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Efficacy of ultrasound-guided percutaneous drainage in the treatment of psoas abscess

Psoas abscess percutaneous treatment

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Abstract
Aim: In this study, we aimed to evaluate the efficacy of ultrasound-guided percutaneous drainage applied to cases determined with psoas abscess, and to investigate predisposing factors and micro-organisms causing the disease.
Material and Methods: Twenty-eight patients were examined, including 15 males and 13 females, aged 22-87 years, who underwent ultrasound-guided percutaneous drainage. Predisposing factors for the development of psoas abscess, the need for an additional surgical procedure after percutaneous abscess drainage, length of stay in hospital after the procedure, complications, and agent micro-organisms were evaluated. The efficacy of percutaneous drainage in the treatment was investigated.
Results: The most common agents were determined to be Staphylococcus aereus, Escherichia coli, and Mycobacterium tuberculosis. Primary psoas abscess was determined in 6 (21.4%) patients and secondary psoas abscess in 22 patients. In cases with secondary psoas abscess, skeletal origin predisposing factors (spondylodiscitis, history of abdominal or vertebral surgery) were seen to most often play a role in the etiology. In 20 of the 22 (78.5%) patients with secondary psoas abscess, effective treatment was applied with antibiotherapy and percutaneous drainage. The mortality rate was 10.7%.
Discussion: Low morbidity and mortality rates are the greatest advantages of percutaneous drainage. Although CT has emerged as a better diagnostic method for psoas abscess, ultrasound-guided percutaneous drainage has the advantages of easy availability, low cost, and it does not contain radiation. Ultrasound-guided percutaneous drainage is an effective and reliable method in the treatment of psoas abscess.

Keywords
Percutaneous Drainage, Abscess, Psoas Abscess, Tuberculous Abscess

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Introduction

Psoas abscess is a relatively uncommon pathology. Although there are no clear data about the incidence, studies have reported a prevalence of 1-10/100,000 per year [1, 2]. Psoas abscess is classified as primary when it occurs with hematogenous spread, and secondary if the infection is spread to adjacent surrounding tissues. The etiology shows variability according to whether the disease is primary or secondary and geographic location. [3]. Back pain and fever are among the most common symptoms [1]. Although back pain, fever, and restricted movement form a classic triad, it is seen in very few patients [4].

Computed tomography (CT) is important in diagnosis and is accepted as the basic imaging method for diagnosis as it is helpful in revealing the underlying cause (inflammatory bowel disease, diverticulitis), especially in acute patients [5]. Magnetic resonance imaging (MRI) plays a major role in showing the spread of infection to the spinal canal and bone marrow [6, 7].

Recent studies have reported mortality rates of2.3%-12% [1, 4]. There are differences in mortality data because of the relative rarity of the disease, the variability of factors playing a role in the etiology, and the generally low number of patients in studies in the literature.

Antimicrobial treatment is usually combined with percutaneous or surgical drainage in the treatment of the disease [4]. Antibiotic treatment alone is insufficient [3]. Compared to surgical drainage, percutaneous drainage has the advantages of a shorter stay in hospital, fewer complications, and lower mortality rates, so it has become the currently preferred treatment method [8].

The aim of this study was to evaluate the efficacy of the percutaneous drainage procedure applied under ultrasound guidance to patients determined with psoas abscess and to investigate the predisposing factors and micro-organisms causing the disease.

Material and Methods

After ethical approval this retrospective, observational study included 28 patients determined with psoas abscess who were treated with ultrasound-guided percutaneous drainage in the interventional radiology unit between 2016 and 2021. Informed consent was not obtained because of the retrospective design of the study. The patient data were obtained retrospectively from the medical records in the hospital information system, in respect of demographic characteristics, predisposing factors for the development of psoas abscess, the need for the additional surgical procedure after percutaneous abscess drainage, length of stay in hospital after the procedure, complications, and agent micro-organisms.

The drainage procedure was applied to all the patients in the interventional radiology unit under local anaesthetic and ultrasound guidance (HI-VISION Avius, Hitachi Aloka Medical, Tokyo, Japan). Under ultrasound guidance, the abscess pouch was entered with an 18 gauge needle and a 10cc sample was taken for microbiological examination. Then, an 8-12 Fr pigtail catheter (Skater, Argon Medical Devices, USA) was placed with the help of a 0.035-inch guidewire. The size of the pigtail catheter was selected according to the viscosity of the abscess material. After appropriate placement of the pigtail catheter, the abscess content was aspirated. It was then irrigated with saline and left for free drainage until the color of the content became clear.

In the follow-up of the patients, the drain was irrigated with saline several times a day and daily monitoring was applied. When the daily drainage amount fell to <10cc, and no residual collection was observed in the psoas on follow-up images, the pigtail catheter was removed. At 7-10 days after removal of the catheter, patients were checked with imaging methods in respect of recurrence (Figure 1).

Results

Twenty-eight patients were examined, including 15 males and 13 females with a mean age of 53.2±20.0 years (range, 22-87 years), who underwent ultrasound-guided percutaneous drainage of a psoas abscess. The epidemiological characteristics of the cases, the risk factors that could have played a role in the development of psoas abscess, and the abscess localization are shown in Table 1.

Unilateral abscess was determined in 23 cases (left psoas in 13 patients, right psoas in 10 patients) and bilateral psoas abscess was present in 5 cases (Table 1). Abscesses were evaluated as primary psoas abscesses in 6 (21.4%) patients and secondary psoas abscesses in 22 (78.6%) patients. In the etiology of the cases with secondary psoas abscess, predisposing factors of skeletal origin most often played a role (12 patients, 42.8%). Vertebral osteomyelitis/discitis in 7 patients (39.2%), vertebral surgery history in 4 patients (14.2%) and sacroiliitis in 1 patient (3.5%) were observed as skeletal predisposing factors. Other predisposing factors of secondary psoas abscess included gastrointestinal causes in 5 patients (17.8%) and genito-urinary causes in 2 patients (7.1%).

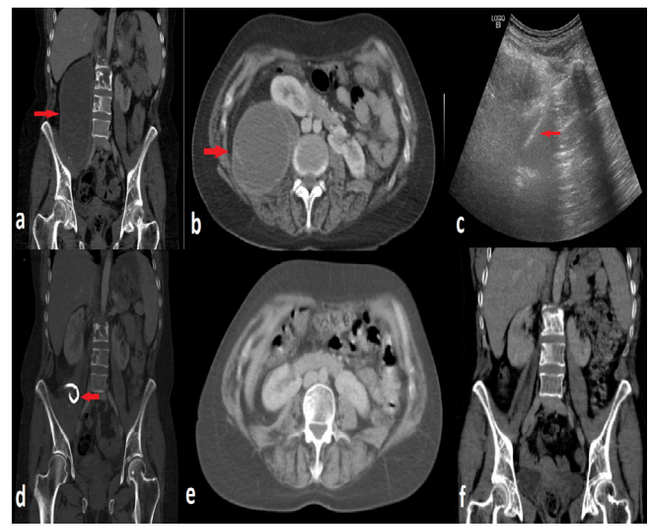


Figure 1. Coronal (a) and axial (b) CT images showing a thick-walled right psoas abscess (arrow) displacing the right kidney. Under the ultrasound guidance (c) a 10 french drainage catheter (arrow) was placed. In the control tomography (d) taken after the drainage stopped, the catheter (arrow) is observed in the completely drained abscess site. Axial (e) and coronal (f) tomography images were obtained 2 months after the percutaneous drainage show complete evacuation of the abscess.

Table 1. Epidemiological and clinical characteristics of the cases with psoas abscess (n=28)

Characteristic	n (%)
Gender , male	15 (53.5)
Age; mean ± SD (min-max)	53.2±20.0 (22-87)
Risk factors	
Diabetes mellitus	3 (10.7)
HIV infection	1 (3.5)
Malignancy	4 (14.3)
Cirrhosis	1 (3.5)
Immunosuppression	3 (10.7)
Localization	
Right	10 (35.7)
Left	13 (46.4)
Bilateral	5 (17.8)

Table 2. Clinical characteristics of the cases who underwent surgery

Patient	Predisposing factor	Localization	Reason for surgery	Culture
72 F	Porotic collapse in the vertebra	Left psoas	Vertebral fracture stabilization	No production
75 F	Colon perforation	Left psoas	Colon resection	E. coli
22 M	Osteomyelitis	Right psoas	Osteomyelitis debridement	No production
46 M	Infected hydatid cyst	Left psoas	Hydatid cyst operation	Echinococcus granulosus
28 M	Spondylodiscitis	Bilateral	Vertebra fixation and abscess drainage	Mycobacterium tuberculosis
31 M	Secondary to trauma (L4 burst fracture)	Right psoas	Vertebra stabilization	Klebsiella spp.
58 F	Adenocarcinoma metastasis	Left psoas	Vertebra stabilization	E. coli

In the cultures of the samples taken from the patients, the most frequently isolated agents were determined to be Escherichia coli in 6 patients (30%), Mycobacterium tuberculosis in 4 patients (20%), and Klebsiella species in 5 patients (25%). No production was determined in the cultures of 10 patients.

Of the 28 patients with catheter placement, surgery was applied to 7, of which only 3 were operated on for abscess treatment (Table 2). Of the total patients, mortality developed in 5, 2 of which had undergone surgery after percutaneous drainage (Table 3). Psoas abscess was treated effectively with antibiotherapy and percutaneous drainage in 22 of 28 patients (78.5%). The mortality rate was 10.7%. The mean duration of drainage was 17.14 days (range, 3-37 days) and the mean length of stay in the hospital was 16.9 days (range, 2-56 days). The catheter became dislodged in 3 patients, so the position was revised. Other than these patients, no major complication associated with the procedure was observed in any case.

Discussion

Psoas abscess generally manifests with non-specific symptoms such as pain, fever, and restricted movement [1]. Despite the application of the necessary treatments, it is a disease which can have a mortal course. There are no definitive data about mortality rates but it has been reported as between 2.3% and 12% in recent literature [1, 4]. This wide range of differences in mortality rates can be attributed to the relative rarity of the disease, the variability of factors playing a role in the etiology, and the generally low number of patients in studies in the literature. In the current study, the mortality rate was found to be 10.7%. Mortality risk factors include high creatinine level, advanced age, cardiovascular disease, bacteremia, and E.coli production in culture [9, 10]. Consistent with the literature, 3 of the exitus patients in the current study had a significant elevation in serum creatine levels followed by acute renal failure.

It has been said that generally, approximately 30% of cases comprise primary psoas abscess [11]. Staphylococcus aureus (S. aureus) is the most common agent in primary psoas abscess [1]. In the current study, 21.4% of the cases were patients with primary psoas abscess. The agent of secondary psoas abscess can show variability according to geographical location and underlying predisposing factors. If there is an abdominal pathology as an underlying factor, such as inflammatory

Table 3. Clinical characteristics of the cases that developed mortality

Patient	Predisposing factor	Cause of mortality	PA type	Culture	Time to mortality after drainage/surgery
72 M	Cirrhosis and DM	ARF	Primary	Klebsiella spp.	10th day after drainage
31 M	Trauma (L4 fracture)	Respiratory failure	Secondary	Klebsiella spp.	23rd day after operation following drainage
58 F	Metastasis	ARF	Primary	E. coli	9th day after operation following drainage
61 M	Spondylodiscitis	Multiorgan failure	Secondary	P. aeruginosa	20th day after drainage
61 F	Lymphoma	ARF	Primary	No production	4th day after drainage

PA: psoas abscess; DM: diabetes mellitus; ARF: acute renal failure

bowel disease, E.coli is most often seen as the agent [9, 12]. In countries where tuberculosis is frequently seen, Mycobacterium tuberculosis has been reported to be the most common agent [13]. Moreover, several studies in recent years have reported bone origin infections as the cause of secondary psoas abscess and S. aureus as the most responsible associated agent [1, 3, 9]. In 9 of the patients with secondary PA in the current study, there was no culture production, and in the rest, the most common agents were E.coli, Mycobacterium tuberculosis, and Klebsiella species.

Percutaneous drainage or surgical drainage methods are used together with antibiotherapy in PA treatment. The place of antibiotherapy alone is a matter of debate, especially in large abscesses. In a previous study it was reported that of 13 patients receiving antibiotic treatment, 11 required a second treatment [2].

The application of percutaneous drainage under imaging guidance, which is a less invasive method, has currently increasing widespread use, and a study in 2015 reported that percutaneous drainage was applied to approximately 82% of all intra-abdominal abscesses [14]. In a study [15] in which 260 patients were applied with percutaneous drainage and 240 with open surgery for intra-abdominal abscess, the mortality rates of the open surgery cases were found to be higher (14.6% vs. 4.2%) and the length of stay in hospital was longer (28.1 vs. 13.5 days). In the same study, the success rates were reported as 69% for percutaneous drainage and 62% for open surgery [15]. In another study that compared the efficacy of open surgery and percutaneous drainage for psoas abscess, the mortality rates were reported as 3% for percutaneous drainage and 22% for open surgery [2]. Percutaneous drainage methods have started to be be the first choice in the treatment of psoas abscess [8]. A success rate of 82.7% has been reported in another study that investigated the efficacy of percutaneous drainage [16]. In the current study, the success rate of percutaneous drainage in the treatment of psoas abscess was 78.5%, which supports the above-mentioned data.

Percutaneous drainage is generally applied under CT or ultrasound guidance. The majority of the studies in the literature have reported CT -guided percutaneous drainage in the treatment of psoas abscess, and those studies have emphasized the high success rate of the treatment, low recurrence rates and short length of hospital stay [17,18]. While a broader anatomic dominance can be achieved with a CT-guided procedure, there are the disadvantages of high cost and the content of ionising radiation. In the current study, the procedure was applied under ultrasound guidance to all the patients, and just as under CT guidance, a low complication rate and high success rate were obtained.

Conclusion

In conclusion, the results of this study demonstrate that ultrasound guided percutaneous drainage is an effective and reliable method in the treatment of psoas abscess. Low morbidity and mortality rates are the greatest advantages of percutaneous drainage. Although CT is known to be a better diagnostic method for psoas abscess, ultrasound guided percutaneous drainage has the advantages of easy availability, low cost, and does not contain radiation.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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