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Guided Percutaneous Drainage for Intra-abdominal Collections: The First Choice in Modern Surgical Practice.

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Abstract

Background Over the past 20 years, percutaneous drainage of intra-abdominal collections has evolved from revolutionary to routine, replacing open surgical abscess drainage in all but the most difficult or inaccessible cases.

Objective To evaluate the practical safety and efficacy of image-guided perctaneous drainage for different intra-abdominal collection.

Method Patients with intra-abdominal collections underwent percutaneous drainage under ultrasound guide were studied prospectively in Al-Imamian Al-Kadhymian Medical City over the period of 20 month from February 2011 to September 2012. The procedure done under local anesthesia and aseptic technique under ultrasound or CT scan guidance.

Results There were 50 patients (32 females and 18 males), Age ranging 12-58 years. Forty seven patients had a previous operative procedure and three patients had no such history. The post-operative collections in majority of patients 34 (72%) were single while in 13 patients (28%) were multiple. The type of content was as following: pus in 32 patients (64%), bile in 13 patients (26%), infected pancreatic/gastric secretions in 3 patients (6%) and infected urine in 2 patients (4%)., Percutaneous drainage was successful in 42 cases (84%), while 8 cases (16%) needed further surgical intervention to cure the collection. No major complications were recorded only minor complications like minor bleeding and wound infections. Mortality was in one case and it is not directly related to percutaneous drainage procedure rather to underlying problem and sepsis after second exploration.

Conclusion Guided percutaneous drainage is a safe and effective procedure for treating an intra-abdominal collections and it can be the first line treatment in severely ill patients.

Key Words Guided percutaneous drainage, abdominal collections.

List of abbreviation: GPD = Guided percutaneous drainage, PD = Percutaneous drainage, IAA = Intra-abdominal abscess, IAC = Intra-abdominal collections, US = Ultrasonography, CT = Computerized tomography (CT-scan).

Introduction

Intra-abdominal abscess (IAA), also known as intraperitoneal abscess, is an intra-abdominal collection of pus or infected material and is usually due to a localized infection inside the peritoneal cavity. It can involve any intra-abdominal organ or be located in between bowel loops. IAA is almost always secondary to a pre-existing or other disease process [(1)].

In more than 80% of cases, the collections derive from intra-abdominal organs and, in many cases, they develop after operative procedures. It is estimated that about 70% of cases are post-surgical [(2)]. The classic treatment of IAA and collections has been operative drainage. However, in recent years, improvement in ultrasonography (US) and computed tomography (CT) provides accurate noninvasive

recognition of fluid masses in the abdominal cavity and facilitates needle aspiration and catheter drainage. Since 1976, the authors have routinely used percutaneous drainage (PD) in the treatment of abscesses at this facility [3].

Percutaneous drainage is a successful modality in most cases for simple abscesses that are not associated with suspected malignancy or large anastomotic leaks. PD, if feasible, could be the first-line therapy and can be performed using guidance from either ultrasound or CT scan [4].

The aim of the study is to evaluate the practical safety and efficacy of GPD for different intra-abdominal collections.

Methods

The study is a prospective interventional one, done in the Department of General Surgery, Al-Imamain Al-kadhymain Medical City, Baghdad, in conjunction with department of radiology over a period of 20 months from February 2011 to September 2012. Patients with simple plus complex abscesses and collections as multiple, recurrent or secondary were included. Abscesses with obvious external fistula and tubo-ovarian and splenic abscesses were excluded. Patients who did not complete treatment or follow-up were also excluded. Ultrasound was done by a trained radiologist. Patients received the general treatment including appropriate antimicrobials as usual.

Technique:

The collection was precisely delineated and a safe route from skin to the cavity was identified by ultrasound prior to the catheter introduction, a diagnostic needle aspiration was done. The catheter was introduced into the abscess cavity, either directly using a trocar catheter (as used for chest intubation (Protex 10-I 6F)) or by modified Seldinger's technique using a guide-wire. The former was used when a direct route from skin to the abscess cavity was available and the latter when the abscess was deep with likelihood of inadvertent injury to the nearby viscera. Maneuvering of the trocar or guide-wire within the abdominal cavity was done strictly under ultrasound surveillance. Once in position, the catheter was secured and attached to a drainage bag. Drainage was recorded daily and the response to the treatment was assessed by clinical parameters and also by serial ultrasound. Normal saline irrigation of the cavity was used to enhance clearance of thick debris and prevent catheter blockage.

The procedure was considered successful if the patient was cured without the need for surgical drainage. After catheter removal, patients were followed up for three months. The results were compared with historical records.

Result

Fifty patient with intra-abdominal collections, 42 patients (84%) sustained percutaneous drainage procedure under ultrasonic guide and the remaining 8 patients (16%) did the procedure under CT scan guidance, there were 32 females (64 %) and 18 males (36%) , the age of the entire group ranging from 12- 58 years with a mean age of 36 year±2.

The collections diagnosed basically on US and/or CT scan. Ultrasound and CT-scanning was needed in 16 patients (32 %).

These intra-abdominal collections were 47 cases followed a previous operative procedure and 3 occurred spontaneously.

The post-operative cases were as follow:13 patients (28%) after cholecystectomy, 10(21%) for acute abdomen, 9(19%) for abdominal trauma, 5(10%) for gynecological problem, 3(6.3%) after colonic surgery, 2(4.2%) for Hydatid cyst, 2(4.2%), 2(4.2%)cases after renal surgery, 2 patients (4.2%) followed gastro-duodenal surgery and one (2.1%) after whipple operation (Table 1).

Three pt had spontaneous abscesses (6% from total number): one infected pseudocyst of pancreas, one liver abscess and last one was psoas abscess. The post-operative collections in majority of pt 34 (72%) were single while in 13 patients (28%) were multiple (like pelvic and subhepatic) for whom multiple catheters were used for their drainage. The sites of a single and multiple collections are shown in table 2 and 3.

Table 1. Distribution of post-operative collections according to primary operation.

Primary operation	No.	%
Cholecystectomy	13	28
Surgery for acute abdomen	10	21
Surgery for abdominal trauma	9	19
Gynecological surgery	5	10
Colonic surgery	3	6.3
Liver hydatid cyst surgery	2	4.2
Gastro-doudenal surgery	2	4.2
Renal surgery	2	4.2
Whipple operation	1	2.1
Total	47	100

IAA associated with underlying fistulae are called complex abscesses, in our study 15 pt (30%) had a complex abscesses, the fistulae and their number were as the followings (biliary = 10, intestinal= 3, pancreatic= 1, duodenal =1, urinary= 1). complex abscesses represented 77% of multiple site abscesses (10 patients).

Table 2. Different locations of single intra-abdominal collections.

The site of collection	No.	%
Pelvic	14	41
Rt. subhepatic	13	38
Rt. subphrenic	2	5.8
Lt. subhepatic	2	5.8
paracolic	1	2.9
Retroperitoneal (renal bed)	2	5.8
Total	34	100

Table 3. Different locations of multiple intra-abdominal collections

The site of collection	No.	%
Pelvic/ Rt. subhepatic	6	46
Rt. Subphrenic/ subhepatic	3	23
Rt.Subhepatic/Lt.subhepatic	2	15.5
Lt.subhepatic/Lt. paracolic	2	15.5
Total	13	100

The amount of material drained after the initial catheter placement was 25-1800 ml. nearly all patients showed signs of improvement after initial catheter placement. The fever subsided within a few days. Irrigation and drainage was continued for an average length of 10 days (range 4-35 days).

Table 4. Types of collection

Type of content	No.	%
Pus	32	64
bile	13	26
Infected pancr./gastr. secretions	3	6
Infected urine	2	4
Total	50	100

Thirteen (26%) patients needed repeated percutaneous drainage (re-insertion of drainage catheters) due to continuous leak in 8 of them (the leak was bile due to complicated cholecystectomy, intestinal secretions in patient with whipple surgery) or due to thick pus that needed larger catheter gage for drainage in 3 patients and last 2 patients were due improper placement of catheter. Out of 13, six patients (12%) underwent surgical interventions to tackle the primary pathology (those patients not cure from PD and conservative treatment and surgical corrections were necessary to deal with underlying intestinal, biliary and urinary fistulae) and one of them unfortunately died after second surgery due to sepsis and multi-organ dysfunction.

Table 5. End result and complications of percutaneous drainage procedure.

Result		infected	Non-infected	Total
No. of collection		35 (70)	15 (30)	50 (100)
Successful drainage		31 (62)	11 (22)	42 (84)
Complications	Major	0	0	0
	Minor	4	3	7

Number between brackets represents the percentage

In general GPD was successful in 42 (84%) cases, while 8 (16%) cases needed further surgical intervention to cure the collection. For simple abscesses PD were 100% successful, while in complex type it was successful in only 8 (50%) patients.

The type of content was as following: pus in 32 (64%) patients, bile in 13 (26%) patients, infected pancreatic/gastric secretions in 3 (6%) patients and infected urine in 2 (4%) patients (Table 4).

No major complications were recorded only minor complications like minor bleeding and wound infections as stated in table 5. Mortality was in one case and it is not directly related to percutaneous drainage procedure rather to underlying problem and sepsis after second exploration.

Discussion

In recent years the indications for percutaneous methods has expanded significantly. The results of percutaneous procedures have been so good and so widely accepted that the indications and applications have continued to expand. Ultrasound-guided and computed tomography-guided puncture or catheter drainage is an easy, gentle, and relatively atraumatic procedure with few complications. General anesthesia is unnecessary. The patients are mobile immediately, and the risk of pulmonary infections and thromboembolism is minimized [5,6].

CT and US are excellent at identifying potential abscess areas [2,7], in current study 84% of cases achieved under US guidance as it is available, cheap and simple and can be portable and the CT guidance reserved for difficult cases in whom localization and accessibility of collections were awkward under US as in some cases of subhepatic, subphrenic and pelvic collections, in current study 8 (16%) patients needed CT guidance, CT after ultrasound has fast emerged to provide radiological guidance more for its specificity than its sensitivity. Haggas and Weinstein [8] prefer CT over ultrasound. Gerzof et al [9] consider CT and ultrasound complementary rather than competitive, the former better for localization of abscess and route planning (as bowel gas or bone does not hamper it) and the latter for catheter placement (as imaging and sector plane flexibility are achieved simultaneously). In one of our pt where ultrasound was unclear, CT helped in outlining the abscess and ultrasound was again resorted for introduction of catheter.

We conclude from our series that most common cause of intra-abdominal collection is an iatrogenic reasons, I mean post-operative as in 47 (94%) patients and this is in agreement with Talib et al [10] and other series [11,12].

We considered percutaneous drainage successful if the pt was cured without undergoing surgery. With these criteria, our overall success rate was 84%, and failed in 16% as 8 patients needed surgical exploration to tackle with underlying pathology and it is nearly similar to other series like Mueller et al [13], Lameris et al [14] and Haage et al [15].

The results are quite satisfactory and approaching 100% in simple than in complex abscesses (50%). The latter is understandable as conventional open surgical drainage also shows such difference, indicating interplay of other variables in addition to the drainage technique in the outcome i.e., the natural underlying pathology (fistulae) render clearance of abscess cavity difficult or impossible. It also explains why earlier series [3,8,9] on percutaneous drainage showed better results as these included only simple abscesses and had excluded complex one. In fact the initial success in percutaneous drainage of simple abscess encouraged its use in complex abscesses, like multiple and multilocular abscesses[16], infected pseudocysts [9,17,18], splenic abscess [16,19,20] and abscesses with fistula [9,21]. Thus compared with the initial 40%, up to 90% abdominal abscesses can now be subjected to percutaneous drainage [22].

Percutaneous abscess drainage can help stabilize critically ill patients by reducing the systemic toxic impact and perhaps, improving the outcome of necessary surgical procedures. Second, it can improve patient management by

changing a 2-step surgical procedure into a 1-step procedure [15]. Percutaneous collection drainage is now a commonly used staging method for the resolution of intra-abdominal sepsis prior to corrective operation [23], So that the successful treatment of abscesses with percutaneous drainage either obviated surgery altogether or facilitated surgery by providing a clean operative field [24].

Therefore, we consider percutaneous drainage worth trying as even if it fails to prevent surgical intervention, it can be a useful temporizing measure [25]. Further in moribund pt, percutaneous drainage would be the only option available[18].

We had catheter related problems in some patients; as a narrow caliber catheter is used, its blockade is common. To avoid this many workers recommend routine saline irrigation of the catheter and it may be the secret of success in most of cases as it not only flush the catheter, but also enhance dissolution of necrotic tissue and dilute thickened collection thereby enhancing drainage and hasten the collapse of cavity.

Complications noted in our series were mostly minor. Major complications reported are bowel and vascular injury [12,26] in addition to recurrent and secondary abscesses. Bowel injury may go unrecognized at the time of procedure to appear later as enterocutaneous fistula. It often closes spontaneously[16]. Vascular injury can lead to visceral hematoma or bleeding in the parieties. Serious bowel and vascular injury can be avoided by proper technique and careful planning prior diagnostic needle aspiration is an additional safe guard [8]. Bowel or vascular injuries were notably absent in our series.

In conclusion, GPD is an efficient and safe procedure for treating IAA and IAC as a definite or temporizing method; the results are very good in patients with simple abscesses and fair in those with complex abscesses; the outcome of GPD is comparable to that of conventional open drainage and has the merit of simplicity and feasibility to be performed under local anesthesia and with very minimal trauma.

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Author contribution

The author is responsible for preparing for all steps of this case report.

Declaration of interest

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