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A Systemic Review on Peritoneal Dialysis Catheter Type and the Resulting Complications

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Abstract: ***Kidneys are the important excretory organs of the body. The rate of kidney kidney failure are increasing day by day.1 in 5 adults with high blood pressure have kidney failure. Although kidney transplantation remains the preferred therapeutic option, peritoneal dialysis continues to play a vital part in the management of end - stage renal illness. This review discusses the strategies for implanting peritoneal dialysis catheters for the treatment of kidney dysfunction. End - stage renal disease is effectively treated with peritoneal dialysis. The geometry of the intraperitoneal section, the amount of cuffs, and the subcutaneous layout are all aspects of PD catheter design that might affect catheter performance. Although improvements to insertion techniques and catheter design, catheter dysfunction and infection continue to be a substantial source of morbidity and a barrier to successful dialysis. The coiled and straight catheters are the two frequently used peritoneal dialysis catheters. In this review I have analysed that both catheters have its own pros and cons. There are various types of catheters but the main focus is to use it in a skilled procedure and avoid infection.***

Keywords: PD - peritoneal dialysis, HD – hemodialysis, SN - swan neck, SC – subcutaneous, BP - blood pressure

1. Introduction

The kidneys are two bean - shaped organs around the size of a fist (1) . Healthy kidneys filter roughly a half cup of blood each minute, removing wastes and extra water to generate urine. Urine travels from the kidneys to the bladder through two ureters, each side of the bladder. The bladder stores urine. The urinary tract consists of your kidneys, ureters, and bladder. (1)

Kidney failure does not occur suddenly. It is caused by an ongoing loss of renal function. Some people have renal disease and are unaware of it unless their kidneys begin to fail. The age - standardized mortality rate from renal illnesses was predicted to be 15.6 per 100, 000 people.

Dialysis is a treatment option for people whose kidneys are malfunctioning. When you have renal failure, your kidneys are unable to appropriately clear your blood. As a result, wastes and poisons accumulate in the circulation. Dialysis works by eliminating waste and excess fluid from the bloodstream to replace your kidneys. (2)

Hemodialysis and peritoneal dialysis are the two forms of dialysis. Both remove waste and extra fluid from your bloodstream. Hemodialysis uses an artificial kidney system, however peritoneal dialysis uses the stomach lining. Peritoneal dialysis is a method of eliminating wastes from the blood circulation. It is a cure for renal failure, a condition in which the kidneys are no longer filtering blood adequately. Peritoneal dialysis (PD) is a renal replacement therapy alternative to hemodialysis (HD) for individuals with chronic kidney disease at stage 5 who are awaiting or unable to obtain a renal transplant. (3)

Catheters are thin, flexible tubes that are inserted into the body to perform various medical procedures. They are commonly used to drain fluids, administer medications, or monitor certain body functions. Depending on the medical requirement, catheters can be put into various regions of the body, such as the bladder, blood arteries, or gastrointestinal system. (4)

Peritoneal catheters are specialised tubes used in peritoneal dialysis, a way of eliminating metabolic waste and excess fluid from one's body when the kidneys are underperforming. These catheters are surgically implanted into the peritoneal cavity, which is the space in the abdomen that surrounds the organs. (5) The peritoneal catheter serves as a conduit for the exchange of dialysis fluid. It has two tubes: an inflow tube and an outflow tube. The inflow tube allows the sterile dialysis solution to be introduced into the peritoneal cavity, while the outflow tube facilitates the removal of waste products and excess fluid from the body. The peritoneal catheter requires regular care and maintenance to prevent infections and ensure its proper function. Patients undergoing peritoneal dialysis rely on these catheters to perform their dialysis treatments at home or in a clinical setting. (6)

Every year, the number of new patients with end - stage renal failure (ESRF) who require dialysis increases by more than 1.8 - fold. (7)

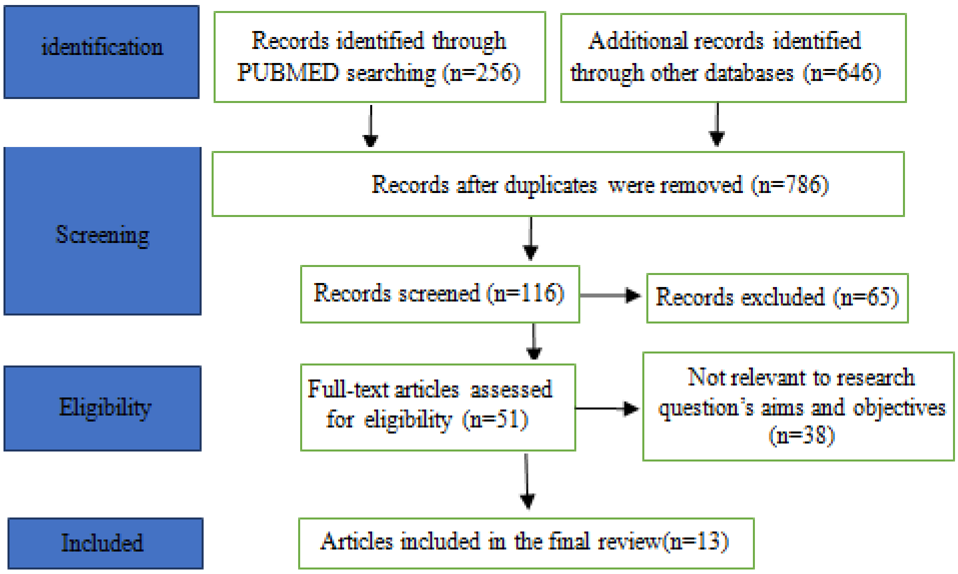
There are many PD catheter configuration modifications that may be related with mechanical and infection problems and affect peritoneal access lifetime. The intra - peritoneal segment (straight or coiled with and without discs), the sc/extra - peritoneal component (straight or swan - neck [SN]), and the number of cuffs (single or double) are the most common variants. However, a properly working catheter is necessary for successful PD. (7) (8)

The appropriate catheter type and exit site are identified prior to catheter placement. The majority of adult catheters have two cuffs: one in the preperitoneal region and one in the subcutaneous tissue. The catheter is held in place by the proximal cuff, while the distal cuff functions as an infection guard. With the patient supine, the insertion site is determined by organising the top surround of the catheter coil with the highest part of the pubic symphysis and indicating the upper surround of the inner cuff in the paramedian plane, 3 cm lateral of the midline The symphysis of the pubic bone has been proposed as a suitable marker for optimum catheter tip placement in the actual pelvis. (8) There are several techniques for placing the PD catheter into the abdominal region. Open surgical and laparoscopic techniques are preferred due to their safety and early success. (9) The possibility to do complete omentectomy or adhesiolysis during catheter insertion is increasing the appeal of the laparoscopic technique. Percutaneous (radiological) insertion of catheters is less invasive, however there is a danger of insufficient catheter placement and intestinal perforation. Complications occur sometime which are discomfort, nausea, or a hard abdomen appear, significant perforation is suspected. With the replacement of the perforation and elimination of the catheter, surgical exploration is required. Bleeding is uncommon following catheter placement and mainly occurs near the exit point. (10) Because of the stress of insertion, blood may be present in the effluent drained at first, but the drainage process should revert to normal in a few days. Misalignment of the catheters into the upper abdomen typically results in discomfort and, in rare cases, outflow failure. Immediate peritonitis with catheter implantation might indicate a faulty surgical approach. If the peritoneal fluid becomes murky and painful, With a transient switch to HD for proper wound healing. Peritonitis is a key issue for PD patients and the primary cause for people to transition to HD. Peritonitis is frequently caused by cutaneous bacterium infection. (11)

We attempted to determine whether one specific type of catheter is superior in terms of outcome and, hence, successful PD by doing this review and meta - analysis. (12)

2. Methodology

The terms 'catheter', 'peritoneal dialysis', coiled and straight catheters and its working' were searched from a database like 'pubmed', 'Google scholars' and 'cochrane library'. I used various search optionsusing keywords. Latest article is taken as a refrence. Only review articles having original data were taken to evaluate the results. The PRISMA for search is shown:



3. Discussion

Catheters have a high success rate, according to the clinical practise guidelines of the National Kidney Foundation Kidney Disease Outcomes Quality Initiative, but peritoneal Dialysis catheters have been linked to complications such as local destruction, hematoma, pneumothorax, thrombosis, venous stenosis, and catheter - associated infection. Central venous perforation is an uncommon disorder that can have dire consequences, including death. In order to further analyse the increased risk of catheter failure, we sought to investigate the probable aetiology of catheter type. (13) We wanted to determine if one type of catheter should be favored over another by meta - analyzing all relevant research on the subject. Nonetheless, the type of peritoneal catheter used has a significant impact on the outcome of PD. There is no agreement in the existing research on the best type of catheter to use for effective PD. (6) However, it is commonly acknowledged that the selection of a PD catheter should be based on the needs of the specific patient in question as well as local practises and knowledge. Despite the limitations indicated above, our study evaluated the long - term effect of two different extra - peritoneal catheter types on patient and technique lifespan and provides rationale for large randomised trials to firmly answer the essential topic of the optimal PD catheter. (14)

It clearly reveals that PD catheters with a straight intraperitoneal portion have just a minor advantage over coiled catheters in terms of catheter survival. Based on sensitivity studies, these catheters also have a considerable advantage over coiled catheters in terms of catheter removal rate. (15) This contradicts the findings that claimed that the coiled catheter could prevent catheter malfunction. Also, coiled catheters are thought to generate less stomach pain during fluid infusion. (11)

An RCT was conducted to compare the outcomes of straight, coiled. There were no changes in outcomes discovered. Because the outcome evaluation was not blinded, we

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eliminated the research from our meta - analysis. A problem that must be addressed is that we cannot be certain that the kind of catheter affects the outcome of Parkinson's disease. In three outcome assessments (the elimination rate, survival year 1, and survival year 2), the straight catheter was significantly preferred over the coiled catheter. Another limitation of the study showed different types of antibiotics used over the patients. (14) The current meta - analysis's findings should be viewed with caution due to its limitations (mostly confounders Despite these limitations, this meta - analysis and systematic review conclusively reveals that the type of catheter used impacts PD catheter survival. A straight intraperitoneal portion is preferred if placed surgically. However, in our opinion, having the assistance of trained staff and their understanding of a particular catheter type remain extremely important components that could contribute to higher catheter survival. (15) We hypothesized that there is no difference in result between the coiled and straight PD catheter groups based on international recommendations, meta - analyses, and research. (14) (16)

4. Conclusion

The installation of permanent PD catheters is critical to the success of a PD programme. It is also critical to understand implantation procedures and difficulties. Typically, the catheter type has little effect on the result. Intra - abdominal adhesions close to the incision site can be readily removed and need less skills than in the laparoscopic environment. (17) Separation of the peritoneum and rectus sheets is simple, which may result in reduced postoperative dialysate leaking. Intra - abdominal adhesions close to the incision site can be readily removed and need less skills than in the laparoscopic environment. Separation of the peritoneum and rectus sheets is simple, which may result in reduced postoperative dialysate leaking. Dialysate leaks, exit - site infections, hernias, vaginal edema, and other discomforts have all been reported as consequences of PD implantation. Kinking, catheter relocation, omental covering, catheter - fibrin coating, and adhesions induced by abdominal infections are all causes of catheter malfunction, which is predicted to occur in 60% of PD patients. (18) There wasn't no significant difference between those with coiled and straight PD catheters in terms of performance or death rates. Article findings indicate that the coiled PD catheter has a higher rate of malfunction than the straight PD catheter. A multidisciplinary approach led by the healthcare team's excitement will enhance the catheter success and long - term outcomes. (19)

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