

Importance of peritoneal dialysis catheter insertion by nephrologists: practice makes perfect

Philip Kam-*tao* Li and Kai Ming Chow

Division of Nephrology, Department of Medicine and Therapeutics, Prince of Wales Hospital, Chinese University of Hong Kong, Hong Kong, Hong Kong

Correspondence and offprint requests to: Philip KT Li; E-mail: philipli@cuhk.edu.hk

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'Practice makes perfect' is one of the most oft-heard aphorisms during our years of upbringing and education. Indeed, we believe that this rule makes perfect sense when applied to the practice of peritoneal dialysis.

To date, there have been no robust randomized trials qualified enough to stir the cauldron that determines superiority (if any) of one dialysis modality over another. Although everyone agrees that selection of peritoneal dialysis versus haemodialysis is an individualized choice, the optimal means of patient selection is hotly debated [1]. The key question is whether patients have shown better survival with one particular modality of dialysis versus another. Accumulating evidence shows an important role for the centre effect in determining treatment success. For example, data from population-based or nationwide cohorts show that increasing cumulative numbers of treated peritoneal dialysis patients are associated with improved patient survival during peritoneal dialysis [2]. In Canada, technique failure rates and covariate-adjusted mortality decreased significantly with increasing numbers of peritoneal dialysis patients being treated (by each individual centre) [3]. For example, patients treated by centres with >500 cumulative peritoneal dialysis patient counts had a 29% reduction in mortality risk. When the centres were further classified by the utility of peritoneal dialysis, significantly lower technique failure rates were found in centres having a higher percentage of patients initiating dialysis on peritoneal dialysis [3]. Similar results were found in the Dutch dialysis registry analysis [4], the United States Renal Data System and in more recent cohorts from the United States [5–7].

To put these registry data in context, it is possible that nephrologists from centres with more experience and specialization with peritoneal dialysis provided more effective management of infectious complications, peritoneal access creation, volume status and cardiovascular disease. What then are the implications for peritoneal catheter insertion by nephrologists? The practice of peritoneal dialysis catheter insertion by nephrologists substantially contributes to treatment outcomes, in part, because it enhances peritoneal dial-

ysis penetration and because of the consistent salutary effect of centre size on technique success rates and patient survival outcomes.

Why does insertion of peritoneal dialysis catheters by nephrologists matter? This issue is more than just the mere need for continuity in patient care. In all likelihood, the ultimate goal is to provide timely and effective catheter insertion without unduly long waiting times or delay, during which potential candidates for peritoneal dialysis may lose interest in this dialysis modality. In an age where tight operating theatre schedules have become the rule rather than the exception, referral to a surgeon (and scheduling an operating theatre) for catheter insertion becomes the rate-limiting step for initiating peritoneal dialysis. In addition, there is a dearth of committed surgical teams having a keen interest in peritoneal catheter placement in most dialysis centres. A lengthy waiting list for catheter insertion is demoralizing for both renal physicians and patients alike, causing an ultimate erosion of confidence in peritoneal dialysis. In this context, catheter insertion by nephrologists is a critical component of a successful peritoneal dialysis programme. There is a plethora of evidence to suggest that catheter insertion by nephrologists improves peritoneal dialysis utilization and increases the peritoneal dialysis population growth rate [8–11]. Importantly, catheter insertion by nephrologists was paralleled by a change in the number of peritoneal dialysis patients in each centre. For instance, initiation of catheter insertion by nephrologists in three centres in the United States was associated with a 22–32% increase in the number of peritoneal dialysis patients [8], whereas a return to catheter insertion by surgeons led to a decline in the peritoneal dialysis population [8]. In other studies, a similar growth in the peritoneal dialysis penetration was seen following the development of comprehensive infrastructure and support systems that included catheter insertion by nephrologists [9–11]. In particular, a universal policy of catheter insertion by nephrologists in one Malaysian dialysis unit was associated with a dramatically increased penetration ratio of peritoneal dialysis compared to haemodialysis, representing a quadrupling from that of the national average [11]. Together, these studies show that peritoneal dialysis catheter insertion by nephrologists reduces the waiting times and therefore enhances peritoneal dialysis uptake; the latter

Table 1. Published single-centre studies regarding catheter insertion by nephrologists for peritoneal dialysis subjects

Source	Study subject and catheter characteristics	Mean follow-up period (months)	Primary successful insertion rate	Percentage of subjects with post-operative infectious complications ^a	Percentage of subjects with drainage complications	Technique success rate
Percutaneous (Seldinger) technique						
Allon [14]	157 curl and straight catheters, USA	Not reported	98.1%	1.9% (within 4 weeks)	10.4%	65% at 12 months
Smith [15]	31 curl catheters, United Kingdom	11	100%	3.2% (within 2 weeks)	3.2%	Not reported
Nielsen [16]	72 (34 curl and 38 straight) catheters, Denmark	7	100%	Not reported	34.7%	Not reported
Özener [17]	133 (130 curl and 3 straight) catheters, Turkey	17	Not reported	3.8% (within 4 weeks)	8.9%	83% at 24 months
Zaman [18]	36 curl catheters, USA ^b	18	94.4%	0% (within 2 weeks)	2.9%	90% at 18 months
Moon [19]	134 (105 curl and 29 straight) catheters, Korea ^b	21	100%	2.2% (within 2 weeks)	1.5%	75% at 24 months
Henderson [12]	283 straight catheters, United Kingdom	6	92.9%	4.2% (within 4 weeks)	18.7%	83% at 6 months
Surgical or open dissection technique						
Lo [20]	93 (45 curl and 48 straight) catheters, Hong Kong	27	100%	Not reported	3.2%	Not reported
Li [21]	39 straight catheters, Macao	16	100%	Not reported	7.7%	Not reported
Peritoneoscopic/laparoscopic technique						
Eklund [22]	65 (50 curl and 15 straight) catheters	8.4	92%	Not reported	7.7%	56% at 24 months
Gadallah [23]	76 curl catheters, USA	36	100%	2.6% (within 2 weeks)	7.9%	63% at 24 months
Kelly [24]	40 curl catheters, Australia	Not reported	95%	5.0% (within 4 weeks)	5.0%	Not reported
Goh [11]	91 curl catheters, Malaysia	9	100%	Not reported	17.6%	86% at 12 months

^aInfectious complication is defined as exit site infection, peritonitis and tunnel infection after peritoneal dialysis catheter insertion.

^bPercutaneous insertion of catheters was accomplished with the fluoroscopy-assisted method.

in turn has been consistently associated with improved patient survival and technique survival during peritoneal dialysis [2].

The next pertinent question concerns the feasibility and safety of peritoneal access creation by nephrologists. An article in the current issue reported high success rates of percutaneous peritoneal catheter insertion by nephrologists in a single United Kingdom dialysis centre [12]. Henderson and colleagues [12] used data from 283 catheters inserted percutaneously by nephrologists at the Imperial College Healthcare NHS Trust, and noted a technique survival rate of 83% at 6 months. In all patients, percutaneous catheter insertions were performed in a dedicated procedure room with the use of intravenous sedation and local anaesthetic. None had internal viscus injury or bowel perforation. Although the results from this observational study are very encouraging, additional questions remain. In particular, their findings did not determine which approach of peritoneal catheter placement produced better outcomes. Currently, peritoneal catheters can be inserted surgically using an open dissection technique, either with the use of a laparoscope or peritoneoscope. Alternatively, catheters may be inserted percutaneously after blind (or with a modified

Seldinger technique) puncture of the abdomen; a variation on this blind technique is the fluoroscopy-assisted method. A detailed discussion and comparison of these methods has been recently reviewed elsewhere [13]. Before deciding to choose one technique over another, one must assess the risk of general anaesthesia, and then determine the relative expertise and availability of the operating theatre, the issues related to the operative time and the break-in period. Also relevant to decisions regarding insertion methods are the clinical needs of adhesiolysis (to eliminate compartmentalization and to restore the lower abdominal cavity and pelvis to an open space), omentopexy (to prevent catheter obstruction or displacement causing suboptimal drainage produced by omental entrapment), hernia detection and repair. That being said, nephrologists have achieved very satisfactory outcomes with catheter insertions using these different methods. We have identified 13 published case studies from around the world [11,12,14–24] wherein peritoneal dialysis catheters were inserted solely by nephrologists (Table 1); the majority of catheters were placed percutaneously using the Seldinger technique. Primary successful insertion rates ranged from 92–100% in the three described methods (surgically using an open dissection technique; with the

use of laparoscope or peritoneoscope and inserted percutaneously). The success of catheter insertion by committed and well-trained nephrologists is not surprising because it effectively reflects the dogma of 'practice makes perfect'.

In terms of geographical variations in practice, blind insertion of percutaneous catheters is seldom used in the United States, whereas open surgical insertion is often practiced by nephrologists in parts of Asia, such as in Hong Kong [2,20]. The common practice of catheter insertion by nephrologists in Hong Kong contrasts markedly with that of other countries. According to a recently published survey examining peritoneal dialysis access practices in 43 renal units in the UK [25], consultant surgeons placed 71.7% of peritoneal catheters (compared to 19.3% of placements by consultant nephrologists). This may explain the relatively long waiting times (from 1 week up to 3 months) for catheter insertion [25]. Therefore, it is of considerable importance to read the encouraging report by Henderson and colleagues [12] from the UK. Their report substantially contributes to the evidence that justifies enthusiasm for peritoneal dialysis access creation by nephrologists. To improve the utilization rates of peritoneal dialysis, the practice of catheter insertion by nephrologists is of vital importance. Timely catheter insertion provided by nephrologists will reduce unnecessary delays, which will shorten the time patients remain on unwanted dialysis modalities. In our centre, nephrologists also perform uncomplicated Tenckhoff catheter removal after severe peritonitis in order to hasten recovery from resistant peritonitis [26]. We believe that peritoneal dialysis catheter insertion in the hands of experienced nephrologists is safe and should be strongly encouraged.

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(See related article by S. Henderson *et al.* Safety and efficacy of percutaneous insertion of peritoneal dialysis catheters under sedation and local anaesthetic. *Nephrol Dial Transplant* 2009; 24: 3499–3504.)

References

- Li PK, Chow KM. Peritoneal dialysis patient selection: characteristics for success. *Adv Chronic Kidney Dis* 2009; 16: 160–168
- Li PK, Szeto CC. Success of the peritoneal dialysis programme in Hong Kong. *Nephrol Transplant Dial* 2008; 23: 1475–1478
- Schaubel DE, Blake PG, Fenton SS. Effect of renal center characteristics on mortality and technique failure on peritoneal dialysis. *Kidney Int* 2001; 60: 1517–1524
- Huisman RM, Nieuwenhuizen MG, Th de Charro F. Patient-related and centre-related factors influencing technique survival of peritoneal dialysis in the Netherlands. *Nephrol Dial Transplant* 2002; 17: 1655–1660
- Port FK, Held PJ, Nolph KD *et al.* Risk of peritonitis and technique failure by CAPD connection technique: a national study. *Kidney Int* 1992; 42: 967–974
- Mujais S, Story K. Peritoneal dialysis in the US: evaluation of outcomes in contemporary cohorts. *Kidney Int* 2006; 70: S21–S26
- Afolalu B, Troidle L, Osayimwen O *et al.* Technique failure and center size in a large cohort of peritoneal dialysis patients in a defined geographic area. *Perit Dial Int* 2009; 29: 292–296
- Asif A, Pflederer TA, Vieira CF *et al.* Does catheter insertion by nephrologists improve peritoneal dialysis utilization? A multicenter analysis. *Semin Dial* 2005; 18: 157–160
- Asif A, Byers P, Gadallah F *et al.* Peritoneal dialysis underutilization: the impact of an interventional nephrology peritoneal dialysis access program. *Semin Dial* 2003; 16: 266–271
- Gadallah MF, Ramdeen G, Torres-Rivera C *et al.* Changing the trend: a prospective study on factors contributing to the growth rate of peritoneal dialysis programs. *Adv Perit Dial* 2001; 17: 122–126
- Goh BL, Ganeshadeva YM, Chew SE *et al.* Does peritoneal dialysis catheter insertion by interventional nephrologists enhance peritoneal dialysis penetration? *Semin Dial* 2008; 21: 561–566
- Henderson S, Brown E, Levy J. Safety and efficacy of percutaneous insertion of peritoneal dialysis catheters under sedation and local anaesthetic. *Nephrol Dial Transplant* 2009; 24: 3499–3504
- Zaman F. Peritoneal dialysis catheter placement by nephrologists. *Perit Dial Int* 2008; 28: 138–141
- Allon M, Soucie JM, Macon EJ. Complications with permanent peritoneal dialysis catheters: experience with 154 percutaneously placed catheters. *Nephron* 1988; 48: 8–11
- Smith SA, Morgan SH, Eastwood JB. Routine percutaneous insertion of permanent peritoneal dialysis catheters on the nephrology ward. *Perit Dial Int* 1994; 14: 284–286
- Nielsen PK, Hemmingsen C, Friis SU *et al.* Comparison of straight and curled Tenckhoff peritoneal dialysis catheters implanted by percutaneous technique: a prospective randomized study. *Perit Dial Int* 1995; 15: 18–21
- Özener Ç, Bihorac A, Akoglu E. Technical survival of CAPD catheters: comparison between percutaneous and conventional surgical placement techniques. *Nephrol Dial Transplant* 2001; 16: 1893–1899
- Zaman F, Pervez A, Atray NK *et al.* Fluoroscopy-assisted placement of peritoneal dialysis catheters by nephrologists. *Semin Dial* 2005; 18: 247–251
- Moon JY, Song S, Jung KH *et al.* Fluoroscopically guided peritoneal dialysis catheter placement: long-term results from a single center. *Perit Dial Int* 2008; 28: 163–169
- Lo WK, Lui SL, Li FK *et al.* A prospective randomized study on three different peritoneal dialysis catheters. *Perit Dial Int* 2003; 23(Suppl 2): S127–S131
- Li CL, Cui TG, Gan HB. *et al.* A randomized trial comparing conventional swan-neck straight-tip catheters to straight-tip catheters with an artificial subcutaneous swan neck. *Perit Dial Int* 2009; 29: 278–284
- Eklund B, Groop PH, Halme L *et al.* Peritoneal dialysis access: a comparison of peritoneoscopic and surgical insertion techniques. *Scand J Urol Nephrol* 1998; 32: 405–408
- Gadallah MF, Pervez A, El-Shahawy MA *et al.* Peritoneoscopic versus surgical placement of peritoneal dialysis catheters: a prospective randomized study on outcome. *Am J Kidney Dis* 1999; 33: 118–122
- Kelly J, McNamara K, May S. Peritoneoscopic peritoneal dialysis catheter insertion. *Nephrology (Carlton)* 2003; 8: 315–317
- Wilkie M, Wild J. Peritoneal dialysis access—results from a UK survey. *Perit Dial Int* 2009; 29: 355–357
- Szeto CC, Chow KM, Wong TY *et al.* Feasibility of resuming peritoneal dialysis after severe peritonitis and Tenckhoff catheter removal. *J Am Soc Nephrol* 2002; 13: 1040–1045

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