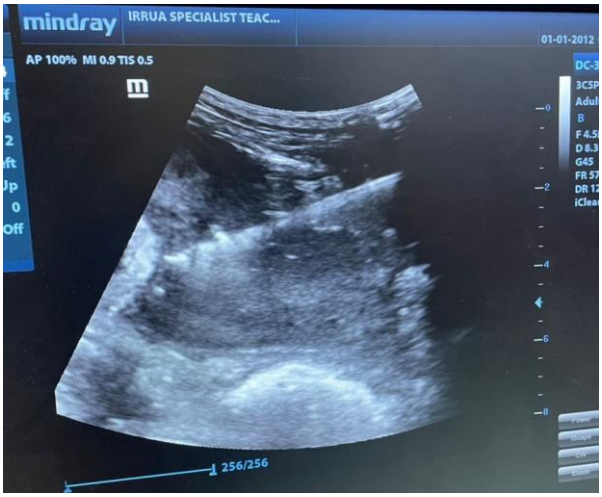

Fig. 2c. Following 2b. Above, a guidewire has been passed through the needle well into the collection but shy of the bowel.

Discussion

Over the years, image-guided drainage of intra-abdominal fluid collections, including abscesses, has become routine in many centres across the globe and is becoming the standard of care in current clinical practice[3]. This procedure may be carried out either by the endoscopic route or by percutaneous access.

This article chronicles the earliest cases of image-guided therapeutic procedures with a focus on ultrasound-guided percutaneous drainage of abdominal abscesses and other fluid collections in a tertiary healthcare centre in Southern Nigeria. This is aimed at documenting the toddler's initial steps

towards the development of a fully functional interventional radiological unit in our centre. The authors' centre at present does not have a dedicated suite for interventional procedures; a regular ultrasound room had to be used but it was possible to maintain asepsis, especially since the procedures are minimal-access - the incisions made after thorough cleansing are only 5mm - 7mm long.

All our patients were managed percutaneously with a good outcome. The mean age of our patients (44.1 years) is similar to that obtained by Misauno M.A.et al[4] who performed percutaneous ultrasound-guided drainage of abdominal abscesses on 24 patients; the mean age in their study was 40 ± 19.3 years, and by Igbinedion B. O.et al[5] in a retrospective documentation of percutaneous drainage of body fluids in a tertiary centre; they recorded a mean age of 41.1 years. Intra-peritoneal abscesses seem to be more commonly encountered in the young and middle-aged.

Of the ten (10) cases of abscess, seven (7) occurred as complications of abdominal surgery. The most notable case (on account the history and of the severity of clinical manifestation) was the 56-year-old man who had had a laparotomy for perforated appendicitis. The abscess later developed from a dropped appendicolith, and though this was successfully extracted during a revisit operation, the patient eventually developed an intraperitoneal abscess. Appendicitis, especially when perforated, is associated with post-operative abscess in about 20% of cases[6].. Appendicolith has been reported as a cause of retroperitoneal abscess[7], either accidentally dropped or extruded because of a stump ligation giving way. The latter cause has led some authors to advocate double ligation of the appendiceal stump.

Complete success was achieved in 9 (75%) of the patients with a complication recorded in 1 (8.5%); this is like that achieved by JS Lameris et al[8] who had a success rate of (74%) and a complication rate of 8%, but a mortality rate of 11%. We did not record any mortality. Better outcomes, however, have been reported by other researchers, such as Saleem M et al[9], who achieved an overall success rate of 96.2%;6 but also noted major complications in 11%, minor complications in 26.9%, and a mortality rate of 3.8%. It should be noted, though, that our patient population is way smaller.

Conclusion

The treatment of abdominal abscesses (and other fluid collections) by ultrasound-guided percutaneous drainage when performed with the correct technique, has been demonstrated to be a safe, effective, and relatively complication-free alternative to laparotomy, particularly in a resource-limited setting saving patients fund, avoiding the complications of general anaesthesia, and providing the added advantage of reduced hospital stay.

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