

# The Efficacy of Percutaneous Abdominopelvic Abscess Drainage in the Treatment of Spontaneous and Postoperative Abscesses in Malignant and Non-Malignant Patients

## Malig niteli ve Malig nitersiz Hastalarda Spontan ve Postoperatif Abselerin Tedavisinde Perkütan Abdominopelvik Abse Drenajının Etkinliği

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Geliş Tarihi/Received: 08.05.2008  
Kabul Tarihi/Accepted: 27.06.2008

*This paper has been presented as oral  
presentation 28<sup>th</sup> National Radiology  
Congress (TURKRAD 2007), 27-31  
October 2007, Antalya*

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**ABSTRACT Objective:** To assess the success rates of percutaneous drainage of spontaneous and postoperative abdominopelvic drainable abscesses of malignant and non malignant patients and to compare our success rates with the literature at any site and origin. **Material and Methods:** A total of 86 abdominopelvic abscesses in 76 patients (35 female, 41 male; range: 14 to 85 years, mean  $\pm$  SD age: 52.6  $\pm$  15.6 years) were analyzed retrospectively for percutaneous treatment. Sixty-two abscesses occurred postoperatively, whereas 24 spontaneously. Abscesses were treated with needle (9/86, 10.5%) or catheter (77/86, 89.5%) according to a 4 cm diameter cut-off. Of 86 abscesses, 23 (26.7%) were catheterized with thin (7-9F) and 54 (62.8%) with thick (10-14F) catheters. **Results:** Failure and recurrence rate was 12.8% (11/86), success and partial success rate was 87.2% (75/86). Secondary success was achieved in 88.4%. Success did not correlate with age, gender, malignancy, location, origin, and type (complicated). Primary success rate was 88.9% (8/9), 91.3% (21/23), and 85.2% (46/54) in needle, thin and thick catheter groups, respectively, with no statistical difference ( $p=0.753$ ). Primary success was 87.1% (54/62) in postoperative and 87.5% (21/24) in spontaneous abscesses, with no statistical difference ( $p=0.960$ ). Serious complications such as venous hemorrhage, hydropneumothorax and empyema developed in 3 patients (4.0%). **Conclusion:** Percutaneous drainage of spontaneous and postoperative abdominopelvic abscesses was an effective treatment in malignant and non-malignant patients as long as they were drainable at any site.

**Key Words:** Drainage; abdominal abscess; radiology, interventional

**ÖZET Amaç:** Malig niteli ve malig nitersiz hastalardaki spontan ve postoperatif drenaj yapılabilir, abdominopelvik abselerin perkütan drenajının başarı oranlarını değerlendirmek. **Gereç ve Yöntemler:** Bu çalışmada, 76 olgudaki (35'i kadın, 41'i erkek; 14-85 yaş, ortalama  $\pm$  SD yaş: 52.6  $\pm$  15.6 yaş) 86 abdominopelvik absenin perkütan tedavisinin retrospektif analizi yapılmıştır. Altmış iki abse postoperatif, 24 abse ise spontan idi. Abseler, 4 cm çapa göre iğne (9/86, %10.5) veya kateter (77/86, %89.5) ile tedavi edildi. Seksen altı absenin 23 (%26.7)'üne ince kateter (7-9F) ve 54 (%62.8)'üne kalın kateter (10-14F) yerleştirildi. **Bulgular:** Başarısızlık ve nüks oranı %12.8 (11/86), başarı ve kısmi başarı ise %87.2 (75/86) idi. Diğer yandan, sekonder başarı %88.4 idi. Başarı ile yaş, cinsiyet, malig nitelik, yerleşim, organ ve tip arasında bir ilişki bulunmadı. Primer başarı, iğne, ince ve kalın kateter gruplarında sırasıyla, %88.9 (8/9), %91.3 (21/23) ve %85.2 (46/54) olup fark bulunmadı ( $p=0.753$ ). Primer başarı, postoperatif abselerde %87.1 (54/62) ve spontan abselerde %87.5 (21/24) olup fark bulunmadı ( $p=0.960$ ). Venöz kanama, hidropnömotoraks ve ampiyem gibi ciddi komplikasyonlar, 3 olguda (%4) görüldü. **Sonuç:** Spontan ve postoperatif abdominopelvik abselerin perkütan drenajı, herhangi bir yerleşimde drenaj yapılabilir olduğu sürece, malig niteli ve malig nitersiz hastalarda etkili bir tedavi olarak bulunmuştur.

**Anahtar Kelimeler:** Drenaj; abdominal abse; girişimsel radyoloji

Türkiye Klinikleri J Med Sci 2008;28(6):847-56

**P**ercutaneous abscess drainage, curative in 80-90% of cases, has become the standard treatment of abdominal and also pelvic abscesses in the absence of an acute surgical abdomen.<sup>1</sup> The recurrence rates are

estimated to be 5-10%, with also low mortality rates.<sup>1-19</sup> Otherwise, mortality rates from 80% to 100% in undrained abscesses were reported and the mortality rates of surgical drainage, which was the standard treatment until 20 years ago, ranged from 30% to 43%.<sup>4</sup>

The predictors for success of percutaneous abscess drainage are still unclear such as malignancy.<sup>1-19</sup> The results of reports with respect to cause are contradictory; i.e., while no difference was noted between the outcomes of spontaneous and postoperative abscesses in some series, a meaningful difference ( $p=0.04$ ) was present in another study.<sup>4,5</sup> Thus, we held this study to examine the success of percutaneous drainage in malignant and non malignant patients with spontaneous and postoperative drainable abdominopelvic abscesses.

## MATERIAL AND METHODS

Between 1993 and 2006, 86 drainable abdominopelvic abscesses in 76 patients followed at least one year after the drainage (35 female, 41 male; range: 14 to 85 years, mean  $\pm$  SD age:  $52.6 \pm 15.6$  years) with a median follow-up time of 24.0 months were evaluated retrospectively.

Patients were mainly divided into two groups; while patients with abscesses due to abdominopelvic operation comprised the postoperative group, the spontaneous group consisted of those with abscesses due to some other reason. Sixty-two abscesses occurred postoperatively, whereas 24 spontaneously. Thirty-seven patients out of 76 (48.7%) had a malignant disease as well. These patients were included in the malignant group, while the others without a malignant disease were placed in the non malignant group. In addition, patients were grouped according to drainage types as the needle, thin and thick catheter groups, which were described hereafter.

Features, success status, and complications of abscesses were separately evaluated in the postoperative/spontaneous, malignant/non malignant, and needle/catheter groups. The abscesses were assessed according to their localizations, microbiological etiologies and origin organs. The other features recor-

ded were patient age and gender, single or double organ involvement, development of fistula, complicated nature, and presence of loculation.

All patients had direct abdominal X-rays to exclude acute abdomen and abdominal ultrasonography (US) to distinguish between abscesses and sterile collections, single and multiloculated abscesses. In most cases computed tomography (CT) scanning was performed for more accurate diagnosis. All patients gave informed consent prior to drainage according to the Helsinki Declaration. Also coagulation parameters (prothrombin and partial thromboplastin times and platelet count) were studied. Patients with platelet counts greater than 70.000/mL, and prothrombin and partial thromboplastin times up to 50% above normal limits underwent puncture for abscess drainage. The decision for intervention was made by the agreement of the surgeon, radiologist, and infectious diseases physician. Empirically broad-spectrum antibiotics were administered to all patients before the drainage. According to the culture results, the antibiotic treatment was modified. All procedures were performed by a staff radiologists or a radiology residents under staff supervision.

Intervention was performed under US and fluoroscopic guidance in 47 patients, only US in 20, and CT in 9. CT was used in patients with difficult to access abscesses, i.e., deeper/smaller abscess; conversely, US was used for easily accessed abscesses. We had no abscess with unsafe drainage route to exclude from the series. In all patients 7-14F pig-tail or sump catheters with/without locked type were used for abscess drainage. Percutaneous approach was performed with modified Seldinger or Trocar technique. Abscess samples were sent for pathological, microbiological and biochemical examinations for a definitive diagnosis. Needle or catheter was used for drainage according to the size of the abscess, i.e., abscesses with a mean diameter larger than 4 cm were managed with catheter, whereas others smaller than 4 cm were drained with needle (16-20G). The cut-off of 4 cm was determined due to the finding that an abscess diameter of less than 5 cm was a significant predictor for

failure.<sup>17</sup> Nine (10.5%) and 77 (89.5%) abscesses were treated with needle and catheter, respectively. All patients had US examination before the drainage. Of 86 abscesses 23 (26.7%) containing non-viscous fluid, which had no echogenicity on US were catheterized with thin (7-9F), whereas 54 (62.8%) with viscous fluid, which had echogenicity on US with thick (10-14F) catheters. Daily rounds were performed after the drainage.

A pouch graph was obtained if an immediate change in drainage was noted or the daily amount of drainage did not decrease over time as expected, no clinical recovery was observed (decrease in fever or leukocytosis), and if the development of a fistula was suspected.

Each of all 7 complicated abscesses was connected to two organs with fistulas; which were hepaticocolic, choledocoduodenal, hepaticoileal, gastrosplenic, pancreaticogastric, gastrojejunal, and pancreaticojejunal which was treated with cyanoacrylate application to the cavity after the abscess therapy and thorax tube drainage for empyema due to pancreatic fistula (Figure 1). Either organ in such abscesses was considered distinct origins. Of the 7 complicated abscesses, 3 were also catheterized with two catheters of the same sizes. This was caused from the same echogenicities and viscosities of the complicated abscesses.

On screening, US was used in almost all patients; CT scanning was particularly done in obese and gaseous patients in whom US was not sufficient for evaluation, and in complicated situations. Treatment and follow-up data including all possible influencing factors were recorded with US, laboratory (leukocyte count and sedimentation rate), and clinical examinations in all patients, and CT in some, immediately after drainage, at 6-month intervals within the first 2 years, and at 12-month intervals after 2 years. For patients who did not attend follow-up visits, data were obtained either by direct contact with the patients or their physicians or examining the medical records of the patients.

The outcomes were success, partial success, and failure. While success, which was actually primary success, indicated partial plus total success,

failure was recurrence plus primary failure. Primary success was defined as one or more percutaneous drainage procedures resulting in complete resolution of abscess without the need for open operative drainage (Figures 2 and 3). Failure was the need for operative or percutaneous drainage after the first percutaneous drainage. Partial success was either temporization (performing percutaneous drainage before the planned surgery for clinical improvement) or palliation (performing percutaneous drainage for only symptomatic relief in patients at a terminal stage disease such as widespread malignancy). Secondary success which was also considered failure was successful percutaneous drainage after failure.

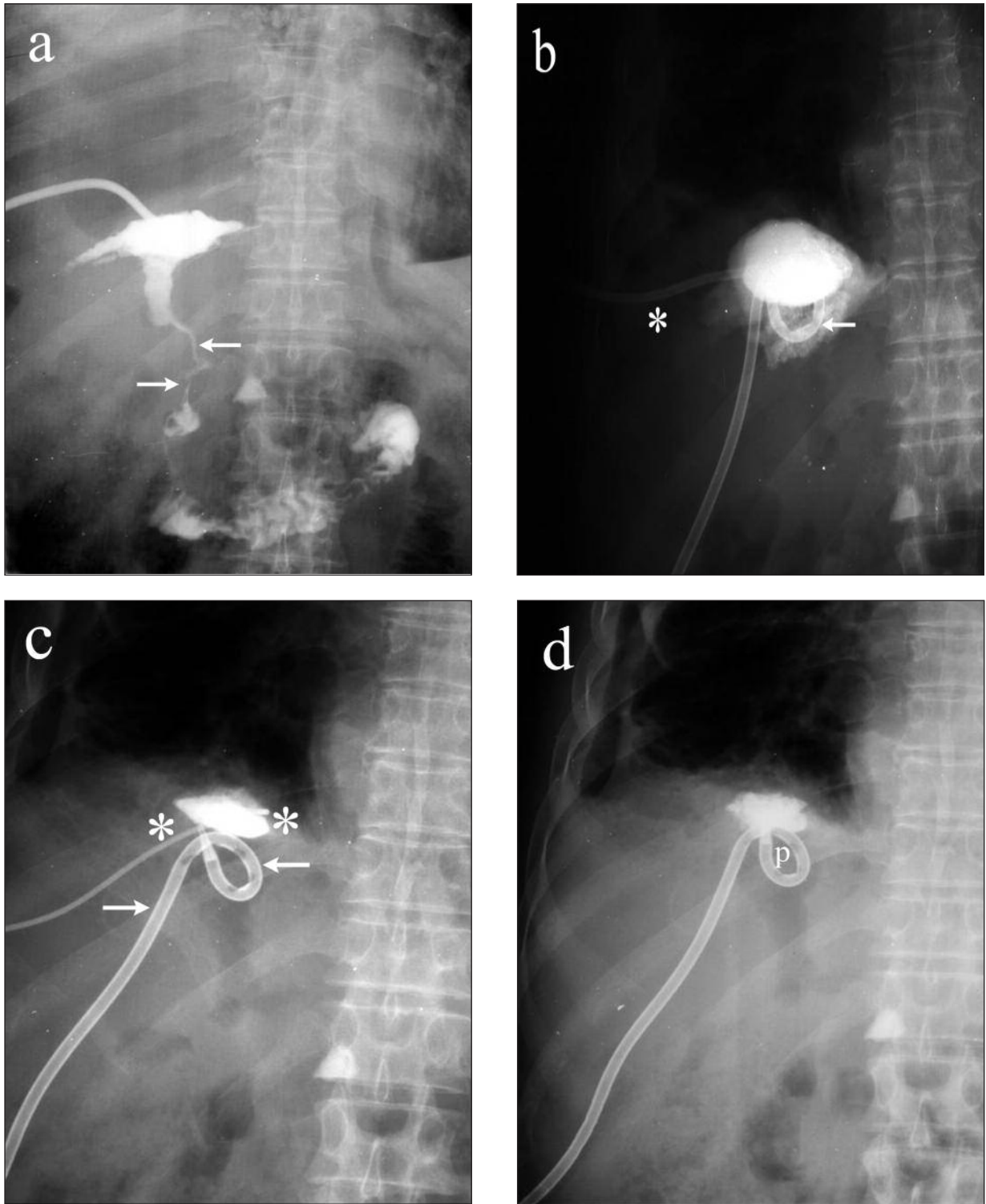
### Statistical Analysis

Statistical analysis was performed using chi-square test for categorical variables at success and Mann-Whitney *U* test for continuous variables (age, drainage, and follow-up times). Postoperative and spontaneous, malignant and non malignant groups were compared, similarly so were other possible effective factors. A *p* value of < 0.05 was considered statistically significant.

## RESULTS

Table 1 shows the localizations of intra-abdominal abscesses. Successes rates were 94.9% (37/39) for the right upper quadrant, 76.5% (13/17) for the left upper quadrant, 90.0% (9/10) for the right and left lower quadrants, and 80.0% (16/20) for the remaining regions; the difference between localizations was not significant (*p*= 0.186).

Table 2 shows abscess etiologies. The other organ was mesentery or omentum in 13 abscesses. Bacteria were isolated in 26 abscesses (30.2%), 21 postoperative and 5 spontaneous. The most common pathogen was *E. coli*, which was detected in 12 abscesses (8 postoperative and 4 spontaneous), whereas *Candida* was isolated in 2 spontaneous ones (one hepatic, the other pancreatic, both treated successfully). *E. coli* was isolated in 12.9% of postoperative vs. 16.7% of spontaneous abscesses. Although spontaneous abscesses were more likely to contain *E. coli*, this was not significant (*p*= 0.731).



**FIGURE 1a-d:** A 68 year-old male patient with complicated abscess with pancreaticojejunal fistula 7 months after total gastrectomy for gastric adenocarcinoma. **a.** Cystography by 10F catheter shows abscess related to jejunum with a fistula (arrows). There is empyema in the right lung. **b.** This jejunal fistula was closed on cystography with a pig-tail catheter (star) at 2 months before cyanoacrylate (glue) application. A pig-tail of 12F pleural catheter for empyema is seen superimposed to this resolved abscess cavity (arrow). **c.** Cyanoacrylate mixed with lipid-soluble contrast medium (lipiodol) is injected into cavity with a 5F straight catheter (stars) against to pleural passage of the pancreatic fluid. Pleural catheter (arrows) is also seen. **d.** Dense cavity above pleural catheter (P) is seen after the application. Empyema was also treated via this pleural catheter a month later/

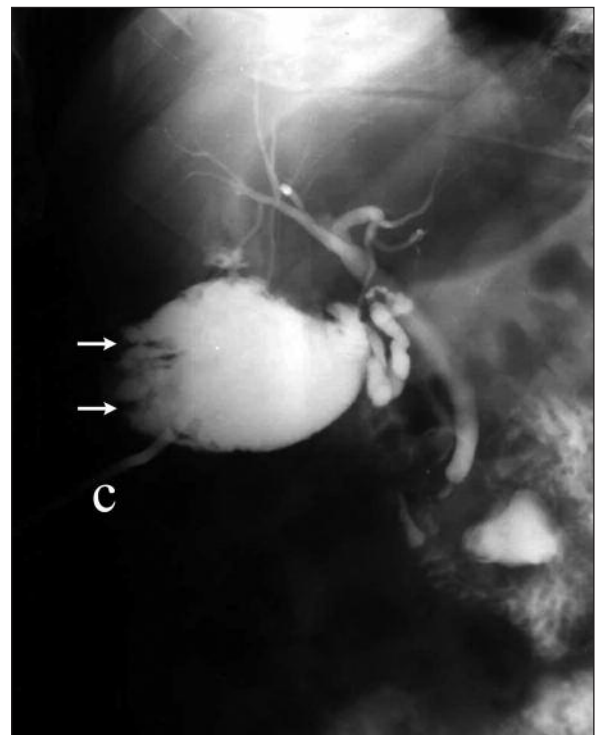


**FIGURE 2a, b:** A 48 year-old male patient with pancreatic abscess after nephrectomy. **a.** Contrast-enhanced CT shows a left subphrenic abscess with air (arrows). **b.** This cavity was successfully drained with a 12F catheter (arrow) for 27 days. Catheter infection was seen and treated with antibiotic.

Table 3 shows the success rates of abscesses with/without malignancies. Primary failure and recurrence rate was 12.8% (11/86), and success and partial success rate was 87.2% (75/86), with a secondary success rate of 88.4%. A patient with 4 recurrences was treated successfully with percutaneous drainage although he was critically ill with coma. Overall success rate was 85.4% (35/41) in abscesses with malignancies, while it was 88.9% (40/45) in those without malignancies. No correlation was found between success and malignancy ( $p=0.625$ ). The success rate of postoperative abscesses with malignancy was 86.5% (32/37), while it was 75.0% (3/4) in spontaneous ones with malignancy; this difference was not significant ( $p=0.483$ ).

In addition, 14 out of 37 patients with malignancies died due to malignant disease; one patient with lung carcinoma at 30 days and in 13 who had gastric (3 patients), pancreatic (1), colonic (2), biliary (3) and ovarian (1) malignancies, and lymphomas (3) after 30 days. In the latter cases, the time of death was at 2 months for 4 patients, at 7 months for 2 at 3, 4, 5, 6, 8, 12, and 15 months for one each.

Needle, thin, and thick catheter groups did not reveal any difference with regard to success ( $p=0.753$ ) although we had to replace 3 thin catheters with larger ones due to insufficient drainage. Overall, 11 failures were experienced; one primary fa-



**FIGURE 3:** 72 year-old woman with gall-bladder empyema. Cystography shows contrasted extra-hepatic biliary system and a 12F catheter (c: catheter). Irregular gall-bladder wall (arrows) is seen. The patient was cured with 16-day drainage.

ilure with needle (postoperative), 2 primary failures with thin catheter (both spontaneous), and 8 with thick catheter (1 spontaneous and 7 postoperative).

Lesion localization	Number	Postoperative	Spontaneous
Right upper quadrant	39 (2) <sup>a</sup>	23 (1)	16 (1)
Right lower quadrant	5 (0)	5 (0)	0
Left upper quadrant	17 (4)	15 (3)	2 (1)
Left lower quadrant	5 (1)	5 (1)	0
Umbilical	5 (1)	5 (1)	0
Perianal-perirectal	2 (1)	1 (1)	1
Retroperitoneal	8 (1)	3 (0)	5 (1)
Other <sup>b</sup>	5 (1)	5 (1)	0
Total	86 (11)	62 (8)	24 (3)

<sup>a</sup> Figures indicate the total number of abscesses and failures are in parenthesis.

<sup>b</sup> Abscess has more than one localization.

Success did not seem to correlate with age ( $p=0.207$ ), gender ( $p=0.489$ ), and yeast isolation ( $p=1.000$ ). Primary success was 87.1% (54/62) in postoperative abscesses (secondary success 89.0%) and 87.5% (21/24) in spontaneous abscesses. The primary success rates of spontaneous and postoperative abscesses did not differ significantly ( $p=0.960$ ). Similarly the success rates of patients with/without gastrointestinal fistulas did not reveal a significant difference ( $p=0.735$ ). Of 7 patients with complicated abscesses, 4 (1 spontaneous, 3 postoperative) were treated with total success, whereas

3 (1 spontaneous, 2 postoperative) with partial success. Complicated and non complicated abscesses did not yield significantly different success rates ( $p=0.588$ ). The etiology of failure was hemorrhage in 3 patients, and postoperative foreign material (compress), empyema, anastomosis fistula, and postoperative colon perforation in one for each complication.

Table 4 shows success with respect to abscess origin. The success of the postoperative liver abscesses was 92.0%, whereas that of the spontaneous liver abscesses was 93.3%, yielding an overall success rate of 92.5% (37/40). Of hepatic abscesses, 16 had biliary origin, most were postoperative (15) and one was spontaneous (gall bladder empyema). One biliary postoperative abscess had failure (traumatic biloma) due to sponge, whereas the remaining 15 biliary abscesses had a success rate of 93.8% (15/16). The success rates of biliary and non biliary abscesses did not differ significantly ( $p=1.000$ ).

Pancreatic and non pancreatic abscesses did have a significant difference for success rates ( $p=0.572$ ). The primary success of the postoperative colon (excluding caecum) abscesses was 62.5% (5/8), whereas the secondary success was 75% (6/8). Three rectal abscesses with needle in one and cat-

Intra-abdominal organ	Postoperative	Spontaneous	Bacterial	Fungal
Liver-biliary <sup>a</sup>	40	25 (10) <sup>b</sup>	13 <sup>c</sup>	1 ( <i>Candida</i> )
Pancreas	6	5 (3)	3 <sup>d</sup>	1 ( <i>Candida</i> )
Small bowel	8	8 (1)	1	0
Anastomosis	2	2 (1)	1 <sup>d</sup>	0
Colon-rectum (excluding caecum)	9	8 (1)	2 ( <i>E. coli</i> )	0
Renal-surrenal	5	3 (0)	2 (0)	0
Spleen	2	1 (0)	1 (1)	0
Stomach-duodenum	6	5 (2)	2	0
Appendix	2	2 (1)	1 ( <i>E. coli</i> )	0
Other (mesentery, etc)	13	8 (2)	2	0
Total	93 <sup>e</sup>	67 (21)	26	2

<sup>a</sup> Five cases have 2 abscesses,

<sup>b</sup> Figures indicate the total number of abscesses and figures in parenthesis are abscesses with positive microorganism,

<sup>c</sup> Bacteria were *E. Coli* in 8 case, *Proteus* in 2, *S. aureus* in 3, and *Streptococcus* in 1,

<sup>d</sup> Multiple bacteria in 3 cases involved *streptococcus* and *enterococcus* in one case, more than 3 bacteria in the second case, and *E. coli*, *enterococcus* and *klebsiella* in the third case with gastrosplenic fistula (descending order),

<sup>e</sup> The number of abscesses (93) seems more than the virtual number (86) because 7 complicated abscesses have been related to 2 organs. Also 10 of 76 patients have 2 abscesses.

**TABLE 3:** Success of percutaneous drainage in abscesses with/without malignancy.

Outcome of lesions	Abscess	Postoperative	Spontaneous
Primary failure	7 (3) <sup>a</sup>	5 (3)	2 (0)
Partial success	9 (7)	6 (6)	3 (1)
Success	66 (28)	48 (26)	18 (2)
Recurrence	4 (3)	3 (2)	1 (1)
Total	86 (41) <sup>b</sup>	62 (37)	24 (4)

<sup>a</sup> Figures indicate the total number of abscesses and figures in parenthesis are those malignancies.

<sup>b</sup> The number of abscesses with malignancy (41) is more than the patient number with malignancy (37) because 4 patients have 2 abscesses.

heters in 2 resulted with one partial success, one success, and one failure. Two sigmoid abscesses failed and recurred. One spontaneous colon abscess was treated successfully. No difference was detected between successes of colonic and non colonic abscesses ( $p=0.086$ ). Eighteen gastroduodenal, enteric, appendiceal, and anastomosis abscesses had 17 successes (94.4%) and the remaining 68 ones had 58 successes (85.3%) with no difference between ( $p=0.445$ ).

No amebic abscess was found, but six hydatid abscesses (3 spontaneous, 3 postoperative) were tre-

ated with success. Five had hepatic and one had renal origin. Patients with two abscesses were treated in 10 (9 postoperative, 1 spontaneous), 9 with success and 1 with partial success. Five loculated abscesses were all treated with success as well.

Table 5 shows complications due to percutaneous abscess drainage. Serious complications developed in 3 patients (4.0%), 2 spontaneous and 1 postoperative. They were venous hemorrhage, hydropneumothorax, and empyema, treated with surgery, thorax tube, and surgery, respectively. Fortunately visceral perforation was not encountered in any case. No procedure-related mortality was seen, but one patient with psoas abscess died due to serious respiratory distress due to lung carcinoma at 30 days. Catheter-related complications such as blockage and malposition developed in 2 patients (2.6%), resolving with catheter exchange.

The duration of drainage for hepatic abscesses were 12.5 days (range 79 days) with biliary origin and 12.0 days (81 days) without biliary origin ( $p=0.116$ ). The median duration of catheterization were 12.5 days (range 79 days) for abscesses with fistulas and 9 days (81 days) for those without fistula ( $p=0.101$ ). The median duration of catheterization

**TABLE 4:** Success rates of percutaneous drainage in the origin organs.

Organ	Total	PO	SP	Success		Pa. success		Pr. Failure		Recurrence	
				PO	SP	PO	SP	PO	SP	PO	SP
Liver-biliary	40 (32) <sup>a</sup>	25 (18)	15 (14)	22 (15)	14 (13)	1 (1)	-	1 (1)	1 (1)	1 (1)	-
Pancreas	6 (6)	5 (5)	1 (1)	3 (3)	1 (1)	1 (1)	-	1 (1)	-	-	-
Small bowel	8 (8)	8 (8)	-	6 (6)	-	2 (2)	-	-	-	-	-
Anastomosis <sup>b</sup>	2 (2)	2 (2)	-	1 (1)	-	-	-	1 (1)	-	-	-
Colon-rectum (excluding caecum)	9 (9)	8 (8)	1 (1)	3 (3)	1 (1)	2 (2)	-	2 (2)	-	1 (1) <sup>c</sup>	-
Renal-surrenal	5 (5)	3 (3)	2 (2)	2 (2)	1 (1)	-	-	-	1 (1) <sup>d</sup>	1 (1)	-
Spleen	2 (2)	1 (1)	1 (1)	1 (1)	-	-	1 (1)	-	-	-	-
Stomach-duodenum	6 (6)	5 (5)	1 (1)	4 (4)	-	1 (1)	1 (1)	-	-	-	-
Appendix	2 (2)	2 (2)	-	2 (2)	-	-	-	-	-	-	-
Other (mesentery)	13 (12)	8 (7)	5 (5)	7 (6)	2 (2)	1 (1)	2 (2)	-	-	-	1 (1)
Total	93 (84) <sup>e</sup>	67 (59)	26 (25)	51 (43)	19 (18)	8 (8)	4 (4)	5 (5)	2 (2)	3 (3)	1 (1)

PO: Postoperative; SP: Spontaneous; Pa.: Partial success; Pr.: Primary

<sup>a</sup> Figures indicate the number of abscesses, figures in parenthesis indicate the number of patients.

<sup>b</sup> Two anastomosis abscesses are oesophagojejunal origin.

<sup>c</sup> A patient with recurrence was treated with a secondary success.

<sup>d</sup> Primary failure was surgically treated.

<sup>e</sup> The number of patients (84) seems more than the virtual number (76) because 7 complicated abscesses were related to 2 organs, and a patient with complicated abscess (gastrojejunal) had a second simple abscess in another organ.

**TABLE 5:** Complication rates in percutaneous drainage of the abscesses.

Complications	Total	Postoperative	Spontaneous
Catheter obstruction-malposition	2	0	2 <sup>a</sup>
Catheter dislodgement	3	1	2 <sup>b</sup>
Skin infection	1	1 <sup>c</sup>	0
Empyema	1	1	0
Hydropneumothorax	1	0	1
30-day mortality	1	0	1 <sup>d</sup>
Venous hemorrhage	1	0	1 <sup>e</sup>
Total	10	3	7

<sup>a</sup> Hepaticocolic fistula and Type 4 renal hydatid cyst,

<sup>b</sup> A recurrence was seen,

<sup>c</sup> 27 days drainage with pancreatic abscess,

<sup>d</sup> Lung Ca with dyspnea,

<sup>e</sup> Liver abscess treated by surgically.

for a total of 23 biliary and complicated abscesses- 16 biliary, 6 complicated abscesses and one abscess both biliary and complicated (choledocoduodenal fistula)-was 14.5 days (range 79 days), whereas that of non biliary and non complicated ones was 9.0 days (81 days); this was a significant difference ( $p=0.023$ ).

The overall median follow-up time was 24.0 months (range 139 months), 18.0 months (136 months) for postoperative and 67.5 months (139 months) for spontaneous abscesses. However, there was no difference between these groups with respect to follow-up periods ( $p=0.097$ ).

## DISCUSSION

One of the most significant advances in the treatment of intra-abdominal infection over the past 2 decades has been the introduction of image-guided therapy with percutaneous drainage.<sup>5</sup> Percutaneous abscess drainage has become a well-established procedure with lower mortality rates than surgical drainage, ranging from 1.4% to 15%.<sup>4</sup>

Intra-abdominal abscess can be diagnosed and drained with either US or CT guidance. The suggestion is that US alone is not a reliable guiding method due to its limitations in delineating the intricate loops of bowel.<sup>11,12</sup> We utilized US in most cases and added CT in 9 cases with deep/small abscesses. However, avoiding CT in a patient with co-

lon perforation in the postoperative intensive unit, we faced with failure that could have easily been diagnosed by CT and treated by surgical intervention. Thus, CT guidance plays a crucial role in the decision whether the abscess should be treated with percutaneous or surgical intervention.

Absence of bacteria on the Gram stain should not be surprising especially in patients who received antibiotics.<sup>15</sup> Indeed; bacteria grew with a rate of 30.2% because all patients had used broad-spectrum antibiotics prior to intervention.

Although the largest size of catheter that can be safely placed is recommended for an effective drainage, no difference was found in success rates between the percutaneous treatment of abdominal abscesses with 7F and 14F catheters in two similar groups of patients in a recent study.<sup>15</sup> This was confirmed in our series as well, because we made our decision according to the echogenicity inside the abscess. Moreover, a cut-off of 4 cm abscess diameter for needle or catheter drainage seems true, since there was no difference between the success rates of these groups.

Abscesses with malignancies could be managed with lower cure rates than those with non malignant lesions, but this was not observed in our series ( $p=0.625$ ). The immunological status of the patients and other therapies administered were not included. Because this might rather have affected our results, we suggest a prospective randomized study regarding the cure rates of abscess drainage in patients with/without malignancy.

Cinat et al reported in 96 patients with percutaneous treatment of abdominal abscesses that a successful outcome was most likely with abscesses that were postoperative, not pancreatic, and not infected with yeast.<sup>5</sup> In spite of this report; we found no statistical difference between spontaneous and postoperative abscesses, pancreatic and non pancreatic ones, and abscesses with yeast and no yeast.

In complicated abscesses, one should expect that percutaneous drainage will have a lower chance of success, be more technically difficult, require longer periods of time for drainage, and have a higher rate of complications.<sup>6</sup> However, we treated 7



complicated abscesses with fistulas all related to two organs, including 3 partial successes (2 temporizations before operation and 1 palliation before chemotherapy). We achieved this with a multidisciplinary approach where a decision was made with a surgeon, radiologist, and infectious diseases physician. Reports suggest that decisions regarding percutaneous versus surgical drainage of complex collections should be made in concert with other physicians involved in the patient's care.<sup>6</sup> Percutaneous drainage, besides treatment, can be helpful in critical early diagnosis of the complicated abscesses, e.g. gastrosplenic fistula.<sup>18</sup>

Success rates ranging from 70% to 100% for percutaneous drainage in hepatic abscesses have been reported.<sup>4</sup> Hepatic abscesses with/without intrahepatic biliary communication have similar rates of cure; the only difference is the longer drainage time of those with biliary origin.<sup>4</sup> Drainage times of hepatic abscesses in our series were not different between those with/without biliary origin. Nevertheless, drainage times were significantly longer in biliary and complicated abscesses than that of the others in our series.

Pancreatic abscesses can be percutaneously treated with a result comparing favorably with surgery; otherwise, the mortality is 100% in untreated cases and 50% in those treated surgically.<sup>8</sup> Furthermore, percutaneous pancreatic abscess drainage can be used as a temporizing measure in critically ill patients.<sup>7-10</sup> We had 83.3% success in percutaneous pancreatic abscess drainage, which is higher than that in the literature.<sup>5,7,8</sup> Because; complicated, viscous, loculated, and especially pancreatic abscesses were personally observed more intensively with more visits and examinations and were irrigated more effectively and frequently (4 x 20-30 mL/day), whereas others were routinely managed with daily and/or every other daily rounds and 2 x 5-10 mL/day of serum physiologic irrigation. Success rates of pancreatic abscesses have ranged from 30% to 80% depending on patient selection in the literature.<sup>5</sup>

Percutaneous drainage of subphrenic abscesses is a well-established technique with reported

success rates higher than 85%.<sup>4</sup> The success rate for subphrenic abscesses in our series was 88.9%. Also, specific types such as hydatid abscesses can be treated even in viable forms and extrahepatic localizations.<sup>19</sup>

We had transgluteal approach in 3 perirectal abscesses and considered the recommendation that the catheter tract should pass as close to the sacrum as possible while sparing the rectum to avoid transgression through the sciatic nerve and superior and inferior gluteal vessels.<sup>15,16</sup> Also, periappendiceal abscesses may be drained preoperatively, in which case appendectomy can be done under elective conditions.<sup>15</sup>

Lower success rates ranging from 71% to 88% have been reported for abscesses with gastrointestinal communication than for non communicating abscesses.<sup>4</sup> However, there was no significant difference between success rates of patients with/without gastrointestinal fistulas in our series. Although median drainage times of abscesses with fistulas were longer than that of abscesses without fistula, the difference was not significant. The success rate was lower for colon and esophagojejunal anastomosis fistulas compared to other gastrointestinal fistulas, and this should be considered before the drainage.

The causes of failure in our series were recurrences, venous hemorrhages, retained postoperative sponge, empyema, anastomosis fistula, and postoperative colon perforation. A failure risk should mainly be considered in any hemorrhage, because we observed this in 3 patients of 7 primary failures, one due to the drainage and the other 2 spontaneous. After temporization of an infected tumor, elective surgery was performed successfully. In our study, we had no abscess with diverticular and Crohn's disease, which had lower success rates in the previous series. If they had been included in our study, our failure rates could have been relatively higher than the current ones. Higher success rates in pancreatic, yeast, and splenic abscesses may be due to the selection of drainable ones or the small number of patients.

The overall procedure threshold for all major complications resulting from adult percutaneous

abscess drainage is 10%.<sup>6</sup> Serious complications developed in 3 patients (4.0%). We observed hemorrhage in one patient (1.3%), and pleural transgression requiring interventions in 2 patients (2.6%), which were due to hydropneumothorax and empyema. Pleural transgression can be avoided by choosing the lowest, most anterior access route possible.<sup>16</sup> In addition, left-sided subphrenic collections can have numerous causes, but the operator should be aware that associated pancreatic tail injury is a common cause.<sup>16</sup> Empyema due to pancreatic fistula was seen in a 37-year-old woman with left subphrenic abscess, resulting in failure, while it was detected in the right lung of a 68 year-old male patient, resulting in achievement. We suggest that more attention should be paid to prevent empyema due to pancreatic fistulas in both right and left upper quadrant abscesses.

Failure occurs in 5%-10% and recurrence in 5%-10% in percutaneous abdominal abscess drain-

nage.<sup>6</sup> There was 4.7% primary failure and 8.1% recurrence in the series, which were within normal limits. Percutaneous abscess drainage with a success rate of 87.2% was valid for both spontaneous and postoperative origin. The postoperative or spontaneous origin or malignant or non malignant character of the abscess may be insignificant for the success of percutaneous drainage of intraabdominal abscesses. There should be prospective studies regarding these factors whereas retrospective ones have already been done.

## CONCLUSION

Percutaneous spontaneous and postoperative abdominopelvic abscess drainage was an effective treatment in malignant and non malignant patients. It was also successful even in complicated fistulas, specific abscesses such as hydatid, and pancreatic origin if they were drainable and safely accessible.

## REFERENCES

- Gervais DA, Ho CH, O'Neill MJ, Arellano RS, Hahn PF, Mueller PR. Recurrent abdominal and pelvic abscesses: incidence, results of repeated percutaneous drainage, and underlying causes in 956 drainages. *AJR Am J Roentgenol* 2004;182:463-6.
- van Sonnenberg E, Mueller PR, Ferrucci JT Jr. Percutaneous drainage of 250 abdominal abscesses and fluid collections. Part I: Results, failures, and complications. *Radiology* 1984;151:337-41.
- van Sonnenberg E, Wittich GR, Goodacre BW, Casola G, D'Agostino HB. Percutaneous abscess drainage: update. *World J Surg* 2001;25:362-9.
- Akinci D, Akhan O, Ozmen MN, Karabulut N, Ozkan O, Cil BE, et al. Percutaneous drainage of 300 intraperitoneal abscesses with long-term follow-up. *Cardiovasc Intervent Radiol* 2005;28:744-50.
- Cinat ME, Wilson SE, Din AM. Determinants for successful percutaneous image-guided drainage of intra-abdominal abscess. *Arch Surg* 2002;137:845-9.
- Bakal CW, Sacks D, Burke DR, Cardella JF, Chopra PS, Dawson SL, et al. Quality improvement guidelines for adult percutaneous abscess and fluid drainage. *J Vasc Interv Radiol* 2003;14(9 Pt 2):S223-5.
- van Sonnenberg E, Wing VW, Casola G, Coons HG, Nakamoto SK, Mueller PR, et al. Temporizing effect of percutaneous drainage of complicated abscesses in critically ill patients. *AJR Am J Roentgenol* 1984;142:821-6.
- van Sonnenberg E, Wittich GR, Casola G, Stauffer AE, Polansky AD, Coons HG, et al. Complicated pancreatic inflammatory disease: diagnostic and therapeutic role of interventional radiology. *Radiology* 1985;155:335-40.
- Balthazar EJ, Freeny PC, vanSonnenberg E. Imaging and intervention in acute pancreatitis. *Radiology* 1994;193:297-306.
- Pickleman J, Moncada R. The role of percutaneous drainage of pancreatic abscesses. *Am Surg* 1987;53:451-5.
- Khurram Baig M, Hua Zhao R, Batista O, Uriburu JP, Singh JJ, Weiss EG, et al. Percutaneous postoperative intra-abdominal abscess drainage after elective colorectal surgery. *Tech Coloproctol* 2002;6:159-64.
- Ercoli FR, Milgrim LM, Noshier JL, Brodin RE. Percutaneous catheter drainage of abscesses associated with enteric fistulae. *Am Surg* 1988;54:45-9.
- Taşar M, Uğürel MS, Kocaoğlu M, Sağlam M, Somuncu I. Computed tomography-guided percutaneous drainage of splenic abscesses. *Clin Imaging* 2004;28:44-8.
- Chou YH, Tiu CM, Chiou HJ, Hsu CC, Chiang JH, Yu C. Ultrasound-guided interventional procedures in splenic abscesses. *Eur J Radiol* 1998;28:167-70.
- Men S, Akhan O, Koroğlu M. Percutaneous drainage of abdominal abscess. *Eur J Radiol* 2002;43:204-18.
- Maher MM, Gervais DA, Kalra MK, Lucey B, Sahani DV, Arellano R, et al. The inaccessible or undrainable abscess: how to drain it. *Radiographics* 2004;24:717-35.
- Hui GC, Amaral J, Stephens D, Atenafu E, John P, Temple M, et al. Gas distribution in intraabdominal and pelvic abscesses on CT is associated with drainability. *AJR Am J Roentgenol* 2005;184:915-9.
- Aribaş BK, Başkan E, Altinyollar H, Ungül U, Cengiz A, Erdil HF. Gastrosplenic fistula due to splenic large cell lymphoma diagnosed by percutaneous drainage before surgical treatment. *Turk J Gastroenterol* 2008;19:69-70.
- Aribaş BK, Dingil G, Kosar S, Ungül U. Percutaneous treatment in a type 4 renal hydatid cyst. *European Journal of Radiology Extra* 2006;57:103-7.