Original Article

Ultrasound-guided percutaneous treatment of abscess foci in different localizations of the body: Results of three year-experience

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Abstract. In this study, we evaluated abscess foci which are found in different localizations of the body, diagnosed with US, CT and MRI and performed US-guided percutaneus drainage. We evaluated the effectiveness of treatment, etiologic factors, organs and localizations of abscess in the cases who underwent drainage.

A total of 63 patients diagnosed with abscess in different tissues and organs, had US-guided percutaneous drainage performed (34 male, 29 female aged between 1-75 years), and 68 abscess foci were analysed. Abscess size varied between 2.5-21 cm and the mean diameter was detected as 8 cm. Diagnosis of abscess was made with US in 45 cases, CT in 23 cases and MRI in 6 cases.

While 48 out of 68 abscess foci were simple, 20 were multilocular and contained septations. Air was observed in 19 of all abscess foci. Clinical findings of abscess completely resolved in 60 out of 63 patients who underwent abscess drainage (95.2%). In 3 abscess, the abscess cavity did not shrink as desired due to multiloculation, dense content, adhesions and fistulization. A drainage catheter had also been inserted, so a decision of surgical therapy was made. Secondary drainage was applied due to recurrence in 2 patients. Thirty two abscess foci (47%) developed postoperatively. Complications were not observed in any of the cases. The duration of catheter was calculated as 5-23 days (mean 10.5 days).

US-guided percutaneous drainage should be the primarily preferred method in treatment of abscess and collections as it is easily applicable, does not require general anesthesia, is well tolerated, and has high success and low complication rates.

Key words: Abscess, ultrasonography, percutaneous drainage

1. Introduction

An abscess is an infection forming in any organ or tissue due to the body fighting infective processes. Conventional medical treatment of abscess focus in any site of the body includes open surgical drainage and debridement together with appropriate antibiotic therapy. While this method is more invasive, it also increases mortality and morbidity, particularly in abdominal abscesses (1,2,3).

Percutaneous drainage of intra-abdominal fluid collection has become a quite effective treatment method in the last 15-20 years, due to the development of imaging methods, interventional radiologic techniques and materials used. Its mortality and morbidity rates are lower compared to surgical treatment. The success of drainage varies depending on etiology, location, content and number of abscesses (4). Today, percutaneous abscess drainage is a routinely applied interventional radiologic procedure in many centers. The vast majority of abscesses are treated effectively when combined with systemic antibiotic therapy (5). Diagnosis of abscesses and collections is easily made with ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI), and then, drainage is planned (6). In addition, US and CT are two valuable methods used for guidance during percutaneous drainage of abscess collections in all body localizations (7). Although diagnosis of abscess may be made more sensitively with MRI and CT, US is the forerunner due to being easily applicable. US is both an indispensable diagnostic tool for urgent imaging today and a

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guiding tool for many interventional procedures. Procedures may be performed statically and dynamically and reveal anatomy and pathology in detail (8).

In this study, we analysed abscess foci found in different localizations of the body and diagnosed them using US, CT and MRI. We retrospectively evaluated the effectiveness of US-guided percutaneous drainage. We also discussed the effectiveness of therapy, organs and sites of abscess, etiological factors and potential complications in light of literature.

2. Material and method

Cases, diagnosed with abscess in different tissues and organs of the body who had US-guided percutaneous drainage at the Department of Radiology, YüzüncüYıl University between June 2010 and November 2013, were evaluated. Sixty-three patients and sixty-eight abscess foci were retrospectively analyzed. We analyzed a total of 63 patients aged between 1-75 years (34 males with a mean age of 50 and 29 females with a mean age of 45). Patients were evaluated with US prior to intervention and a Philips HD11 (Bothell, Washington, USA) US device was used for US-guided percutaneous drainage. A 2.0-5.0 MHz convex probe was preferred for deep abscess collections, and a 7.0-11.0 MHz linear probe was preferred for superficial abscess foci. Abscesses measured between 2.5-21 cm, and the mean diameter was 8 cm. The diagnosis of abscess was made with US in 45 cases, CT in 23 cases and MRI in 6 cases. Particularly, paravertebral and psoas abscesses, developing after spondylodiscitis, were diagnosed using MRI. Although most of the drainage procedures were applied only once, two interventions were applied from different sites and at different times as necessary. Culture antibiogram was sent during drainage, and systemic antibiotic therapies were planned.

Percutaneous drainage catheters were chosen according to the inner density of the abscess, and larger catheters were used for collections which had high density or increased echogenity in US examinations done prior to drainage. The percutaneous drainage site was sterilized using povidion iodine, and 10 cc of local anesthetic (prilocaine hydrochloride, Citanest) was applied. A small incision was made 2-3 minutes after local anesthetic application, and the catheter was inserted into abscess cavity. An 18-20 Gauge Chiba needle was used in 5 superficial abscesses, and simple aspiration was performed. Sixty three abscesses were drained with the Seldinger method using pigtail catheters of 7-12 Frdiameter. Catheters were placed in the lower part of the cavity for better drainage. All catheters were attached to the skin with 2/0-3/0 prolene or silk suture material, and information was given to the patient about catheter care after catheterization. The interventional radiology team followed up on patients regarding general condition, laboratory findings and drainage. Patients were called to the interventional radiology unit and checked with US when needed.

3. Results

While 48 out of 68 abscess foci of 63 patients were simple, 20 were multilocular and included septations. Air was observed in 19 abscess foci. US-guided Seldinger technique was used in percutaneous drainage. The success of the procedure was determined as 95.2%. The most common etiologic factor was found to be post-operative abscesses (47%), of which most common were gynecologic, pelvic interventions and malignant tumor surgery (colon, stomach, renal etc.) (Table 1). The most common site of abscess was intestinal anses (Table 2). All percutaneous abscess drainages were performed under US guidance and the duration of catheter was calculated as 5-23 days (mean 10.5 days). Abscess cavities were found to shrink on US checks. The amount of drained fluid was recorded, and the catheter was removed when the amount was below 5-10 cc daily. No catheter or procedure-related complications were observed during or after drainage catheter insertion.

Table 1. The different potential causes that resulted with the abscesses formation

The distribution of the facts among patients that potentially caused the abscesses formation			
Post-operative	29*	Cholecystitis	2*
Urinary stone, hydronephrosis, pyelonephritis	6*	Geniturinary infection	2*
After peritoneal dialysis	6*	Pancreatitis	2*
Spondylodiscitis	5*	Gun-shot wound	1*
Upper respiratory tract infection	3*	Unknown etiology	7*

Footnotes: *= patient numbers

Table 2. Distribution of abscess foci according to organs and sites

Organ/Site	n	Organ/Site	n
Between intestinal anses	12	Paravertebral	3
Pelvic	11	Thigh	2
Psoas	7	Perisplenic	2
Perirenal	6	Pancreas	1
Perihepatic-subhepatic	5	Peripancreatic	1
Liver	6	Breast	1
Neck	5	Abdominal wall	1
Subdiaphragmatic	5		

Clinical findings of abscess completely improved in 60 out of 63 patients (95.2%) (Figure 1 and Figure 2). The abscess cavity did not shrink as desired in 3 abscesses due to multiloculation, dense content, adhesions and fistulization, so surgical treatment was decided. Secondary drainage was applied in two patients as they re-occurred. Drainage was applied at different times as there were more than one abscess foci in 5 patients. Four patients were diagnosed with tuberculosis as a result of microbiologic tests. Drainage was applied twice at different times as there were abscesses in two foci in two patients. These patients were given long-term anti-tuberculosis treatment.

4. Discussion

Since its initial description in 1979, percutaneous catheter drainage has become part of the standard algorithm for managing nonacuteabdominopelvic abscess (9). Percutaneous drainage is appropriate for many abscess foci, particularly abdominal abscesses. The main criteria for percutaneous drainage is a safe access route (10). Percutaneous abscess drainage methods are effective and safe for the treatment of abscesses and collections which have a safe intervention route.

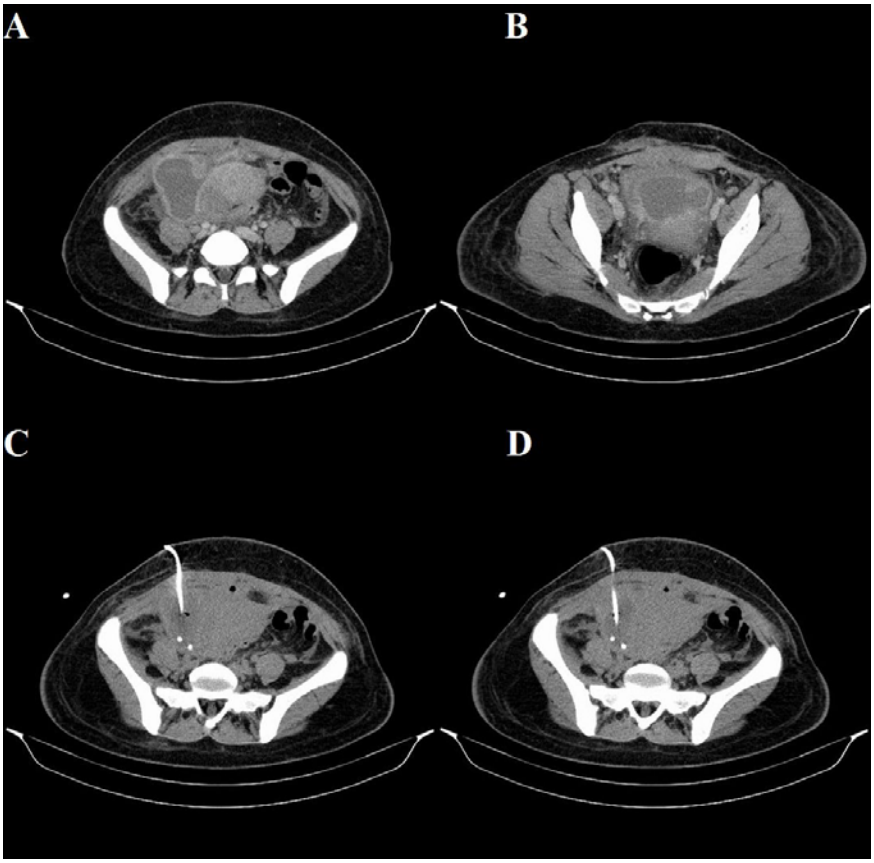

Fig. 1. A-D. 28-years-old female.There is a postoperative abscess, located in pelvis right side that shows a peripherally enhancement after contrast administration (A,B).Drainage catheter was placed into the abscess cavity and a markedly regression in size of abscess is observed on control CT images that were taken after external drainage (C,D).

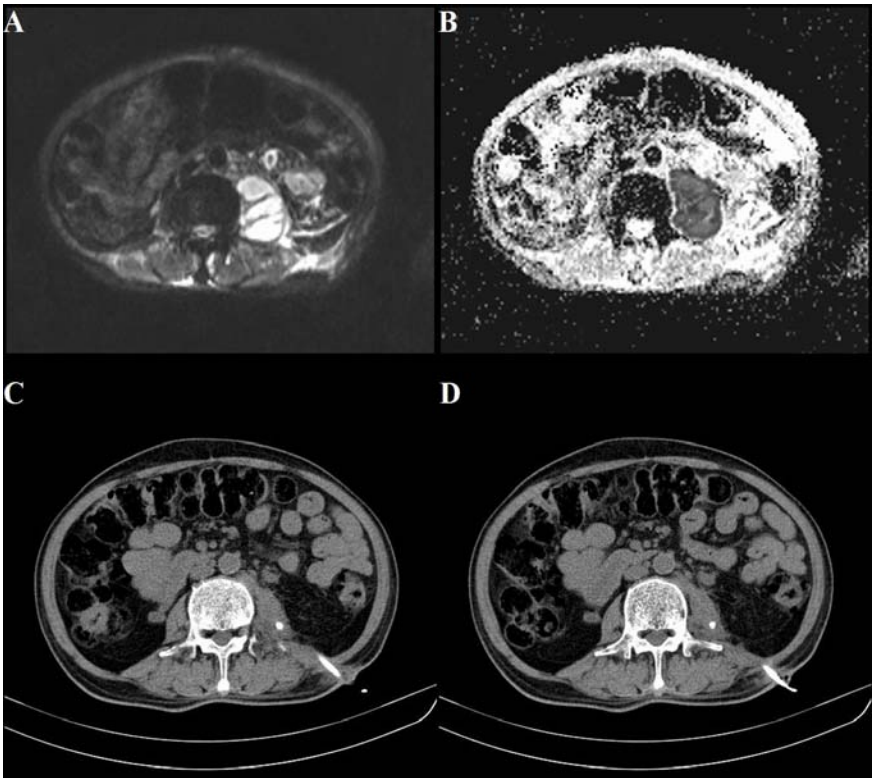

Fig. 2. A-D. 65-years-old male. There is an abscess formation in left psoas muscle that is restricted on diffusion weighted MRI.(A,B). On follow-up CT images, drainage catheter which was placed into the abscess cavity in left psoas muscle is seen and after external drainage the abscess disappeared. No additional complication was observed (C,D).

US and CT are valuable methods for the diagnosis of abscess. US is both rapid and easily available; therefore, it is preferred for the diagnosis of abscess foci arising in the peritoneal space, liver, superficial structures, abdominal and thoracic wall ,and muscle and skeletal system. CT provides better anatomic data about the collection and neighbouring tissues in deep abscesses and obese patients. Diagnostic accuracy varies between 80-100% in CT and 67-80% in US. Although non-infected materials include mild internal echoes on US, a typical abscess is seen as a poor demarcated hypoechoic mass. Presence of gas within the collection is an important finding for abscess, although its echogenity varies depending on abscess content (6,7,11). In our study, gas was detected in 15 abscess foci. Of them, 11 were detected with CT and 4 were detected with US. Inappropriate access route, insertion of a drainage catheter with inadequate diameter, early removal of catheter, multilocular abscesses, abscesses with dense content, infected tumors and abscesses with fistula are the factors which decrease success in percutaneous abscess drainage (11). In our study, while access and drainage were achieved in 68 abscess foci, it could not be achieved in 3 abscess foci, of which two were due to adhesions between intestinal anses, fistulization to intestinal anses and dense content. These patients had operations.

The success rates of percutaneous drainage vary between 68-100% in different series in literature (12,13). Lambiase et al. (14) found a success rate for percutaneous drainage of 91% in their study in 1992. Akıncı et al. (12) reported a success rate of 91% in intraperitoneal abscesses. Buckley et al. (15) found a success rate of 73.1% in intra-abdominal percutaneous abscess drainage. Success rate was 95% in our study, and the reason for this higher ratio than in literature is due to the abscess foci being out of the abdomen in a few patients.

In the study of Gervais et al. (16), it was detected that 48% of abdominopelvic abscesses are post-operative. In our study, 32 abscess foci were postoperative (47%), consistent with literature. Abscesses developed after malignant tumor surgery (colon, stomach, renal etc.) in nine patients. They developed after gynecologic and pelvic operations in eight patients, after

cholecystitis in five patients and after operations due to other causes in two patients. We may explain high abscess rate after malignant tumor surgery from severe surgical processes, having received chemo-radiotherapy before surgery and the immune system's sensitivity.

Liver abscesses continue to be a source of significant mortality and morbidity worldwide, mainly in tropical countries. Developments in sectional imaging and the interventional radiology field have changed the approach to the diagnosis and treatment of liver abscesses (17). Various diseases that may lead to pyogenic liver abscesses include abdominal surgery, trauma, neoplastic disease, biliary tract disease, or bacteremia in immune-compromised patients. Liver abscesses can be single or multiple (1). US images of pyogenic abscesses are usually thick homogenous hypoechoic lesions with an irregular wall, and the ones with air content may be seen as echogeneicfelds with or without posterior shadowing (7). CT findings of a pyogenic liver abscess include hypodense homogenous lesions with or without thick rims, fluid levels or microbubbles (1). While single abscesses may be treated with percutaneous drainage, multiple abscesses may require CT-guided interventions and the use of many catheters (18). Liver abscess was detected in six of our patients and peri-subhepatic abscess was detected in five. All were pyogenic abscesess. Of them, four had developed post-operatively. Abscess reocurrence did not develop after successful drainage in one patient in our study. Reocurrenceoccured in one case. This case did not respond to percutaneous treatment, as the abscess was large and multilocular.

In conclusion, US-guided percutaneus abscess drainage is easily applicable, well tolerated, does not require general anesthesia, has high success and low complication rates. Therefore, percutaneous abscess drainage using the Seldinger method is less traumatic, easier, more practical and inexpensive compared to surgery in treatment of abscesses which have a safe access route.

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