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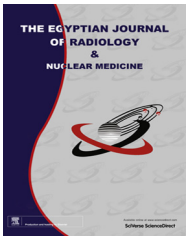

ORIGINAL ARTICLE

Value of implantable peritoneal ports in managing recurrent malignant ascites

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KEYWORDS

Malignant ascites;
Percutaneous palliation;
Implantable peritoneal port

Abstract *Purpose:* To evaluate the safety and efficiency of percutaneous implantable peritoneal port in minimally invasive treatment of intractable ascites.
Patients and methods: 40 patients with malignant ascites were referred from the oncology clinic to the radiodiagnosis department for percutaneous placement of peritoneal port catheter as a palliative treatment under guidance of ultrasonography and fluoroscopy. Ports were evaluated for safety and efficiency.
Results: The technical insertion success rate of percutaneous implantable peritoneal port was 100% with gradual removal of ascites together with 100% immediate relief of symptoms. No major complication was noticed however one minor immediate complication (2.5%) was detected as leakage at the port placement site which stopped spontaneously with removal of ascites and conservative patient management .In long term results, one patient (2.5%) developed infection at port site after 3 months of successful ascites drainage. This technique avoided ascites related morbidity, increases patient compliance, and satisfaction by decreasing hospital visits as the drainage and patients monitor can be done at home.
Conclusion: The percutaneous implantable peritoneal port system is safe and effective in palliation of symptomatic malignant ascites with minimal invasive treatment. Port aspiration can be performed by patients or family members without nursing assistance or hospital visits.

1. Introduction

Ascites is a common complication of advanced malignancies and cirrhosis (1–3). It usually carries a poor prognosis in both cancer and liver disease (4,5). The commonest causes of malignant ascites are primary tumor of breast, ovary, colon, stomach, pancreas and bronchus (6).

Symptoms of ascites include marked abdominal distention, shortness of breath, diminished appetite, fatigue, and

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lower-extremity edema which can significantly compromise a patient's everyday function (2).

Diuretics have long been a useful treatment in cirrhotic ascites (7) and liver metastasis ascites (8,9). However they can cause electrolyte disturbance and hypotension, so they need to be used with caution in patient with poor renal or hepatic function (10).

Available treatment options for intractable ascites include repeated paracentesis, transjugular portosystemic shunt (TIPS) creation, peritoneovenous shunting, liver transplantation (11,12). Tunneled peritoneal catheters with external component which was not considered viable treatment options as a result of problems with infection, malposition, and occlusion (11,12); however, they have been used for many years for peritoneal dialysis with acceptable complication rates (13,14). In 1999, 27,000 people received peritoneal dialysis in the United States, constituting 9% of the dialysis population, where mortality rates was similar to or lower than those in hemodialysis patients (15). Tunneled catheters have generally been placed in operating rooms (13). Recently, 2-year catheter survival rates with percutaneous placement have been reported to be 49–82% (15). Rosenblum et al. (11) described the use of a subcutaneous venous access port to treat refractory ascites with promising results in 9 patients.

Recently peritoneal port represents minimally invasive effective option for treatment of intractable ascites (11,12).

2. The aim of the work

The purpose of this study was to evaluate prospectively the safety and effectiveness of radiologically placed peritoneal ports in palliation of malignant ascites.

3. Patients and methods

3.1. Patients

This prospective interventional study included 40 patients (25 male and 15 female, mean age 58.1) with malignant ascites referred from the oncology clinic to the radiodiagnosis department at Ain Shams University Specialized Hospitals for percutaneous placement of peritoneal port catheter as a palliative treatment between October 2010 and March 2013.

3.2. Inclusion and exclusion criteria

Patients included in our study were selected according to the following criteria:

- o International normalizing ratio (INR) less than 1.5.
- o Prothrombin time should be less than 15 s.
- o Partial thromboplastin time should be near normal.
- o Platelet count should be greater than 50,000 per mm^3 to limit the risk of bleeding.
- o There should be no infection at the time of port placement.
- o At least a moderate amount of ascites should be present at the time of port placement to help insure placement of the catheter in an optimal location.
- o No age predilection.
- o Patients with infected ascites were excluded.

The selected patients who had approved to participate in our study gave an informed consent (or their guardians approved) their images will be included.

3.3. Procedure

The standard retrograde procedure of peritoneal implantable port with a 14.3F silicone catheter (Bard Access System, Inc., Salt Lake City, UT, USA) (Fig. 1) to the patients was as follows:

Ultrasonography was used to mark the puncture site of large volume ascites without loculations and an 18G Chiba needle was used for ultrasound (US) guided puncture. An appropriate insertion site at the right lower quadrant was locally anesthetized with Prilocaine HCl. After the stylet of the needle was removed, spontaneous drainage of uncomplicated ascites was confirmed. A 0.035-in guide wire was advanced into the pelvic aspect of the peritoneal cavity under fluoroscopy and a 6F dilator was inserted over the guide wire, which was then removed and a dilator was capped.

The port pocket was created 5–8 cm (tunnel length) above the puncture site over the anterolateral lower ribs. A 3–4 cm incision was made and a subcutaneous pocket was prepared according to the reservoir size. The thickness of the tissues between the port pocket and the skin was approximately 1 cm to permit easily location of reservoir by palpation and to prevent skin necrosis.

A subcutaneous tunnel was created between the pocket and the ascites. The reservoir end of the catheter was connected to the tunneler, pulled through the tunnel, cut to the appropriate length and connected to the reservoir. It was placed into the pocket and fixed to skin with a 19G Huber needle (Fig. 2).

The guide wire was advanced to the pelvic portion of the peritoneal cavity through the dilator under fluoroscopy guidance and serial dilatation was performed. A 16F peel-away sheath was placed over the guide wire and the catheter was advanced

Fig. 1 Peritoneal implantable port with a 14.3F silicone catheter (Bard Access System, Inc., Salt Lake City, UT, USA).

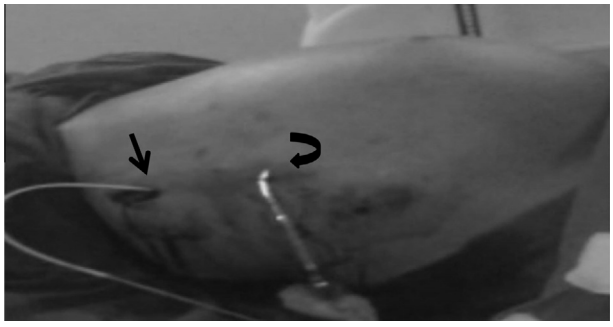

Fig. 2 Pocket and peritoneal entry site. The port pocket was prepared over the anterolateral lower ribs (straight arrow). Needle holder at the ascites entry site (curved arrow).

through the peel-away sheath into the ascites, which was then removed.

Port-catheter function and integrity were confirmed with sterile saline injection and ascites aspiration via Huber needle.

The port site was closed with two layers of subcutaneous 3–0 Vicryl (Ethicon Inc.) absorbable sutures. The port was accessed with a 25 large bore 19G Huber needle for higher flow in a shorter time after preparation with a sterile technique. The patients were advised to aspirate a maximum volume of 3 L to avoid volume depletion. The port-catheter was flushed with 20 mL of heparinized saline solution (2000 IU heparin, 100 IU/mL) after each use.

3.4. Data were collected and evaluated as regard the following points

1. *Procedural data included immediate results*: Technical success of port placement, removal of ascites, symptoms relief, and immediate complications.
2. *Long-term follow-up data included long term results*: Duration of symptom relief, requirement for port removal, duration of port patency, location where port aspiration was performed (hospital visits), and long term complications.

4. Results

Our study was performed with the participation of 40 patients between October 2010 and March 2013, comprising 25 males (age range from 45 to 71 years old, mean age 60.2) and 15 females (age range from 32 to 68 years old, mean age 54.5).

The male patients included 5 patients with cancer colon, 5 patients with mesothelioma, 5 patients with cancer head of pancreas, 4 patients with bronchogenic carcinoma, 3 patients with cancer sigmoid and 3 patients with cancer stomach.

The female patients included 3 patients with cancer stomach, 3 patients with cancer sigmoid, 6 patients with cancer ovary, 1 patient with uterine liomyosarcoma, 1 patient with mesothelioma, and 1 patient with adenosarcoma.

4.1. Data were collected and evaluated as regard the following points

4.1.1. Immediate results (Fig. 3)

Forty ports were placed in 40 patients which all show technical success in insertion with removal of ascites gradually and immediate relief of symptoms. There were no major complications. There was one minor complication, which was a leakage at the port placement site in a patient with pancreatic carcinoma and this stopped spontaneously with removal of ascites and patient conservative management.

4.1.2. Long-term results (Fig. 4)

Thirty-nine patients (97.5%) showed complete relief of symptoms and good compliance until death. The ports were still in place and functioning at the time of death or till the end of this study (Fig. 5).

Thirty-nine patients (97.5%) were treated successfully without further catheter manipulation (catheter removal), or antibiotic therapy.

One patient (2.5%) had an unsuccessful procedure. She had her port successfully inserted (technical success) followed by immediate relief of symptoms and decreased hospital visits yet three month later she developed infection at port site and loculation of ascites. Ascites sampling, culture and sensitivity were performed where *Escherichia coli* single growth was discovered. Cather removal and aggressive antibiotic were prescribed after which infection subsided with no reaccumulation of ascites till the end of this study.

Two patients (5%) had kinking (Fig. 6) and migration of the catheter in the subphrenic region 3 months after the procedure. Yet it was still well functioning.

The long-term patency rate of ports was 100% with mean patency duration 284.5 days. Forty patients were treated with peritoneal port without any occlusion that did not respond to a 20-ml of heparinized saline solution flush.

Twenty-eight patients died during the course of the study due to severity of their underlying disease. Among whom, the patency rate was 100%, with complete relief of symptoms in all.

Twelve patients survived till the end of the study with patency rate 100%, and all had complete relief of symptoms caused by ascites.

Thirty patients (75%) were treated at home (with decreased hospital visits) and five (12.5%) were treated as outpatients in our clinic because they were not able to use the device. Five patients (12.5%) were admitted to the hospital because of other medical problems (Fig. 7).

Avoidance of repeated paracentesis was satisfactory to patients and clinicians.

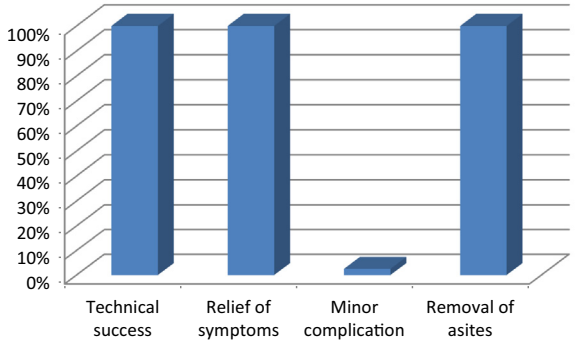

Fig. 3 Chart showing short term results.

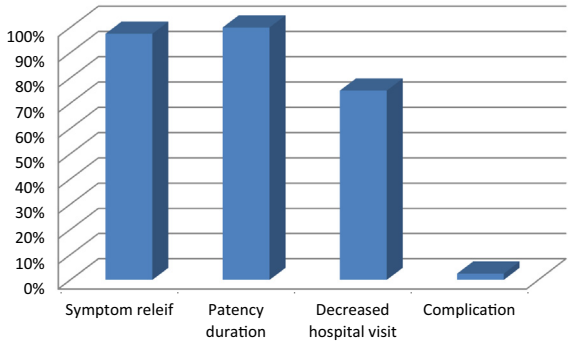

Fig. 4 Chart showing long term results.

5. Discussion

Intractable large-volume ascites is often disabling. It decreases and compromises the quality of the patients' life. It may be due to cirrhotic liver or malignant ascites (16).

The goal of management of malignant ascites is the effective relief of symptoms in the safest and most convenient manner for the patient. Treatment options include: repeated paracentesis, tunneled peritoneal catheters, TIPS, peritoneovenous shunting, peritoneogastric shunt, peritoneal-urinary drainage and peritoneal portcatheters. Some of the previously listed techniques require repeated hospital visits. Others are invasive techniques that require general anesthesia (3). They also carry high risk of infection and bleeding, can be complicated by encephalopathy, disseminated intravascular coagulation or early occlusion (17).

Cuffed, tunneled percutaneously placed peritoneal ports series were first described by Rosenblum et al. in 2001 (11). It was modified venous access ports with one reported case of catheter obstruction (10% of catheters). In the study performed by Ozkan (16) and in our study, we used peritoneal port specifically designed to permit repeated access to the peritoneal cavity. Compared with the device used by Rosenblum et al., this catheter is larger in caliber and has multiple side holes (Fig. 1). These properties may explain the 100% patency rate in both studies.

There are 2 general types of tunneled peritoneal ports: antegrade or retrograde tunneled lines. The antegrade tunneled catheter must be measured and cut to the correct length before threading the tunneler and catheter from superior incision (catheter exit site) to incision at the insertion site through the subcutaneous tunnel. With retrograde tunneling, the tip of the catheter and the tunneler were threaded from the insertion site to incision at catheter exit site. In our study we agreed with Rosenblum et al. (11), Savin et al. (1) and Ozkhan et al. (16) for the use of the retrograde technique as we assumed that this will help placing the catheter in a good pelvic position allowing better drainage with high technical success rate.

Previously port pocket was created related to the anterior superior iliac spine (11). In a study by Ozkan et al. (16), the placement of the port was over a bony surface (lower costal margin) yet the reservoir reversed on the first day of the procedure due to the large pocket size without suturing the port. In our study, a 3–4 cm incision was made and a subcutaneous pocket was prepared according to the reservoir size at the lower costal margin and the port was sutured. This explained the absence of reservoir reversal and provided an easier target for nurses or family members to access the port.

During our study we were not confronted by hematoma at the port placement site as reported by Savin et al. (1), or by extensive ecchymosis at the reservoir and tunnel site resulting in patient discomfort and difficulty in port access for the first few aspiration as reported by Monsky et al. (18).

Savin et al. (1), reported that they had one patient whose port was placed the day after paracentesis and loculated ascites was not recognized at the time of placement, likely because of the presence of only minimal residual ascites at the time of port placement. Because the catheter was placed into a loculated collection, the patient required additional paracenteses to maintain symptom relief. In our study, ultrasonography was used to mark the puncture site of large volume ascites without loculations.

We agreed with Ozkan et al. (16), that the kinking and migration of the catheter in the subdiaphragmatic region did not cause any problems or affected the drainage.

Spontaneous bacterial peritonitis is much more common in patients with ascites with underlying cirrhosis than in patients with malignancies (19). Spontaneous bacterial peritonitis occurs in 8–10% of patients with cirrhotic ascites, but only a rare case report has described spontaneous bacterial peritonitis in patients with cancer with ascites (20). O'Neill et al. (2) have

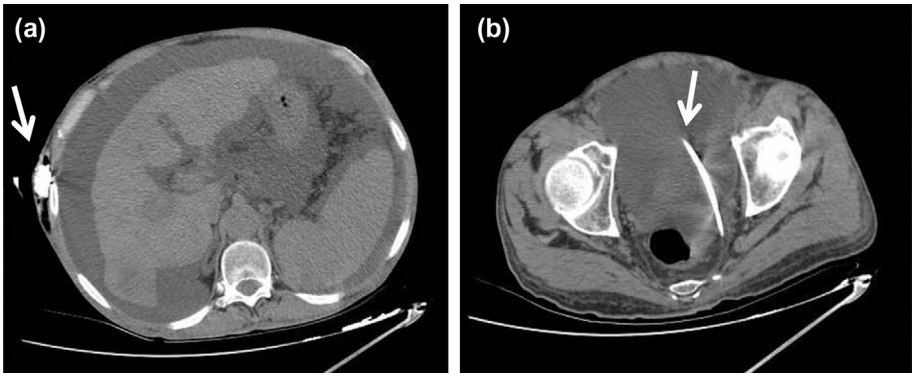

Fig. 5 65 years old female patient with metastatic cancer stomach. Clinical examination and radiological studies were done. US revealed clear tense ascites. (a) Axial CT scan shows port-catheter in place subcutaneously (white arrow). (b) CT shows port-catheter catheter in place in the pelvic cavity (white arrow).

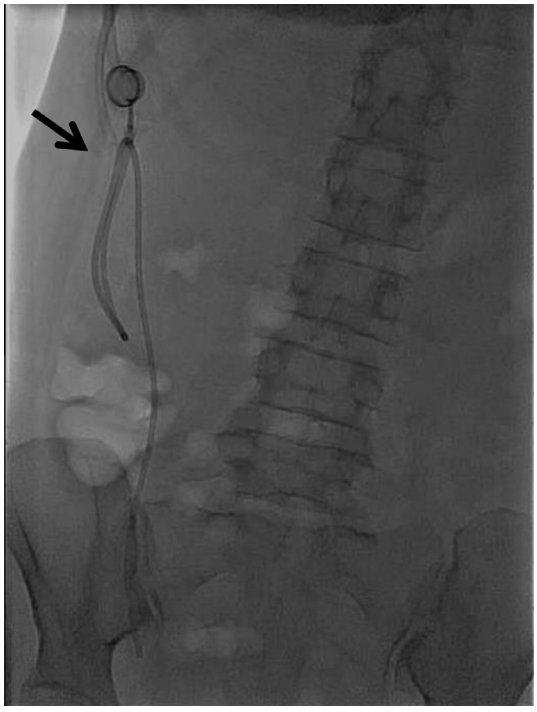

Fig. 6 59 years old female patient diagnosed as liomyosarcoma of the uterus. Clinical examination and radiological studies were done. US revealed clear tense ascites. 3 months later, radiograph revealed a kinked subphrenic port-catheter (black arrow).

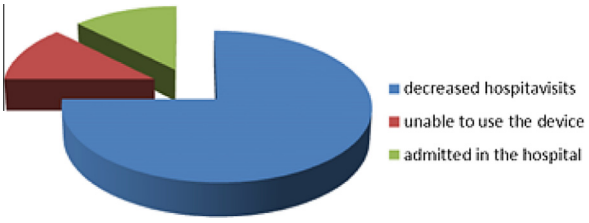

Fig. 7 Pie chart showing hospital visit distribution.

reported a series of 24 patients with malignant ascites palliated with a tunneled peritoneal catheter that was placed under sonographic and fluoroscopic guidance; of whom 4 patients (17%) developed bacterial peritonitis, three of them responded to antibiotics and one had to have his catheter removed. In our study we reported low infection rate only in one case (2.5%) which occurred 3 month after successful insertion and use of the port. Infection was attributed to inability of the patient to use the port under aseptic conditions so the port was removed.

Monsky et al. (18), were confronted with three cases with leaking of peritoneal fluid from the catheter entry site in patients of obese body habitus and two with findings suggestive of cellulitic skin irritation. Rosenblum et al. (11) reported that two of three cases of peritonitis were associated with peritoneal fluid leakage at the port site with gap in port incision. They suggested that these infections could have been prevented with improved suture technique and its removal 10–14 days after port placement. In our study, the port site was closed with two layers of subcutaneous 3–0 Vicryl (Ethicon Inc.) inverted sutures, and the skin is closed by interrupted silk sutures. The leakage at the port placement site was noticed in one patient with pancreatic carcinoma and this stopped spontaneously with removal of ascites and patient adequate conservative management.

In our study, the technical success rate and the long term patency were 100% and the efficacy rate of the port catheter was 97.5%.

6. Conclusion

Peritoneal port system for intractable ascites is a safe and an efficient way to avoid morbidity and the patient's anxiety related to marked ascites with repeated puncture-aspiration. It provides a closed system between tapping sessions where it allows an entire integration with total liberty in daily life between two sessions of drainage which can be performed at home. It has a minimal rate of complication. This patient-friendly technique may be a treatment option with good success rate, patient compliance and clinician satisfaction.

Conflict of interest

None.

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