腹膜透析植入管面面观

高雄長庚醫院 兒童外科 李信儀
腹膜透析優點

1. 持續性的透析
2. 維持較久的殘餘腎功能
3. 飲食限制較少
4. 無痛透析
5. 對心血管的影響小、血壓控制穩定
6. 減少經由血液感染的危險
7. 貧血情形較不嚴重
8. 較好的生活品質
全國第一

- 高雄長庚腹膜透析人數：509
- 高雄長庚腹膜透析比率：35%
20歲女性

Drug allergy: vancomycin

【2012/02/24 12:19】
SUBJECT: 1PM換藥水

【2012/02/24 12:21】
SUBJECT: 叫不到人

【2012/02/24 15:43】
SUBJECT: 想admission to兒科
cstill abdominal pain
腹痛及其處理(20120224)

(血液):
- 20120224
- 11:44
- WBC 1000/μL 4.0
- RBC million/ 3.58
- Hemoglobin g/dL 10.4
- Hematocrit % 30.7
- MCV fl 85.8
- MCH pg/Cell 29.1
- MCHC gHb/dL 33.9
- RDW-SD fl 40.1
- Platelets 1000/μL 125
- RDW-CV % 12.8
- Segment % 73.4
- Lymphocyte % 13.8
- Monocyte % 7.3
- Eosinophil % 5.0
- Basophil % 0.5

(生化):
- 20120224
- 11:44
- Sugar mg/dL 95
- Amylase(B) U/L 112
- Lipase U/L 87
- AST/GOT U/L 18
- ALK-P U/L 62
- Na meq/L 137
- K meq/L 2.9
- CRP mg/L 3.3
婦科問題及其處理(20160808)
移除導管(20161108)
Tunnel and peritoneal catheter exit site infections in continuous peritoneal dialysis

- Prevention
- Evaluation of the exit site and diagnosis of infection
- Initial antibiotic therapy
- Resistant infection
- Indications for catheter removal
- Site and timing of new catheter placement
- Prevention/treatment of recurrent infection
exit site to see if the external cuff is exposed → surgically "de-roof" the tunnel, completely expose the cuff, and then remove it by shaving the cuff.

**INDICATIONS FOR CATHETER REMOVAL →**
Fungal peritonitis can be highly morbid, resulting in scarring of the peritoneal membrane and the inability to perform further peritoneal dialysis in the future. Prolonged, unrealistic attempts to "save the catheter" must be avoided to prevent this outcome.
INDICATIONS FOR CATHETER REMOVAL

- tunnel infection
- if the infection does not respond or progresses after several weeks of antibiotic therapy.
- if a tunnel abscess is present
- exit-site infection and coexisting peritonitis

In all cases, perioperative antibiotics should be given and then continued for one to two weeks after catheter removal.
SITE AND TIMING OF NEW CATHETER PLACEMENT

- If there is no peritonitis associated with the exit-site infection, the infected catheter can be removed and a new catheter placed simultaneously in the opposite lower quadrant.

- A new catheter should **not** be placed at the time the infected catheter is removed if active peritonitis is present.
Peritonitis

- Gram-positive peritonitis – 50%
- Gram-negative, non-Pseudomonas peritonitis – 15%
- Culture-negative peritonitis – 20%
- Pseudomonas peritonitis remove

- Fungal peritonitis – 2% remove
- Mycobacterial peritonitis remove?
- Polymicrobial peritonitis – 4% remove
Indications for catheter removal

- Relapsing peritonitis
- Refractory peritonitis
- Refractory catheter infections (exit-site and tunnel infections)
- Fungal or mycobacterial peritonitis.
- Peritonitis occurring in association with intra-abdominal pathology
Outflow failure

- Constipation/obstipation
- Catheter malposition
- Intraluminal catheter occlusion (often by thrombus)
- Extraluminal catheter occlusion (usually by omentum or adhesions)
- Catheter kinking
Omentum wrapping
Omentum wrapping

- The incidence of Omentum wrapping has been estimated at 5%-15%.
- Omental wrapping may occur because of peritoneal contact with fresh dialysate, with sudden changes in pH, osmolality, flow direction, or volume.
- The laparoscopic approach is used successfully to diagnose and resolve mechanical problems

Obesity
Obesity

- Obese patients with ESRD are less likely to initiate PD

Why?
- Misconceptions: outcomes of PD in obese patients
- Obese patients are not offered PD
- Clinicians inexperienced and thus less comfortable with management of PD in obese patients

Snyder et al. Kidney International, Vol. 64 (2003), pp. 1838–1844 - Obese subjects were less likely to initiate peritoneal dialysis, less likely to undergo transplantation, and more likely to switch to hemodialysis, but had better survival than those with lower BMI.
obesity

- LowBMI(<22) is associated with increased risk of death, regardless of RRT modality
- Obesity(BMI>30) may confer a survival *advantage* in ESRD – in contrast to its negative effects in the non-CKD population

References:
BMI and dialysis

- Obesity may confer a survival advantage in dialysis patients
  - this survival benefit may be more pronounced with HD than with PD, however, BMI > 30 is *not associated* with worse survival (than normal BMI) in PD patients
  - No strong evidence exists that mortality significantly differs between obese patients on peritoneal dialysis vs. obese patients on hemodialysis

References
- Pliakogiannis T, Trpeski L, Taskapan H, Shah H. Ahmad M. Fenton S. Bargman J.
- Oreopoulos D.
Obesity and PD: concerns and potential clinical problems

- Catheter leak, exit site infections, peritonitis

- Patients with high BMI may have inadequate solute clearance or ultrafiltration
Obesity and PD: Potential clinical problems

- **Problem:** catheter leak, exit site infections, peritonitis
- **Solutions:**
  - plan catheter placement in advance (pre-operative catheter measurements)
  - avoid midline incision site (use paramedian)
  - avoid pannus region for exit site
  - ensure patient can see exit site, placing it higher up on abdominal wall
  - use pre-sternal catheters if needed
Obesity and PD: Potential clinical problems

- **Problem:** patients with high BMI may have inadequate solute clearance or ultrafiltration?
  - **Solutions:**
    - use larger fill volumes (2500 – 3000 mL)
    - use CCPD
    - monitor residual kidney function (RKF) often and consider planning for transition to HD as RKF is lost
Obesity and PD: Conclusions

- Obesity is not an absolute contraindication to PD
- PD in obese individuals
  - does require larger dwell volumes
  - may become more difficult once pt is anuric, and one must evaluate the patient often, adjusting PD prescription accordingly
- Survival studies of peritoneal dialysis in obese patients are inconclusive
  - Due to selection bias, nutritional factors, heterogeneity of studies
Previous abdominal surgeries and PD
Previous abdominal surgeries and PD

Potential problem:

– Previous abdominal surgeries lead to adhesions or incisional hernias, which in turn cause PD catheter malfunction due to

  • Catheter kinking
  • Catheter migration or malposition
  • Peritoneal compartments with fluid loculation
  • Catheter entrapment or obstruction
  • Catheter leaking
History of previous abdominal surgery does not necessarily predict outcome on PD

- Adhesion or hernia formation after abdominal surgery is not predictable
  - There are large inter-individual differences in adhesion formation rate after surgery

- Adhesions cannot be assessed on physical exam.
Technical advances in PD catheter placement improves PD outcomes:
Laparoscopic PD catheter placement

- Allows for simultaneous adhesiolysis or omentopexy
- Allows for real-time evaluation of the peritoneum to assess suitability
- Allows for detection and repair of subclinical abdominal/inguinal hernias at the time of catheter placement, and before PD begins
- Has been shown to reduce the catheter malfunction rate (due to adhesions) to less than 3%
PD in the elderly

- PD is not contraindicated in elderly and offers some advantages over in-center HD.
- Home care assistance can allow more elderly ESRD patients to receive PD.
- Mortality appears to be related to increased burden of comorbidities with age, rather than due to modality *per se*.
- Complication rates between PD and HD in the elderly are similar; peritonitis rates may be somewhat higher in elderly but the reported overall peritonitis rates in elderly are acceptable (less than 1:20 months).
Guidelines for Laparoscopic Peritoneal Dialysis Access Surgery

PATIENT SELECTION

1. Contraindications for laparoscopic PD catheter placement include active abdominal infection and uncorrectable mechanical defects of the abdominal wall (+++ Evidence, Strong recommendation) 絕對禁忌

2. History of prior abdominal surgery, regardless of how many, is not a contraindication to laparoscopic PD catheter insertion. It is appropriate for surgeons with experience in advanced laparoscopy to attempt lysis of adhesions and catheter placement in these patients. (++Evidence, Strong recommendation) 非禁忌
PATIENT SELECTION.

3. Patients with abdominal wall hernias should be diagnosed and repaired before or at the same time as PD catheter insertion. A repair should be chosen that minimizes peritoneal dissection and does not place mesh intraperitoneally (++ Evidence, Weak recommendation)疝氣如何處理
Right side inguinal hernia
Incarcerated hernia
4. Peritoneal dialysis may be initiated in patients with intraabdominal foreign bodies such as after open abdominal aortic aneurysm graft repair, but a four month waiting period is recommended. Very limited data exists regarding peritoneal dialysis in the presence of an adjustable gastric band. (++ Evidence, Weak recommendation)

5. Peritoneal dialysis may be safely initiated in patients with ventriculoperitoneal shunts (++)
PATIENT SELECTION

6. Gastrostomy tubes can be used in pediatric patients on peritoneal dialysis, though placement by blind percutaneous endoscopic technique (PEG) appears to be associated with higher infection rates compared to open insertion. (+Evidence, Weak recommendation) 胃造口
7. Laparoscopic PD catheter insertion with carbon dioxide pneumoperitoneum requires general anesthesia. Patients who are high risk to undergo general anesthesia should be considered for a technique of catheter insertion that only requires local anesthesia and sedation, such as open insertion or fluoroscopically guided percutaneous insertion. Laparoscopic insertion using nitrous oxide pneumoperitoneum and local anesthesia is also an option where available. (++ Evidence, Weak recommendation) 腹腔鏡需要全身麻醉
8. For peritoneal access, blind percutaneous, open surgical, peritoneoscopic, fluoroscopically guided percutaneous, and laparoscopic insertion procedures, when performed by experienced operators, are feasible and safe with acceptable outcomes. (+++ Evidence, Strong recommendation)

9. Laparoscopic lysis of adhesions should be incorporated to reduce catheter dysfunction. (+++ Evidence, Strong recommendation)
2007
41 y/o
2014
CAPD
2014
2015
Remove PD
2016
決定性的一刻
努力嘗試
再度嘗試，終於成功
再度嘗試，終於成功
10. Laparoscopic suture fixation of the PD catheter may reduce catheter dysfunction but additional evidence is needed. (++ Evidence, Weak recommendation) 可以固定導管

11. Rectus sheath tunneling helps prevent migration and may be superior to suture fixation since it does not require added ports and instruments. (++ Evidence, Weak recommendation) 腹直肌隧道技術
手術技巧

改良腎衰竭患者腹膜透析導管植入

以單孔腹腔鏡進入腹腔

檢查

利用腹腔鏡管道置入導引鋼條

將腹膜透析導管經由導引鋼條植入腹腔

不用開腹並且減少腹壁傷口可以減少病發症
12. Omentopexy in adults is a safe adjunct to laparoscopic PD catheter insertion and should be incorporated either routinely or selectively to reduce catheter dysfunction. (+++ Evidence, Weak recommendation)

13. Omentectomy should be considered in pediatric patients undergoing peritoneal dialysis catheter placement (++ Evidence, Weak recommendation)

14. The combination of lysis of adhesions, rectus sheath tunneling and omentopexy in combination offers the lowest rate of postoperative PD catheter dysfunction and should be a preferred technique in adults. (+++ Evidence, Strong recommendation)
15. Presurgical assessment should include thorough examination for hernias and the catheter exit site should be marked before surgery. (+ Evidence, Weak recommendation)

16. A need for preoperative bowel preparation has not been conclusively demonstrated and further evidence is needed before a recommendation can be provided.

17. Prophylactic antibiotics should be used prior to laparoscopic insertion of PD catheter. Vancomycin may be superior to first generation cephalosporins in minimizing early peritonitis after PD insertion. However its routine should only be considered based on local resistance patterns and outcomes. (+++ Evidence, Strong recommendation)
18. Peritoneal access during lap PD insertion should be obtained away from previous scars; surgeons should use the technique they are most comfortable and experienced with. (+++ Evidence, Weak recommendation)
19. The surgeon should minimize the size and number of ports used and place them in a manner that optimizes visualization of the catheter peritoneal insertion point and the pelvis. (++ Evidence, Weak recommendation)

腹腔鏡洞口越少越佳
腹腔鏡腹膜透析導管植入
單孔腹腔鏡 -- 導管植入

以單孔腹腔鏡手術植入腹膜透析導管

可以減少透析液滲漏，腹壁疝氣，導管位移以及引流不順等併發症

腹腔鏡檢查可以找出影響導管使用時間的因子；像是腸沾黏，腹股溝疝氣等
20. When inserting the PD catheter through the abdominal wall, the deep cuff should be placed inside the rectus sheath. (++ Evidence, Strong recommendation). 内侧毛氈在腹直肌

21. The superficial PD catheter cuff should be 2 cm from the skin exit site in children and at least 2 cm in adults to prevent future cuff extrusion. (+ Evidence, Weak recommendation) 外侧毛氈至少兩公分
POSTOPERATIVE PROTOCOL

22. Minimizing dressing changes and handling may be beneficial in the first two postop weeks. (+ Evidence, Weak recommendation) 兩週內盡量不換藥

23. Adequate time should be given after surgery for healing before PD is initiated and the current standard is two weeks. A more urgent start should be considered when the benefits outweigh the risks (++ Evidence, Weak recommendation) 兩週後開始透析
24. Blind percutaneous PD catheter insertion has acceptable malfunction and leak rates compared with open insertion in patients who have never had prior abdominal surgery. The technique may be especially useful in high-risk patients for general anesthesia as it can be performed at the bedside, under local anesthesia by trained nephrologists. However, bowel perforation and bleeding risk should be considered (+++ Evidence, Weak recommendation)
25. **Open surgical** insertion continues to be a standard to which others are compared. It is safe (**low perforation rate**) and effective and can be performed under local anesthesia and sedation. It appears to have higher leak and dysfunction rates compared to image guided percutaneous and advanced laparoscopic insertion. (+++ Evidence, Weak recommendation) 傳統開腹法
26. Peritoneoscopic insertion is a technique used worldwide, mostly by “interventional” nephrologists. It has been studied in patients who have had prior surgery, but there is at least a 1% perforation rate. It appears to be comparable to open surgical insertion in experienced hands, but has not been compared to laparoscopic and fluoroscopic guided percutaneous insertion. (++ Evidence, Weak recommendation)
ADULT OUTCOMES

27. In patients without prior abdominal surgery, percutaneous fluoroscopic PD catheter insertion results in similar or better complication rates and dysfunction rates compared to open or basic laparoscopic insertion, and avoids general anesthesia. (+++ Evidence, Weak recommendation)

28. Basic laparoscopic insertion without using techniques to minimize catheter dysfunction results in similar dysfunction rates as open insertion. (+++ Evidence, Strong recommendation)
29. Advanced laparoscopic PD catheter insertion using lysis of adhesions, catheter fixation preferably with rectus sheath tunnel, and omentopexy performed in combination has the lowest reported rate of catheter dysfunction in adults, even in patients with prior abdominal surgery. (+++ Evidence, Strong recommendation)
Postoperative complications

30. **Bleeding** after PD catheter insertion may occur from inferior epigastric artery injury or lysis of adhesions and should be managed according to standard surgical principals. The insertion point should be at the **medial border** of the rectus sheath to avoid arterial injury. Coagulation parameters should be assessed and corrected pre-operatively. (+Evidence, Weak recommendation) 出血

31. Dialysate leaks after PD catheter placement may be amenable to treatment, and potentially prevention, with the use of **fibrin glue**, particularly in the **pediatric** population. (++Evidence, Weak recommendation.) 滲漏
Postoperative complications

32. Exit site infection is managed by **oral antibiotics**. Chronic exit site and cuff infections may managed by **catheter salvage** consisting of **unroofing the track, shaving the superficial cuff** and using **a new exit site**. (++Evidence, Weak recommendation)

33. Pain during PD is a **rare complication** that is usually amenable to medical management but occasionally requires repositioning or removal of the catheter. (++Evidence, Weak recommendation)
PD catheter malfunction

34. Malfunctioning PD catheters should be evaluated by physical examination and plain radiographs to rule out constipation. If negative, further studies such as catheterography or CT peritoneography, followed by diagnostic laparoscopy are indicated. (++Evidence, Weak recommendation)

35. Non-operative treatments of malfunctioning PD catheters which have been proven effective include flushing, thrombolytics and fluoroscopic wire manipulation. (++Evidence, Weak recommendation)
PD catheter malfunction

- Patients with malfunctioning PD catheters not amenable to non-operative measures should undergo laparoscopy with catheter repositioning, adhesiolysis, omentectomy or omentopexy. Patency should be assured by stripping and flushing. Suture fixation of the catheter to the pelvis or polypropylene sling may be utilized to reduce catheter migration. Surgical techniques for catheter salvage require individualization based upon operative findings. (+++Evidence, Strong recommendation)

腹腔鏡處理
腹腔鏡處理Omentum wrapping
## 醫療服務給付項目及支付標準查詢

<table>
<thead>
<tr>
<th>異動</th>
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### 中文項目名稱
連続性可攜帶式腹膜透析—4.連続性可攜帶式腹膜透析導管植入術。

### 英文項目名稱
Continuous ambulatory peritoneal dialysis，CAPD 4.CAPD，Tenckhoff catheter implantation

### 健保支付點數
3570

### 價格參考期間
093.07.01 ~ 迄今

### 附註
1. 限以經專案向健保署申請同意後之醫院申報
2. 包含手術費及一般材料費。
結論

- 腹膜透析可以應用在更多需要洗腎的患者身上
- 患者植入後的照顧需要有經驗的團隊合作