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Original Article

Ultrasound guided drainage of intra-abdominal collections; Results of initial experience from Tikur Anbessa Specialized Hospital

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Abstract

Background: *Image-guided percutaneous aspiration and drainage (PAD) is a safe and cost-effective means of draining an abscess. PAD is noninvasive and has decreased procedure-associated morbidity and mortality, reduced cost of treatment, and reduced length of hospital stay as compared to open surgical drainage. The widely used imaging modalities that can be used for drainage are ultrasound (US) and Computerized Tomography (CT) . This study aims to share our initial experiences in the successful introduction of US-guided percutaneous drainage of intra-abdominal collections in the tertiary center.*

Method : *An institution-based retrospective record review of patients who were diagnosed to have intra-abdominal collections and treated with PAD was done from 2020 back to 2013. Cases were collected from the accessible records of the department of radiology and patient charts were then retrieved. Data was collected using a structured questionnaire and a descriptive analysis of findings was done using SPSS version 25.*

Results: *A total of 53 patients were retrieved from the record. 35 (66%) were males and 18(34%) were females with patients' age ranging from 10 years to 80years with a mean age of 43.1+15.8. 59 patients. Most of the intra-abdominal collections were either idiopathic or surgical complications which accounted for 60.4% & 18.9% respectively and the success rate of PAD with a single attempt was 90.2% with s*uccess increased to 96.2% with a second attempt.

Conclusion: *PAD can be used as an alternative way of managing patients with intra-abdominal collections not only in developed nations but also in developing countries like Ethiopia with a high rate of success.*

Keywords: *ultrasound, CT, aspiration, catheter drainage, abscess, fluid collections, and percutaneous drainage*
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Introduction:

An abscess is a localized collection of infected fluid which has a significant impact on the clinical care and outcome of patients. The presence of an abscess in any body part may result in significant morbidity and mortality mostly associated with sepsis. The mortality of undrained abscesses is also very high which may reach up to 100% (1). Before the introduction of percutaneous aspiration and drainage (PAD), medical treatment of abscesses with antibiotics and surgical drainage of those abscesses which cannot be treated with antibiotics or that failed medical treatment were the usual mode of management. The introduction of PAD challenged the traditional methods of management with antibiotics and surgery and was shown to have less complication rate compared with surgical management. It is also shown to have a low rate of complications compared with surgical drainage of abscesses (2-4).

Because of the increased mortality and morbidity associated with open surgical drainage of abscesses, open surgical drainage should be reserved for abscesses that cannot be percutaneously drained(3, 5-8).

The most widely used imaging modalities for both diagnosis and assessment of extent of collections and also as a guide for insertion of needle and drainage tube are ultrasound (US) and computerized tomography (CT) (9-12). Even if the choice depends on personal experience in addition to the location and depth of an abscess; the wide availability, ease of use, guidance in any plane, and real-time visualization of the needle tip make US the modality of choice in most institutions (13-15).

Until recently in the institution where this research was conducted [Tikur Anbessa Specialized Hospital (TASH)] and in the country as a whole, there was no choice other than the surgical mode of

management for intra-abdominal collections. Although there were attempts in performing US-guided aspiration at some institutions (16), the attempt couldn't change the practice and the surgical management option continued even after that. There were also attempts in a few private institutions in the capital city, Addis Ababa, to use PAD for management of collections and abscesses but couldn't be sustainable because they were performed with visiting foreign professionals mostly coming from developed nations. The percutaneous intervention was introduced in Ethiopia recently and the procedure was performed with Ethiopian professionals with the introduction of radiology fellowship training in 2013. Before the introduction of the procedure, all patients were managed with open surgical intervention by evacuation of the collection and insertion of the drainage tube. Therefore, the objective of this study is to share our experience of the successful introduction of US-guided drainage of abscesses in Tikur Anbessa Specialized Hospital which is the tertiary teaching institution in the country. The study may also serve as the basis for future multicenter studies.

Methods and Materials

Study area

The study was conducted at TASH, which is located in Addis Ababa, the capital city of Ethiopia. It is the largest & one of the oldest public hospitals in the country providing a high level of clinical care for millions of people and training to health science students from different parts of the country and the Horn of Africa. The hospital is selected for this study because it is the first institution to introduce image-guided procedures in the country and is still the leading institution in the volume of image-guided procedures. Close to 50 image-guided procedures are being done per month the majority of them being image-guided diagnostic biopsies and Fine Needle Aspirations Cytology (FNACs).

Study Design and period

An institution-based retrospective record review was conducted from June 2020-August 2020 by retrospectively collecting imaged procedures which were done from 2013 – 2020. This period was chosen because image-guided procedures were introduced as a standard of care in 2013 with the introduction of radiology fellowship training. All patients with an intraabdominal collection for whom US-guided draining was done during the stated period were collected from the department of radiology and patients' chart were retrieved and data were collected using a structured questionnaire.

Source of data

The source population of this study was all patients for whom US-guided intervention was performed for intra-abdominal collections.

Inclusion and exclusion criteria

All patients for whom US-guided aspiration or drainage was done for an indication of intra-abdominal collections were included in the study. Patients who were excluded from the study included those who had incomplete electronic or chart records.

Procedure techniques

Procedures followed standardized techniques which are the trocar and Seldinger techniques. The trocar technique is a single-step procedure where a trocar and catheter are inserted into the abscess cavity with a direct puncture. Seldinger technique is a two-step procedure where an intervention needle and guidewire were inserted, and the tract is dilated using serial dilators and finally the drainage catheter is advanced over the guidewire to the target collection.

Data collection tools and techniques

Data were collected from electronic records of the department procedure log and patients chart using a structured questionnaire. The questionnaire contains sociodemographic characteristics, location, and characteristics of the collection, cause, and site of collection, techniques used, the success of the procedure, and procedure time. The collected data was then entered into SPSS version 23 and analyzed. Descriptive statics was made for sociodemographic characteristics, location and characteristics of the collection, techniques of the procedure, and duration of the drainage. Findings were displayed using graphs and charts.

Ethical considerations

Ethical approval to conduct the research was obtained from the research and ethics committee of the Department of Radiology. All patient identifiers were removed from the data.

Results

Patient demographics

There were 53 patients' information retrieved from the record. Thirty-five were male and 18 were female (Figure 1). Patients' age ranged from 10 years to 80years with a mean age of 43.1+15.8 years. Half of the patients were from the larger cities and the rest were from the rural regions. Nearly a quarter (12/53) of patients have underlying chronic illnesses like HTN, DM, Chronic renal and liver disease, or underlying malignancy. The rest have no documented underlying chronic conditions.

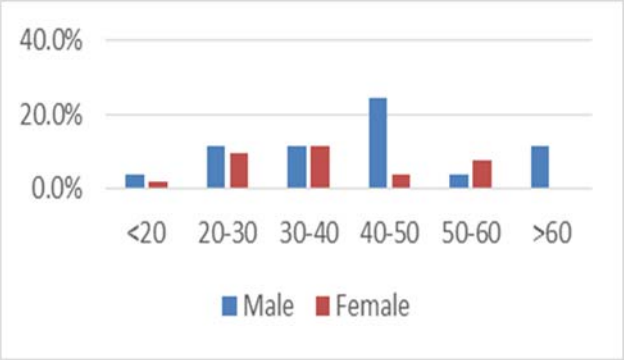


Figure1: Age distribution of patients with an intra-abdominal abscess at TASH

Imaging characteristics of the collection

There were scattered fine internal echoes (debris) in 11 out of 53 collections and there were homogeneous internal echoes (debris) in 42/53 collections.
Collections were unilocular in 12/53 and multilocular in 41/53 of the cases. The size of the collection ranged from 4.2cm to 22.2cm in maximum dimension with a mean size of 10.1cm.

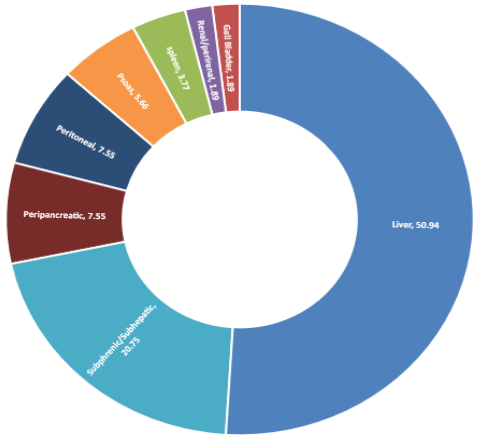
Diagnostic lab investigations were available for 20 of the collections among these two were inconclusive. Two of the collections were transudative. Eleven of the collections were pyogenic in origin, one was amebic, and two were tuberculous abscesses. Two of the collections were peripancreatic fluid collections.

The shortest distance of the abscess collection from the skin ranged from 1cm – 11cm with a mean distance of 2.8cm. Most of the intra-abdominal collections were either idiopathic collections (32/53) or surgical complications (11/53) (figure 2).

Figure 2: Frequency distribution of causes of intra-

abdominal collections for which percutaneous drainage was done

Twenty-seven of the collections out of 53 were in the liver followed by subphrenic/subhepatic collections in 11/53 cases (Figure 3) accounting more than two-thirds of the collections.



Indications and Techniques of the procedure

The procedure was done for diagnostic purpose of characterizing the fluid in 16/53 and for therapeutic drainage for 37/53 cases. There were two types of interventions done; one was just needle aspiration of the collection for 14 cases, and the other was tube drainage which was done for 39 out of 53 cases. Trocar and Seldinger techniques were employed for tube drainage in 18 and 21 out of 39 cases for whom a drainage tube was inserted and left in the collection for progressive drainage over time. The choice of the technique depends on individual preference and availability of the supply at the time of the procedure.
For 34 of the 39 cases for whom a drainage tube was inserted 10/12 French catheters were used and for the rest of the collection 8 French catheters were used. Only a single catheter was used for the majority of the collections except for two collections which were in the liver where two catheters were used at the same time to drain the collection.
Insertion of needle or drainage tube was done with a single attempt in 50/53 of the collections and repeat attempts were made for three of the collections. The mean duration of complete drainage of the collection is 8.7days with duration ranging from 1-22 days (Figure 4)

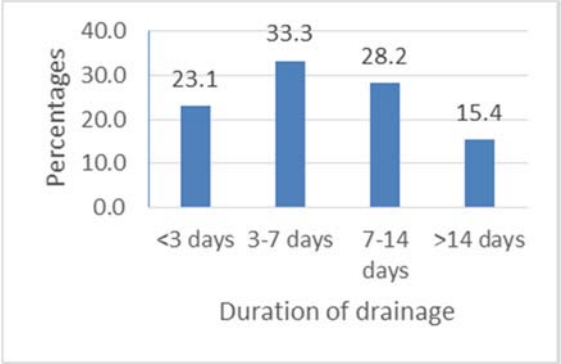


Figure 4: Total duration in days that percutaneous drainage took for complete evacuation of the collection

The success of the procedure

The procedure was successful in 51 out of the 53 cases and failed in two cases. The cases which failed for percutaneous drainage were peripancreatic collections which showed no sign of superinfection and showed no growth on culture. Both collections recurred after 5 and 7 days of the complete evacuation of the collection and underwent surgical drainage.

Discussion

We retrospectively analyzed 53 cases of intra-abdominal collections which were managed with US-guided PAD. Most of the collections have no identified source and are located predominantly in the liver, subphrenic, and subhepatic spaces confirming liver and biliary trees being the most common sources of intra-abdominal abscesses. Post-operative complications account for the majority of abscess collections. More than half of the abscesses in this study were in the liver with more than 2/3rd occurring in males.

Most intra-abdominal abscess collections arise from the colon or appendix, but it is not uncommon that the source may be undetermined (7). For those who have identifiable cause for the collection, most have bowel origin and colon and rectum being the most common source followed by liver and biliary sources (6, 7, 11, 17). Post-operative complication, which also accounted the second most common causes in our study, mostly occur following bowel surgery (7). Among those which diagnostic lab investigation from the fluid were done, most were pyogenic in origin which is also the case in other published literatures. (17). Collections may sometimes grow yeast and significant proportion may not grow organism at all (17). As seen in our case, rarely tuberculosis may be the cause of intra-abdominal abscess.

In all of our cases, PAD was performed under US guidance. Even if each imaging modality offers unique advantages and disadvantages, choice of modality differs with different factors including operator preference, wide availability of US, ease of use and less procedure related complications make US the preferred modality of guidance (7, 18). Use of techniques of inserting drainage tubes may be based on operator experience, size, location and depth of collection as well as presence of a safe access route. Seldinger technique is often used for small deep collections which are difficult to access. The trocar technique is often used for large and superficial collections. This technique has the advantage of the speed and avoids leakage of abscess outside the abscess cavity due to serial access tract dilatations. The limited use of the Seldinger technique in our case may partly be explained by operator preference as well as the limited access of the supply compared with the trocar technique.

Almost all of our cases have collections greater than 4cm in dimension and an abscess size of more than 20cm was also effectively treated with PAD in our series.

Most intra-abdominal abscess collections which are <5cm in dimension can effectively be treated with antibiotics alone. Moreover, due to difficulties in inserting drainage tubes in small abscess collections, most procedures in small collections may result in a failed attempt and are predictors of failure of PAD(1, 6). Abscesses larger than 5cm often fail for conservative management with antibiotics, so percutaneous drainage is the recommended treatment (7).

We found out that more than two-thirds of the cases in our study took a week or less for complete drainage of the collection, however, some collections also took more than three weeks for complete drainage. This has also been the case in multiple published works of literature where drainage took from a couple of days to even more than a month (7, 8, 18) and the recurrence rate following complete PAD is low(7) as is also the case in our study.

In our study, we found out that the success rate of US-guided drainage with a single attempt is 90.6% which has increased to 96.2% with repeated attempts which is encouraging for an institution that attempted to introduce PAD of the intra-abdominal collection as an alternative means of treatment of patients. This was also shown in other literature works where the success of PAD was found to be higher than 70 % (3, 6-8, 11) with up to a 12% increase in the rate with repeated attempts (11).

Two of our failed PADs were peripancreatic collections which recurred after successful drainage and ended up in surgical drainage. The reported success rate for pancreatic-associated abscesses and pseudocysts in other published works is shown to be very low(8).

PAD of intra-abdominal collections can be used as an alternative modality for appropriate candidates. The widely available US in the institution can also be used as guidance. The authors would like also to recommend organized data recording of the image-guided procedures in the department.

Limitations

Due to a lack of central recording of all procedures in the department, we were unable to include all cases.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

First author was the major contributor in conception of the idea, interpreting the data and shaping the research. The second author collected the data, do preliminary analysis, and edited the manuscript

Acknowledgment

Not applicable

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