EFFICACY OF PERCUTANEOUS NEPHROSTOMY FOR MANAGEMENT OF PYONEPHROSIS

Muhammad Naeem[1], Faiz ur Rahman[2], Anayat Ullah[3], Tariq Ahmad[4], Liaqat Ali[5], Hazrat Ullah[6]

ABSTRACT

Objective: *To evaluate the efficacy of Percutaneous Nephrostomy (PCN) for the management of pyonephrosis.*

Methodology: *This descriptive study of 78 cases of pyonephrosis was conducted at Institute of Kidney Diseases Hayatabad Medical Complex, Peshawar Pakistan from July 2010 to December 2011. Ultrasound guided percutaneous nephrostomy was performed and pus was sent for culture and sensitivity. Urine output in the PCN was monitored. Patients were clinically observed. Blood chemistry was analyzed. Patients were put on antibiotics based on culture and sensitivity. Efficacy was defined as the symptomatic relief of a patient in respect to pain and fever and biochemical improvement in terms of decreased TLC count and improved RFTs in early post PCN period. Data was collected on a structured proforma and was analyzed on SPSS version 10.*

Results: *Out of 78 patients who underwent percutaneous nephrostomy for pyonephrosis, 42(53.84%) were male and 36(46.15%) were female. The majority, 69(88.46%) patients had underlying obstructing urinary calculi. Other causes of obstruction included, benign strictures 5(6.41%); pelviureteric junction obstruction 3(3.84%) and malignant stricture 1(1.2%). Culture of the drained pus was positive in 73(93.58%) patients. After 2 to 3 weeks of PCN, 53(69%) patients underwent minimally invasive procedures as definitive treatment of the obstructing lesion whereas 23(31%) patients required major surgery after 4 to 6 weeks.*

Conclusion: *Percutaneous drainage for pyonephrosis is an effective diagnostic and therapeutic method, decompressing the obstructed and infected pelvicaliceal system and rapidly stabilizes the patient's clinical condition and makes him fit for definitive treatment.*

Key Words: *Percutaneous nephrostomy, Pyonephrosis, Stone disease.*

This article may be cited as: Naeem M, Rahman F, Ullah A, Ahmad T, Ali L, Ullah H. Efficacy of percutaneous nephrostomy for management of pyonephrosis. J Postgrad Med Inst 2013; 27(4): 428-32.

INTRODUCTION

Pyonephrosis can be defined as the presence of pus in an obstructed renal collecting system[1]. It may present with a classic triad of fever, flank pain, and hydronephrosis or simply hydronephrosis and sepsis. It is a potentially life threatening condition and it is desirable to provide immediate temporary relief of the obstruction, until definitive treatment can be undertaken[2].

Prior to the introduction of antibiotics, the treatment of pyonephrosis frequently consisted of nephrectomy to remove the non-functional kidney, which was a potentially dangerous source of infection. This approach was later modified as a result of the advances made in antibiotic therapy, and included vigorous antibiotic treatment and prompt drainage of the kidney[3].

Percutaneous nephrostomy is a procedure of establishing a drainage tract into the upper urinary

[1-6]Department of Urology and Renal Transplantation, Institute of Kidney Diseases, Hayatabad Medical Complex Peshawar - Pakistan.

Address for correspondence:
Dr. Muhammad Naeem
Assistant Professor
Department of Urology and Renal Transplantation, Institute of Kidney Diseases, Hayatabad Medical Complex Peshawar - Pakistan.
E-mail: mnaeem04@yahoo.com

Date Received: November 09, 2012
Date Revised: May 26, 2013
Date Accepted: June 02, 2013

system by puncturing the kidney directly through the skin[2].

At present PCN has become the initial treatment of choice in pyonephrosis[4]. It rapidly stabilizes the patient's clinical condition thus permitting selection of the most conservative final therapy.

Percutaneous nephrostomy (PCN) catheter insertion was first described by Goodwin et al[5] in 1955 as an emergency procedure to relieve urinary obstruction. Subsequently, the safety and efficacy of this procedure has been established using a variety of different imaging modalities including various combinations of computed tomography (CT), fluoroscopy, and ultrasound. The purpose of such drainage is to decompress the upper urinary passage caused as a result of supra or intra vesical obstruction. It can be used as a conduit for diagnostic and therapeutic procedures to provide urinary diversion and improve renal functions. Major complications include sepsis, hemorrhage, vascular injury, bowel transgression, and pleural complications[6]. Major complications requires hospitalization (>48 hours). Minor complications require no therapy except overnight admission for observation only[6]. Mild hematuria commonly occurs after PCN catheter placement and often resolves spontaneously after a few days[7]. Obstruction of the PCN catheter may occur, and a second catheter may successfully be inserted when this happened[2].

PCN drainage decompresses the obstructed and infected pelvicaliceal system and rapidly stabilizes the patient's clinical condition and makes him fit for definitive treatment. Pyonephrosis is a serious urologic emergency which needs prompt drainage. We have conducted this study to determine the efficacy of PCN, regarding the optimization of patient clinically and biochemically for definitive treatment of the underlying cause.

METHODOLOGY

This descriptive study was conducted at Institute of Kidney Diseases Hayatabad Medical Complex, Peshawar from July 2010 to December 2011. Seventy eight cases of pyonephrosis presented to Out Patient and Emergency Departments of Institute of Kidney Disease were included in the study. All patients of pyonephrosis presented to Outpatient and Emergency Departments were included in the study. The patients below 13 years of age and patients with blood dyscrasias were excluded from the study. After taking history, performing general physical and local examination, investigations such as Urine routine examination, Complete blood count, Blood sugar, Blood Urea, Serum creatinine, Serum electrolytes, HBs, HCV, Prothrombin time, Activated Prothrombin time, Bleeding time, Clotting time, Ultra sonography renal tract and X-ray KUB were performed. As the procedure is done under local anesthesia, all the patients were briefed in detail preoperatively and written informed consent was taken from every patient, counter signed by his next kin.

An Ultrasound was performed before the procedure to decide the nature and site of obstruction. Pigtail catheter of 6Fr to 8.5Fr was selected depending on the age of the patient, clinical and imaging findings. Below 12th rib approach in prone position was preferred during the procedure. A supporting pillow was put under the abdomen on the side of the procedure to correct lumber lordosis and to support the kidney. Local anesthetic (2% lignocaine) was injected to anesthetize the puncture site after proper cleaning and draping of the area. By Ultrasound the localization of the puncture site was confirmed and the distance between the puncture site and the target calyx was measured. A small stab incision was made in the skin and 18G Chiba needle was entered under Ultrasound guidance towards the target calyx. The tract was then dilated with plastic dilators up to 12Fr. Pig-tail nephrostomy tube was put in the renal pelvis. Pus was collected for culture and sensitivity test, the PCN tube was fixed with silk "0" and connected with urobag. Broad spectrum antibiotic was given pre and post operatively and patients were followed up for pain and fever for the outcome of PCN after 2 to 4 days. Urine analysis, serum creatinine and full blood count was done after 2-3 days and again after 14 days. All the pre op, per op, and post op patients data was collected on structured proforma and was analyzed on SPSS version 10.

RESULTS

Of the 78 patients in whom percutaneous nephrostomy was attempted, 42 (53.84%) were male and 36 (46.15%) were female. The mean age of the male patients was 39 ± 6 years and in female it was 41 ± 7 years. The majority, 69 (88.46%) patients had underlying obstructing urinary calculi. Other causes of obstruction included benign strictures 5 (6.41%) patients, pelviureteric junction obstruction 3 (3.84%) patients and malignant stricture 1 (1.2%) patient. Five of our patients had bilateral pyonephrosis due to obstructive calculi and three patients were having pyonephrosis of the solitary functioning kidney. The outcome of our study in terms of improvement in pain and fever relief was 100 percent in all patients.

The procedure was successful in 76 (97.43%) pa-

Figure 1: Complications of Percutaneous Nephrostomy

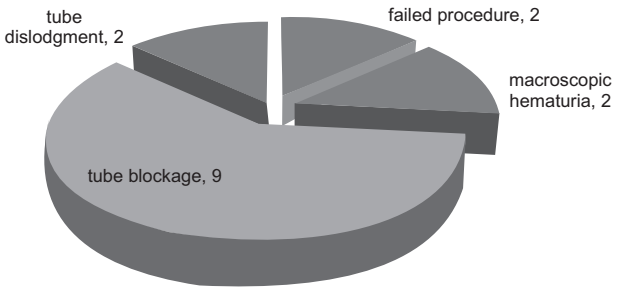

Table 1: Percentage of cultured organisms

Organism Cultured	Percentage
Escherichia coli	60%
Klebsiella	18%
Proteus	12%
Pseudomonas	7%
Enterococcus	3%
Multiple Organisms	27%

Table 2: Percentage Sensitivity of cultured organisms

Antibiotics	% of Sensitivity
Gentamicin	82%
Ceftriaxone	71%
Cephalexin	54%
Nitrofurantoin	40%
Cotrimoxazole	35%
Nalidixic Acid	32%
Ampicillin	29%

tients and in two patients we failed to put the nephrostomy tube under Ultrasound guidance in spite of repeated efforts and were managed by open nephrostomy. Two patients complained of macroscopic hematuria for 24-36 hours which were managed conservatively. In 11 patients reinsertions were required, as the drainage tips of PCN were blocked by thick pus in 9 (60%) patients after 2-5 days and in 2 (13%) patients dislodgement occurred as shown in figure 1.

Mean serum creatinine levels were 2.16±0.9mg/dl preoperatively and 1.49±0.5mg/dl, two to three days after the procedure. The mean TLC count before the procedure was 14,700/cu mm which decreased to 8,100/cu mm within 72 hrs after the procedure and with parental antibiotics. The average time taken to complete the procedure was 31 minutes, ranging from 22 to 50 minutes.

Culture of the drained pus was positive in 73 (93.58%) patients. The most common organism cultured was *Escherichia coli* (60%) followed by *Klebsiella (18%)*, *Proteus (12%)*, *Pseudomonas (7%)* and *Enterococcus(3%)*. Multiple organisms were found in 21 (27%) out of 78 patients (Table 1).

The microorganisms were sensitive to gentamicin (82%), ceftriaxone (71%), cephalexin (54%), nitrofurantoin (40%), cotrimoxazole (35%), nalidixic acid (32%) and ampicillin (29%). Table 1 and 2 shows the culture and sensitivity of the organisms. After 2 to 3 weeks of PCN, 52 (69%) patients underwent minimally invasive procedures as definitive treatment of the obstructing lesion where as 23 (31%) patients required major surgery after 4 to 6 weeks. Out of 78 total patients, Nephrectomy was performed in 14 (17%) cases who were having non functioning kidneys on renal scans while kidneys were saved in 64 cases.

DISCUSSION

Percutaneous nephrostomy should be given preference over ureteral stents if signs of infected hydronephrosis are detected[8]. Camunez et al, observed that following PCN in pyonephrosis clinical symptoms disappears in 24-48 h after the procedure and once the acute phase is over definitive surgery can be carried out[9]. In our study the patient were completely free of symptoms in term of pain and fever after 48 hrs which is in accordance with literature[8,9]. The risk of pyonephrosis is increased in patients with upper urinary tract obstruction secondary to various causes such as stones, tumors and pelvi-ureteric junction obstruction[10]. In our study the majority, 69 (88.46%) patients had underlying obstructing urinary calculi. Other causes of obstruction included strictures 5 (6.41%) patients, pelvi-ureteric junction obstruction 3 (3.84%) patients and malignant stricture 1 (1.2%) patient. According to the study of C.K. Ng et al[11] the cause of pyonephrosis was stone in 77% of patients where as in the study of St Lezin M[12] it was 73% of patients. Stone as a causative agent was even more in our study which could be due to high prevalence of stone in our population. Samarsinghe et al, did not find any renal function improvement in patients with chronic obstruction and terminal malignancy[13]. In another study renal functions improved significantly when PCN was performed for benign conditions (mean creatinine 3.52 mg/dL before and 2.18 mg/dL after PCN), however in malignancy there has been no significant improvement in renal function (before PCN mean creatinine 6.39 mg/dL and after PCN 5.41 mg/dL)[14]. In our study the PCN was done for benign conditions causing pyonephrosis therefore improvement in renal function was significant. The first ultrasound guided Percutaneous nephrostomy was performed by Pederson and achieved a success rate of about 70%[15]. Since then, a large number of studies of ultrasound guided Percutaneous nephrostomies have been carried out, particularly in the last two decades and a success rate up to 92% have been reported[16].

Now Ultrasound-guided intervention is becoming an increasingly popular and valuable tool in the critical care setting[17].

Isa Khan also concluded that the availability of Ultrasonography has revolutionized the technique of percutaneous approach to the renal tract and has significantly reduced the number of puncture attempts[18]. In our study, primary technical success rate of ultrasound guided nephrostomy was 97.43% which is very much comparable with the results of Millward SF[19]. We used pigtail catheter with side holes for the drainage of pyonephrotic kidney, although Canales BK et al[20] recommended symmetric balloon nephrostomy catheter which combines strong drainage flow and strong retention strength, but this catheter is not easily available in the local market.

Lee et al described a major complication rate of 6% and a minor complication rate of 28%[21].

The complications in our study such as Bleeding, blockage of nephrostomy and premature dislodgment of nephrostomy tube, as well as failure of procedure, was almost equal to that reported by Stables DP[22]. No mortality was reported in our study as compare to 0.2% the study of Maher et al[23].

CONCLUSION

Pyonephrosis is a serious urological emergency which most commonly occurs due to urolithiasis in our set up. Percutaneous nephrostomy is a safe and effective modality for the management of pyonephrosis. It decompresses the obstructed and infected pelvicaliceal system and rapidly stabilizes the patient's clinical condition and makes him fit for definitive treatment.

REFERENCES

1. Yoder IC, Lindfors K, Pfister RC. Diagnosis and treatment of pyonephrosis. Radiol Clin North Am 1984;22:407-14.

2. Karim R, Sengupta S, Samanta S, Aich RK, Das U, Deb P. Percutaneous nephrostomy by direct puncture technicque: an observational study. Indian J Nephrol 2010;20:84-8.

3. Rabii R, Joual A, Rais H, Fekak H, Moufid K, Bennani S, et al. Pyonephrosis: diagnosis and treatment: report of 14 cases. Ann Urol (Paris) 2000;34:161-4.

4. Ho PC, Talner LB, Parsons CL, Schmidt JD. Schmidt percutaneous nephrostomy: experience in 107 kidneys. Urology 1980;16:532-5.

5. Goodwin WE, Casey WC, Woolf W. Percutaneous trocar nephrostomy in hydronephrosis. J Am Med Assoc 1955;157:891-4.

6. Ramchandani P, Cardella JF, Grassi CJ, Roberts AC, Sacks D, Schwartzberg MS, et al. Quality improvements guidelines for percutaneous nephrostomy. J Vasc Interv Radiol 2001;12:1247-51.

7. Regalado SP. Emergency percutaneous nephrostomy. Semin Intervent Radiol 2006;23:287-94.

8. Mokhmalji H, Braun PM, Martinez Portillo FJ, Siegsmund M, Alken P, Kohrmann KU. Percutaneous nephrostomy versus ureteral stents for diversion of hydronephrosis caused by stones: a prospective, randomized clinical trial. J Urol 2001;165:1088-92.

9. Camunez F, Echenagusia A, Prieto ML, Salom P, Herranz F, Hernandez C. Percutaneous nephrostomy in pyonephrosis. Urol Radiol 1989;11:77-81.

10. Reznek RH, Talner LB. Percutaneous nephrostomy. Radiol Clin North Am 1984;22:393-406.

11. Ng CK, Yip SK, Sim LS, Tan BH, Wong MY, Tan BS, et al. Outcome of percutaneous nephrostomy for the management of pyonephrosis. Asian J Surg 2002;25:215-9.

12. St Lezin M, Hofmann R, Stoller ML. Pyonephrosis: diagnosis and treatment. Br J Urol 1992;70:360-3.

13. Samarasinghe UC, Perera ND. The value of percutaneous nephrostomy: Sri Lankan experience. Ceylon Med J 1998;43:92-5.

14. Sood G, Sood A, Jindal A, Verma DK, Dhiman DS. Ultrasound guided percutaneous nephrostomy for obstructive uropathy in Benign and malignant diseases. Int Braz J Urol 2006;32:281-6.

15. Pedersen JF. Percutaneous nephrostomy guided by ultrasound. J Urol 1974;112:157-9.

16. Nielsen OS, Grossmann E. Ultrasonically guided percutaneous nephrostomy. Scand J Urol Nephrol 1990;24:219-21.

17. Nicolaou S, Talsky A, Khashoggi K, Venu V. Ultrasound – guidedinterventional radiology in critical care. Crit Care Med 2007;35:186-97.

18. Khattak IK, Irshad M, Zaheerullah, Gul R. Obstructive Uropathy Percutaneous nephrostomy in seriously ill patients. J Postgrad Med Inst 1996; 10:59-60.

19. Millward SF. Percutaneous nephrostomy: a practical approach. J Vasc Interv Radiol 2000;11:955-64.

20. Canales BK, Handlin K, Braasch M, Antolak C, Reddy A, Odeh B, et al. Percutaneous nephrostomy catheter: drainage flow and retention strength. Urology 2005;66:261-5.

21. Lee WJ, Patel U, Patel S, Pillari GP. Emergency percutaneous nephrostomy: results and complications. J Vasc Interv Radiol 1994;5:135-9.

22. Stables DP. Percutaneous nephrostomy: techniques, indications, and results. Urol Clin North Am 1982;9:15-29.

23. Maher MM, Fotheringham T, Lee MJ. Percutaneous nephrostomy. Semin Intervent Radiol 2000;17:329-39.

CONTRIBUTORS

MN conceived the idea, planned and wrote the manuscript of the study. FR, AU, TA, LA and HU assisted in analysis of data and gave input in the write up of manuscript. All the authors contributed significantly to the research that resulted in the submitted manuscript.