CLINICAL EVALUATION OF TENCKHOFF CATHETER INSERTION IN PAEDIATRIC PERITONEAL DIALYSIS : A SINGLE CENTER STUDY

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ABSTRACT

Objective: *This study aimed to evaluate the clinical outcome of Tenckhoff catheter insertion at Sardjito General Hospital for pediatric renal failure.* ***Material & Methods:*** *Data were collected from January 2014 to December 2018 at Sardjito General Hospital. All patient records were collected retrospectively such as patient characteristics, underlying diseases of kidney failure, congenital abnormalities, surgical technique, complications that occur after Tenckhoff catheter insertion.* ***Results:*** *45 patients meet the inclusion criteria. A total of 7 patients with acute kidney failure (15.5%) and 38 patients with chronic kidney failure (84.5%). Glomerulonephritis is the most common cause of kidney failure (21 patients, 46.7%). The insertion technique used was open surgery in 34 patients (76%) and laparoscopic insertion in 11 patients (24%). Complications reported were catheter dysfunction, leakage of dialysate, surgical site infection, and peritonitis.* ***Conclusion:*** *Tenckhoff catheter insertion for peritoneal dialysis (PD) in pediatric patients with acute and chronic renal failure performed in our center is effective and safe. The most common cause of renal failure in pediatric is glomerulonephritis. Open surgery and laparoscopic insertion of Tenckhoff catheter both have a low complication rate. Catheter dysfunction due to mechanical catheter obstruction is one of the main problems in the placement of Tenckhoff catheter.*

Keywords: *Tenckhoff, peritoneal dialysis, pediatric.*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk mengevaluasi hasil klinis pemasangan kateter Tenckhoff untuk gagal ginjal anak di Rumah Sakit Umum Sardjito.* ***Bahan & Cara:*** *Data dikumpulkan dari Januari 2014 hingga Desember 2018 di Rumah Sakit Umum Sardjito. Semua catatan pasien dikumpulkan secara retrospektif seperti karakteristik pasien, penyakit yang mendasari gagal ginjal, kelainan bawaan, teknik bedah yang dilakukan, komplikasi yang terjadi setelah pemasangan kateter Tenckhoff.* ***Hasil:*** *Terdapat 45 pasien yang memenuhi kriteria inklusi. Sebanyak 7 pasien dengan gagal ginjal akut (15.5%) dan 38 pasien dengan gagal ginjal kronis (84.5%). Glomerulonefritis adalah penyebab gagal ginjal yang paling umum (21 pasien, 46.7%). Teknik pemasangan yang digunakan adalah operasi terbuka pada 34 pasien (76%) dan laparoskopi pada 11 pasien (24%). Komplikasi yang dilaporkan adalah disfungsi kateter, kebocoran dialisat, infeksi di tempat bedah, dan peritonitis.* ***Simpulan:*** *Pemasangan kateter Tenckhoff untuk PD pada pasien anak dengan gagal ginjal akut dan kronis yang dilakukan di pusat kami efektif dan aman. Penyebab gagal ginjal yang paling umum pada anak adalah glomerulonefritis. Operasi terbuka dan pemasangan laparoskopi kateter Tenckhoff keduanya memiliki tingkat komplikasi yang rendah. Disfungsi kateter akibat obstruksi kateter mekanik adalah salah satu masalah utama dalam penempatan kateter Tenckhoff.*

Kata Kunci: *Tenckhoff, peritoneal dialysis, anak.*

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INTRODUCTION

Kidney failure in pediatric patients presents significant therapeutic challenges that encompass several extrarenal comorbid conditions, such as growth failure, cardiovascular problems, developmental and neurocognitive impairment. Acute renal failure, or acute kidney injury (AKI), is common in children admitted to hospitals, with a pooled incidence estimated at 33.7%.[1] There is also an increasing prevalence of chronic kidney disease (CKD) globally and an annual incidence rate of 8%

in pediatric patients.[1] In addition, kidney failure in pediatric patients carries an extremely high mortality rate.[2]

There was a study conducted in Italia in 2000, reported that CKD prevalence of 74.7 per million in the age-related population. This ItalKid project surveys based on a population of 16.8 million children (< 20 years of age), and CKD defined in patients with eGFRs < 75 mL/min/1.73 m^2.[3]

Peritoneal dialysis (PD) is one form of treatment for patients with kidney failure.[4-5] Through diffusion and ultrafiltration, toxic materials can be diffused out from the body into the peritoneal cavity through dialysate fluid. The advantage of PD than hemodialysis is that PD can be done by the patient himself at home. Another advantage is being able to visit the dialysis center at intervals, no use of needles, providing continuous therapy, while traveling, or when the patient sleeps.[6] PD has a role in the management of acute and chronic kidney failure in pediatric patients.[1] The PD process requires the installation or insertion a peritoneal catheter. The most widely used peritoneal catheter is the Tenckhoff catheter. Its placement can be done by open surgery, laparoscopic, or percutaneous surgery.[7]

Clinical evaluation after Tenckhoff catheter insertion have been reported in several studies. PD at Sardjito General Hospital began in 1995 for adolescent patients and Tenckhoff catheter for pediatric size available since 2014.

OBJECTIVE

This study aimed to evaluate the clinical outcome of Tenckhoff catheter insertion at Sardjito General Hospital for pediatric renal failure.

MATERIAL & METHODS

All data collected retrospectively from the medical record who underwent Tenchkhoff catheter insertion from January 2014 to December 2018 at Sardjito General Hospital. We collected data such as patient characteristics, underlying disease of kidney failure, comorbidities, congenital abnormalities of the patient, catheter insertion technique, and complications that occur after Tenckhoff catheter installation after 1 year of follow-up.

The inclusion criteria in this study are patients under the age of 18 years, underwent Tenchkhoff catheter placement at Sardjito General Hospital. Exclusion criteria in this study were patients who underwent Tenckhoff catheter placement other than for dialysis purposes. Descriptive analysis was performed using SPSS™ (Statistical Package for Social Science) software version 18.

RESULTS

During 2014 to 2018 there were 45 patients meet our criteria, consist of 19 boys (42 %) and 26 girls (58%). Table 1 provide patient characteristics which the ages group 10 to 16 years has the highest number of patients (24 patients).

Table 1. Patients characteristics who performed Tenckhoff catheter insertion for PD.

Characteristic		Number	Percentage
Sex	Boy	19	42%
	Girl	26	58%
Age	< 1 year	3	6.7 %
	1-5 years old	4	8.9 %
	5-10 years old	14	31.1 %
	10-16 years old	24	53.3 %

Tenckhoff catheter insertion for pediatric PD was performed on 7 patients with acute kidney failure and 38 patients with chronic kidney failure. As mentioned in table 2, we reported 3 patients with glomerulonephritis, 3 patients with nephrotic syndrome, and 1 patient with renal agenesis as the underlying cause of acute kidney injury. The underlying cause in patient with chronic kidney failure were: glomerulonephritis, congenital anomaly of kidney and urinary tract (CAKUT), nephrotic syndrome, congenital heart disease, lupus nephritis, and ureteric obstruction caused by sacrococcygeal teratoma. Glomerulonephritis was the most common cause of both acute and chronic kidney failure.

Tenckhoff catheter insertion for PD in our center is performed by urologist with open surgery or laparoscopic techniques. Laparoscopic insertion of Tenckhof catheter all performed with 2 port technique and the first trocar inserted by direct trocar access. We reported 34 patients in open. and 11 patients in the laparoscopic group. Table 3 showed that open procedure was more common than laparoscopy and there was 6 patient performed the concomitant procedure.

Table 2. Renal failure aetiology in pediatric patients who performed Tenckhoff catheter insertion.

Aetiology of Renal Failure		Number	Percentage
Acute	Glomerulonephritis	3	6.7%
	Nephrotic Syndrome	3	6.7%
	Renal Agenesis	1	2.2%
Chronic	Glomerulonephritis	18	40%
	Nephrotic Syndrome	6	13.3%
	Congenital Heart Disease	4	8.9%
	Lupus Nephritis	2	4.4%
	Congenital Anomalies of Kidney and Urinary Tract (CAKUT)		
	- Renal Hypoplasia	3	6.7%
	- Polycystic Kidney	3	6.7%
	- Ureteric Obstruction due to ureteral anomaly	2	4.4%
	Ureteric obstruction due to sacrococcygeal teratoma	1	2.2 %

Table 3. The number of surgical techniques and concomitant procedures performed.

		Number	Percentage
Surgical Technique	Laparoscopy	11	24%
	Open surgery	34	76%
Concomittant procedure	Omentectomy	5	9%
	Hernia Repair	1	2%
	No concomitant surgery	39	88%

A plain abdominal radiograph was performed after the procedure of Tenckhoff catheter insertion to ensure that the catheter was not kinked and the distal part of the catheter remained at the low position in the intraabdominal cavity so that dialysate fluid could flow in and flow out from the intraperitoneal cavity without any disruption. Table 4 provide distribution data of distal catheter position. One patient did not have post operative abdominal photo because the condition was not transportable due to multiple organ failures prior catheter insertion procedure.

Table 4. Distribution of distal catheter position.

Distal catheter position	Number	Percentage
Pelvic	34	76%
Right Paravertebra		
- As high as os illium	2	5%
- Above os illium	2	5%
Left Paravertebra		
- As high as os illium	2	5%
- Above os illium	4	9%

After 1 year follow-up, we reported that the most common complication in Tenckhoff catheter insertion is catheter dysfunction. Other complications found were leakage of dialysate, surgical site infection, and peritonitis.

Table 5. Complication reported.

Complication	Total	Percentage
Catheter dysfunction	7	15.6 %
Leakage of dialysate	3	6.7 %
Surgical site infection	3	6.7 %
Peritonitis	2	4.4 %

DISCUSSION

We obtain a similar result from the study conducted by Daschner et al. in Germany where the age distribution of pediatric patients who performed Tenckhoff catheter insertion was higher in older children group.[8] Glomerulonephritis became the most common cause of both acute and chronic kidney failure. This was not much different from

studies in South Africa and other developing countries.[2,9] While there were several differences with results in Germany and Korea.[2,10] Congenital abnormalities being the most cause of chronic kidney failure which then managed with PD.[4] Acute PD remains as important therapeutic of choice in newborns and infants with AKI after surgery for congenital heart disease and AKI caused by sepsis. Acute PD is now also the best modality for the management of AKI in primary kidney disease such as glomerular disease, acute tubular necrosis due to ischemia and or drugs and hemolytic-uremic syndrome.[6] Another advantage is that PD has also been shown to be beneficial in children with AKI secondary to snakebite. bacterial and parasite infections such as leptospirosis and malaria.[4]

Despite the fact that PD has many advantages in pediatric patients. the amount of PD used in developing countries is smaller than in developed countries.[11] This also happened in the South African country as the research carried out by C Levy et al.[5,11] The use of PD is largely in urban areas with parental education generally higher than the majority of the population. The availability of dialysate and PD equipment is also a problem. Dialysate and PD equipment mostly available only in big hospitals in big cities, even though there are also patients living far from tertiary health centers, as in rural areas that do not have basic infrastructures such as paved roads and large hospitals. So the problems related to parental education, cost, and unavailability of access to PD are problems that must be faced in developing countries such as in South Africa and we also found the same problem in Indonesia.[9] Tenckhoff catheter insertion for pediatric PD in Yogyakarta province only performed in our center.

Tenckhoff catheter insertion in our center performed by urologist and surgical technique performed were open surgery or laparoscopy. The surgical technique chosen by the operating surgeon were based on the patient's clinical condition. preferences and expertise of the operating surgeon. Younger patients generally have smaller abdominal cavity so that open surgery were more likely chosen. We reported 3 patients unable to be transferred to the operating theater so that catheter insertion performed bed side by open surgery.

We did not find intra-abdominal organ injury, massive bleeding, and post-operative hernias. Complications that occur after Tenckhoff catheter insertion in our center were catheter dysfunction, leakage of dialysate, infection around the catheter insertion site, and peritonitis. The most common complication is catheter dysfunction. We defined catheter dysfunction when dialysates used for PD procedures cannot infuse in or drained out. Catheter dysfunction happened due to mechanical factors such as catheter kink, migration of distal catheter, omental blockage, or there are fibrin that occludes the catheter. We found 7 patients with catheter dysfunction during 1-year follow-up and revision of catheters performed by open surgery. An abdominal plain photo was taken prior surgery to reasses catheter alignment and position of distal catheter. We reported 4 patients with migration of catheter, 2 patients with omental blockage, and 1 patient with catheter occlusion due to fibrinous material. Other studies in the United Kingdom showed that infection was the most common complication.[12] While other studies in Malaysia reported similar results with our study.[13] They reported that catheter dysfunction (due to migration and obstruction) was the most common complication (13.3%).[13]

Dialysate leakage in 3 patients were conservatively managed and we delayed the use of PD for 2-3 weeks to facilitate the wound healing process. All of the patients successfully managed and PD could be performed without any leakage. Surgical site infection occurred in 3 patients and managed conservatively by changing the dressing twice per day, oral, and topical antibiotics and patients advised to improve hygiene. Patients could continue PD. Peritonitis occurred in 2 patients during 1 year follow-up. Intravenous antibiotics were given. Tenckhoff catheter removed and patients switch to hemodialysis. Peritonitis is a serious complication and we reported 2 patients (4.4%). Several studies reported that peritonitis incidence range between 2.9% to 12.5%.[9,13-14] The lowest incidence were reported by Liu in Malaysia.[13] They performed povidone body scrub 2 days before catheter insertion to minimize the risk of peritonitis. but the study did follow up only in a month. Several techniques for inserting a Tenckhoff catheter have been described, but no one technique has consistently proved to be superior than other in order to prevent peritonitis.[15]

CONCLUSION

Tenckhoff catheter insertion for PD in pediatric at Sardjito General Hospital during 2014-2018 period was performed on 45 patients where the

age distribution was greater in older children. A total of 7 patients with acute kidney failure (15.5%) and 38 patients with chronic kidney failure (84.5%). The insertion technique used were open surgery and laparoscopic technique in 34 patients (76%) and 11 patients (24%) respectively. Complications reported after 1 year follow-up were catheter dysfunction, leakage of dialysate. surgical site infection, and peritonitis. However, Tenckhoff catheter insertion for pediatric PD in our center can be an effective, simple, and safe procedure.

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