

PERCUTANEOUS CATHETER DRAINAGE OF ABDOMINAL ABSCESSSES AND FLUID COLLECTIONS

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Abstract: Percutaneous catheter drainage (PCD) of abdominal abscesses and fluid collections represents a dramatic advance in patient care. The pre-requisite for PCD is an abnormal fluid or pus collection and/or suspicion that the collection is producing symptoms sufficient to warrant drainage. The abscesses or fluid collections are generally discovered by imaging such as US or CT scan. PCD can be performed in almost any organ system after complete preprocedural hematological assessment. During the intervention certain guiding principles such as choosing shortest pathway, avoiding pleural recesses and intervening organs and important structures or utilising the gravity to advantage may be extremely useful. Transrectal and transvaginal routes have also been successfully tried to drain deep pelvic abscesses by catheter. Procedures can be performed by either a "Single step trocar technique" or a "Classical Seldinger technique". Successful PCD is defined as complete resolution of infection requiring no further operative intervention. Percutaneous catheter drainage of abscesses adheres to the basic principles of surgical management by providing decompression, evacuation and continuous drainage without dissemination of sepsis. Its safety, simplicity and excellent cure rates in drainage of abdominal abscesses and fluid collections have established it as preferred first line treatment.

Key Words : Percutaneous catheter drainage (PCD): Collection: Single step trocar technique: Classical Seldinger technique

INTRODUCTION

Percutaneous catheter drainage (PCD) of abdominal abscesses and fluid collections represents a dramatic advance in patient care. Over last two decades, the procedure has evolved from one of the alternative modes of treatment to the routine first line treatment of choice for abscesses in nearly every organ system except for the most difficult or inaccessible cases¹⁻⁴. Initially it was believed that only patients with simple fluid collections or large unilocular abscesses were ideal for PCD but recently studies have shown that even patients having septated and viscous fluid collections can also be successfully treated particularly with the adjunctive use of fibrinolytic agents⁵. However the simpler the abscess the more likely PCD will be shorter and successful. The procedure is one of the easiest and safest interventional procedures with very high success rate and few complications. PCD has resulted in reduced mortality and morbidity and has helped to reduce length of hospital stay and hospital costs.

INDICATIONS

Because of variability in the presentation of abscesses and fluid collections, the indications for PCD must be stated in general terms. The pre-requisite for PCD is an abnormal fluid or pus collection and/or suspicion that the collection is producing symptoms sufficient to warrant drainage⁶. Our personal experience is that a catheter drainage should be

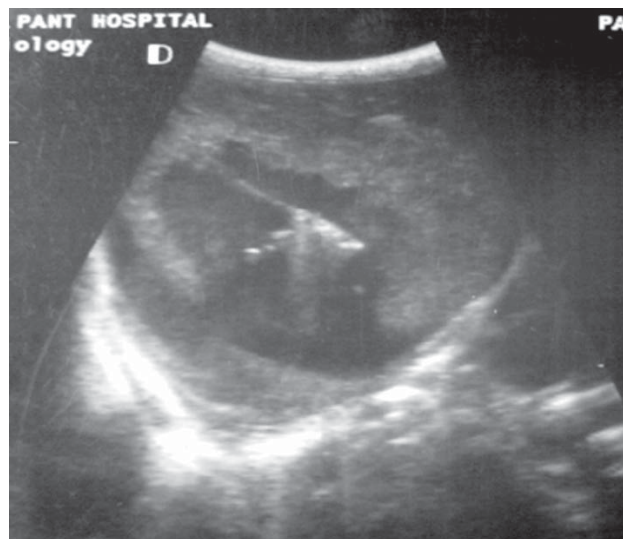


Fig 1: PCD in a right lobe liver abscess with rupture in subdiaphragmatic space.

performed if any abscess or fluid collection is larger than 4 to 6 cm. Smaller collections are first given a trial by needle aspiration and only if they enlarge or recur is catheter drainage resorted to.

The abscesses or fluid collections are generally discovered by imaging such as US or CT scan. Whereas commonly fever, leucocytosis, malaise, anorexia or other systemic symptoms point to an infection, these signs and symptoms may be absent in elderly, very ill or immuno-compromised patients. In such cases diagnostic aspiration may be the only

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Fig. 2a and 2b: PCD in a post-necrotic pancreatic pseudocyst

means of determining that a fluid collection is infected. PCD can be performed in almost any organ system. Contraindications are relative and depend on the suitability of surgical alternative. Common relative contraindications are coagulopathy and thick necrotic tissue requiring surgical debridement e.g. pancreatic abscess. Besides straight forward cases which have unilocular collections of pus or fluid where the success rate of PCD is very high (> 80%) there are difficult situations where PCD can be technically difficult, duration of drainage can be very long and therefore the success rate would be less with higher rates of complication and recurrence. Examples of such conditions are multiple abscesses, multiloculated abscesses, pancreatic abscess, drainage routes that traverse bowel or pleura, infected clot and infected tumor^{7,8}. In such situations decisions regarding PCD should always be taken in concert with the treating physician or surgeon.

PRE-PROCEDURE WORK-UP

Baseline blood counts are always obtained as these help in monitoring the infection later on by documenting falling WBC counts. Prothrombin time, platelet count and INR are routinely done to assess the coagulation profile so as to minimize the risk of bleeding during or after the procedure. The abscesses and fluid collections can be easily detected



Fig. 3: Cavitogram through the drainage catheter showing communication of the abscess cavity with colon. CBD stent seen in-situ

by US. However if time permits and cost is not a constraint, a pre-procedure CT scan is always desirable. CT scan is best for localization of the abscess or fluid collection and is of immense help in planning the route of catheter insertion particularly in situations where intervening bowel can not be avoided to gain access to the abscess. CT scan with oral contrast may also be useful in demonstrating the fistulous communication of the abscess with bowel or any other viscus.

MATERIAL AND TECHNIQUE:

PCD is performed in vast majority of cases under real-time US guidance preferably taking help of a pre-procedure CT. In difficult access routes the procedure is done under CT guidance.

All aseptic precautions are taken and only local anesthesia is employed except in pediatric patients where a short general anesthesia (Ketamine) is used.

Prior to catheter insertion, a needle aspiration is always done to know the exact nature of the contents of the cavity as it subsequently determines the selection of the catheter size. For thick pus larger bore catheters are selected. During the initial puncture or catheter insertion the following points are always kept in mind:

- Shortest pathway with easiest angulation is chosen.
- Intervening organs or structures are always avoided e.g. bowel, spleen, pleura etc.
- For right and left hypochondrium, pleural recess is avoided by making the puncture in expiration and entering below tenth intercostal space.
- For a solid organ abscess, like liver and spleen, access path should traverse a small amount of normal tissue to reduce the risk of peritoneal spillage and bleeding.
- In specific situations depending upon the gravity of situation one can traverse a solid organ like liver or bowel to enter an abscess.
- Transrectal and transvaginal routes have also been successfully tried to drain deep pelvic abscesses by catheter⁹.

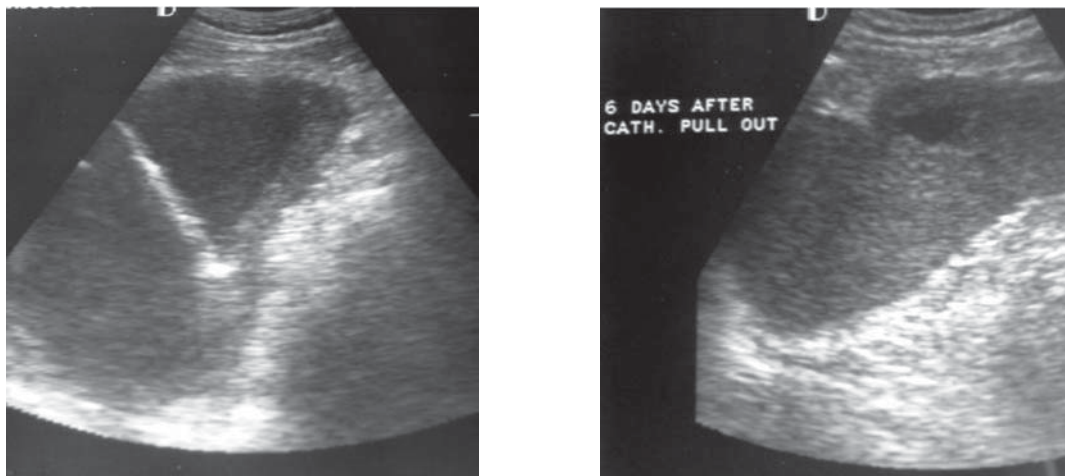


Fig. 4a and 4b: Successful PCD in a large splenic abscess showing almost complete resolution of abscess at 6th day after catheter pull-out.

For catheter insertion, one can use either a “Single step trocar technique” or a “Classical Seldinger technique”. Trochar technique is employed for abscesses or fluid collections which are large and are very easily accessible as the entire assembly of needle, cannula and catheter is inserted in one go. Commonly pigtail catheters are used ranging in size from 8F to 14F depending on the viscosity of fluid or pus aspirated. Care must always be taken to ensure that the drainage holes of the catheter are large enough. Pigtail catheters with locking device are always better as these are less likely to get dislodged. The catheter can be secured to the skin either by a silk suture or adhesive plaster or it can be fixed using specific devices. Lastly the catheter is either connected to a urine bag or a suction device like Romovac.

While using Seldinger technique for PCD the most important material is a suitable guidewire over which the tract is dilated and finally the catheter is introduced. The guidewire should be stiff enough to guide the dilators and catheters into the abscess but should not be too stiff to prevent easy coiling of wire shaft within the abscess. It must have a floppy tip so as to encourage the wire to coil within the abscess and not perforate the wall. Generally a 0.038-inch, 145 cm heavy-duty stainless steel wire is good enough¹⁰. For multiple abscesses two or even three separate catheters can be inserted in a single sitting.

PATIENT MANAGEMENT

Once the catheter has been inserted, it is only the Radiologist who should be actually involved in day-to-day management of the catheter as well as the patient. Frequently one has to change the dressing and reposition the catheter under US or fluoroscopic guidance. If the flow of pus or fluid is free and US scan does not reveal any significant residual collection, irrigation of the cavity is avoided, particularly

in sterile collections. Only if the catheter is blocked and there is thick debris or fluid in the cavity, should it be irrigated with small volume of normal saline. Fibrinolytic agents like streptokinase and urokinase which liquefy the contents and facilitate drainage, have also been tried with good results.

Most of simple abscesses or fluid collections are successfully drained in 1 to 2 weeks time by PCD. Commonly when drainage diminishes to less than 10 ml per day and the patient also has shown good clinical recovery the catheter can be pulled out. Some prefer to keep the catheter inside for a couple of extra days after clamping the catheter and if there is no reaccumulation of fluid or pus, the catheter is finally pulled out.

In situations when the daily drainage of pus is copious and is not diminishing and also the patient does not show any clinical improvement, a fistulous communication with bowel or any other viscus like biliary system should be suspected. A contrast study through the catheter should always be performed in such cases to demonstrate the fistulous communication. In such cases drainage would generally be prolonged to 4 - 6 weeks or even longer when the fistula finally closes. Catheter care is important in such cases and frequently these need to be changed or upsized. Success rate is also lower in such cases.

SUCCESS RATE

Successful PCD is defined as complete resolution of infection requiring no further operative intervention. Commonly a small cavity would remain when the catheter is pulled out but it resolves gradually over a period variable from few weeks to months. Curative drainage has been achieved in greater than 80% of patients^{2,3}. Partial success is defined as either adequate drainage of the abscess with surgery subsequently performed to repair an underlying

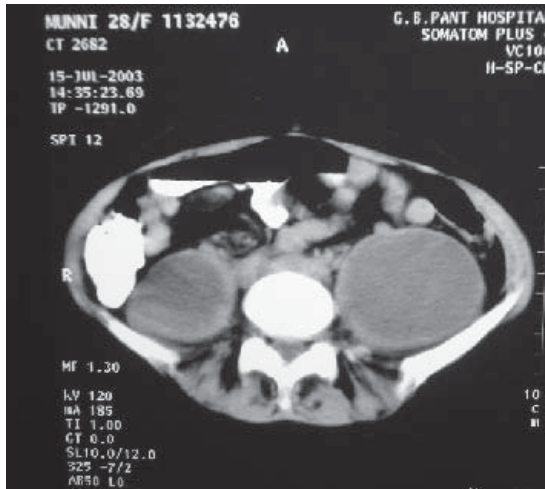


Fig. 5a and 5b: Successful PCD in bilateral psoas abscesses. Complete resolution of both the abscesses just before catheter pull-out.

problem or as temporizing drainage performed to stabilize the patient prior to surgery. Partial success occurs in 5 to 10% of patients. Failure occurs in 5 to 10% and recurrence in another 5 to 10% patients^{11,12}. However the success rates will depend on the proportion of abscesses or fluid collections drained in patients with relative contraindications, on the complexity of the collections and on the severity of the underlying medical or surgical problem.

COMPLICATIONS

PCD is a very safe procedure and complications are rare. Complication rates are highly dependent on the expertise and selection of patients. Most of centers agree that there is significant drop in the complication rate once the required expertise is gained and when proper selection criterion is laid down by the department. Complication rates would obviously vary depending on the percentage of difficult and complicated cases drained. Table shows various complications and their occurrence rates.

Complications	Rate (%)
Septic shock	1-2
Bacteremia requiring new intervention	2-5
Hemorrhage requiring transfusion	1
Superinfection (includes infection of sterile fluid collections)	1
Bowel transgression requiring intervention	1
Pleural transgression requiring additional interventional chest procedures	2-10

Catheter dislodgement, by far the commonest problem encountered during PCD is an acceptable complication. Even in spite of best of efforts and usage of fixation devices, catheter dislodgement is not infrequent. However if the patient, nursing staff and attending physician are properly trained the incidence reduces significantly⁽⁷⁾. For all the major complications resulting from percutaneous abscess drainage, the accepted threshold is maximum 10%⁽⁶⁾.

CONCLUSION

Percutaneous catheter drainage of abscesses adheres to the basic principles of surgical management by providing decompression, evacuation and continuous drainage without dissemination of sepsis. Its safety, simplicity and excellent cure rates in drainage of abdominal abscesses and fluid collections have established it as preferred first line treatment.

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