

Differences of Electrolytes Value in Pre and Post Percutaneous Nephrolithotomy (PCNL) In Nephrolithiasis Patients in RSUP H. Adam Malik Medan

M. Bob Muharly Rambe*, Dhirajaya Dharma Kadar**, Ramlan Nasution**

* Department of Surgery, Adam Malik General Hospital Medan, Indonesia

**Department of Surgery, Urology Division, Adam Malik General Hospital Medan, Indonesia

DOI: 10.29322/IJSRP.10.11.2020.p10718

<http://dx.doi.org/10.29322/IJSRP.10.11.2020.p10718>

Abstract- Percutaneous nephrolithotomy (PCNL) is the treatment of choice for kidney stones. In the PCNL procedure, artificial occlusion of the pelvic system and irrigation were performed. Although the irrigation process is performed with isotonic fluids, the PCNL procedure carries a risk of intravascular absorption of fluid. Apart from affecting hemodynamics, this can affect the amount of electrolytes before and after PCNL. The purpose of this study is to determine the difference between serum electrolytes in the conditions before and after the Percutaneous Nephrolithotomy (PCNL) procedure. This research is an analytical study with a cross-sectional design. Samples were taken using consecutive sampling technique according to the inclusion criteria in patients who had undergone Percutaneous Nephrolithotomy (PCNL) in RSUP Haji Adam Malik Medan, as many as 47 people. Data were taken from February to June 2020. The results showed that the sodium value before and after PCNL has a mean difference of 1.90, so that the p value > 0.05, which means not statistically significant. It is also known that the value of potassium before and after PCNL has a mean difference of 0.47, so that the p value > 0.05, which means not statistically significant. The chloride value before and after PCNL had a mean difference of 0.45, so the p value was > 0.05, which means not statistically significant. In conclusion, there is no difference between electrolyte levels before and after PCNL based on the duration of action.

Keywords- PCNL, Electrolytes, Nephrolithiasis, Indonesia

I. INTRODUCTION

Urinary tract stones are a common problem that is often found in society. This can be found in all countries with prevalence rates varying from 5% to 15%. The prevalence of urinary tract stones is also increasing in adult and pediatric populations worldwide.¹

Based on the Basic Health Research (Riskesdas) in 2013, the prevalence of kidney stones based on interviews increased with age, the highest was in the 55-64 years age group (1.3%), decreased slightly in the 65-74 years age group (1.2%) and age

≥75 years (1.1%). The prevalence is higher in men (0.8%) than in women (0.4%).¹

In dealing with kidney stones, various procedures can be performed, including open surgery and Percutaneous Nephrolithotomy (PCNL). As time went by, PCNL is in great demand because it has the advantages of being minimally invasive and relatively cheap compared to open surgery. PCNL also has clear indications and has a good trend.¹

In the PCNL procedure, artificial occlusion of the pelvic system and irrigation were performed. The goal is to make it easier to perform the puncture and prevent fragments of rock from entering the ureter. In addition, irrigation is carried out to facilitate visibility. Although the irrigation process is carried out with isotonic fluids, the PCNL procedure does carry the risk of intravascular absorption of fluid. Plasma fluid consists of water (91-92%) and solid parts (8-9%), electrolytes such as sodium, potassium, bicarbonate, chloride and calcium are one part of plasma fluid (Mathew, et al 2019). In the study conducted by Xu et al, there were changes in sodium, potassium and chloride just before PCNL and 24 hours after PCNL. From 34 patients who received PCNL, the sodium levels decreased from 140.0 mEq / L to 138.6 mEq / L. Decrease in Potassium levels from 4.2 mEq / L to 4.1 mEq / L. Decreased levels of chloride actually from 103.8 mEq / L to 104.8 mEq / L.¹

Pan et al also conducted a pre- and post-PCNL study on sodium and potassium levels. In sodium there is an increase in the amount of sodium from 138.0 mEq / L to 143.0 mEq / L. While for potassium there was a decrease from 3.5 mEq / L to 3.45 mEq / L.²

II. METHODS

This research is an analytical study with a cross-sectional design. The data source comes from secondary data obtained from medical records to determine the sample to match the inclusion and exclusion criteria in patients who have undergone Percutaneous Nephrolithotomy (PCNL) at Haji Adam Malik Hospital Medan.

The research was conducted at the Department of Surgery, Division of Urology, Faculty of Medicine, University of North

Sumatra / RSUP Haji Adam Malik Medan from February to June 2020 and has been approved by the ethics committee.

The sampling method in this study was using consecutive sampling technique, based on the unpaired numerical categorical analytic formula, the total sample size was 47 people.

The data collected was processed and analyzed descriptively to see the frequency distribution based on characteristics. Changes in serum electrolytes (sodium, potassium, and chloride) were evaluated with a paired T-Test if the distribution was normal, if not normal, use the Wilcoxon Test with $P < 0.05$ which was declared significant.

III. RESULTS

From total of 47 patients sampled, 26 (55.3%) were male patients and 21 (44.7%) were female patients. From the research data it is known that there were 20 (42.6%) patients who had PCNL on the right side and 27 (57.4%) on the left side. The mean values of sodium, potassium and chloride before PCNL were 135.72 ± 5.97 , 3.79 ± 0.76 and 103.74 ± 3.37 , respectively. Meanwhile, the average values of sodium, potassium, and chloride after PCNL were 134.17 ± 4.42 , 3.61 ± 0.57 and 103.49 ± 3.24 . While the duration of the PCNL operation, 19 patients (40.4%) were done in less than 2 hours and 28 patients (59.6%) were done more than 2 hours.

Table 1. Demographic Characteristics of Samples

Variable	n (%)	Mean \pm SD
Gender		
Male	26 (55.3)	
Women	21 (44.7)	
Sodium		
Before PCNL (mEq / L)		135.72 ± 5.97
After PCNL (mEq / L)		134.17 ± 4.42
Potassium		
Before PCNL (mEq / L)		3.79 ± 0.76
After PCNL (mEq / L)		3.61 ± 0.57
Chloride		
Before PCNL (mEq / L)		103.74 ± 3.37
After PCNL (mEq / L)		103.49 ± 3.24
PCNL action		
Right	20 (42.6)	
Left	27 (57.4)	
Duration		
<2 hours	19 (40.4)	
≥ 2 hours	28 (59.6)	
Bleeding	90 (5 - 250)	

From the data in table 2 below, it is known that the sodium value before and after PCNL has a mean difference of 1.90 with CI 95% -0.13 - 3.95, so that the p value > 0.05 means that it is not statistically significant. It is also known that the value of potassium before and after PCNL has a mean difference of 0.47 with a CI 95 -0.19 - 1.13, so that the p value > 0.05 , which means that it is not statistically significant. From table 4.2 it is also known that the chloride value before and after PCNL has a mean difference of 0.45 with CI 95% -0.68 - 1.59, so that the p

value > 0.05 , which means that it is not statistically significant. It can be concluded that the values of sodium, potassium and chloride before and after PCNL were not statistically significant.

Table 2. Difference in electrolytes of sodium, potassium, and chloride before and after PCNL with a duration of operation <2 hours (n = 19)

Variable	Before	After	Mean diff. (95% CI)	p value
Sodium (mEq / L)	135.91 ± 5.87	134.00 ± 5.32	1.90 (-0.13-3.95)	0.064
Potassium (mEq / L)	4.08 ± 0.80	3.60 ± 0.16	0.47 (-0.19-1.13)	0.144
Chloride (mEq / L)	102.36 ± 2.33	101.91 ± 1.64	0.45 (-0.68-1.59)	0.395

In Table 3, the comparison of sodium levels before and after the action was compared to the right or left PCNL action. On the right PCNL, it was found that the mean difference in sodium levels was 2.0 with CI 95% -1.47-5.47 so that the p value was > 0.05 , which means that there was no statistically significant relationship. The left PCNL action was also performed a comparison which resulted in the mean difference value of 1.22 with CI 95% -0.38-2.83 which has a value of $p > 0.05$ so that there is no statistically significant difference. So that sodium levels have no difference with either right or left PCNL action.

Table 3. Comparison of Sodium to PCNL Action

Action	Sodium levels		Mean Difference	P value
	Before	After		
PCNL Right (n = 20)	136.55	134.55 ± 5.14	2.00 (-1.47-5.47)	0.243
PCNL Left (n = 27)	135.11	133.89 ± 3.88	1.22 (-0.38-2.83)	0.131

IV. DISCUSSIONS

In the treatment of kidney stones, there are several actions that can be chosen, depends on its classification, one of which is percutaneous nephrolithotomy (PCNL).⁴ In its implementation, irrigation fluid is used to make it easier to puncture and prevent stone fragments from entering the ureter, but this has the risk of absorption of fluid intravascularly so that it can interfere with electrolytes, hemodynamics and metabolic changes in PCNL patients.^{3,4}

In this study, various characteristics were obtained from the processed sample, from a total of 47 patients tested, 26 (55.3%) were male and 21 (44.7%) patients were female. The same thing was also found in a study conducted by Sekar et al (2018), most of the subjects were men (n = 25, 62.50%) followed by women (n = 15, 37.50%). Based on the location of the kidneys performed by PCNL, 20 (42.6%) were right kidneys and 27 (57.4%) were left kidneys. In contrast, in a

study showed that with 142 kidney units, PCNL was performed on 85 right kidneys and 57 left kidneys.^{5,6}

In the results of the study, in general, there was a change in sodium levels where before the PCNL action the mean sodium was 135.72 +5.97 and after the action it was found that the mean sodium was 134.17 + 4.42. It was also found that the sodium level before the procedure was 138.65 and after the PCNL action was 139.8 with a p value of 0.211 so that there was also no significant difference in changes in sodium levels in patients after the procedure.⁴ There was a statistically significant decrease, where the initial sodium level was 139,875 while the final result was 137,725. but although statistically this means that the decrease in sodium levels that occurs does not require action to correct sodium levels.⁷ This can occur because there is intervention in the kidney and irrigation. which continues to the vital organs, namely the kidneys.^{8,9}

There were differences in sodium levels between the pre-operative (mean-140.60, SD-3.03), intra-operative (mean-141.00, SD-1.28) and post-operative (mean138.85, SD-3.26) with p value <0.05 with 2 factor ANOVA without replication test.⁵ This can occur because there is intervention in the kidneys and continuous irrigation of vital organs, namely the kidneys.^{8,9} There were also differences in sodium levels between the pre-operative (mean-140.60, SD-3.03), intra-operative (mean-141.00, SD-1.28) and post-operative (mean138.85, SD-3.26) with p value <0.05 with 2 factor ANOVA without replication test.⁵

This can occur because there is intervention in the kidneys and continuous irrigation of vital organs, namely the kidneys.^{8,9} The same thing was also found in the Sekar et al (2018) study where there were differences in sodium levels between the pre-operative (mean-140.60, SD-3.03), intra-operative (mean-141.00, SD-1.28) and post-operative (mean138.85, SD-3.26) with p value <0.05 with 2 factor ANOVA without replication test.⁵

In this study, it was also seen related to the relationship between electrolyte levels which were affected by the part of the kidney that was carried out by PCNL, in the PCNL that was done on the right, the sodium level found before the action was 136.55 + 6.5mEq / L and after action is 134.55±5.14 mEq / L with a p value of 0.243, it was found that the pre-action value was 3.61 + 0.71 mEq / L and after the action is 3.50-±0.54 mEq / L with p value> 0.05, while the chloride content before treatment was 103.95 + 3.22 mEq / L and the after-action score was 103.40±3.10 mEq / Lwith p value is 0.118. At the left PNCL location, it was found that the pre-treatment sodium levels were 135.11 + 5.6mEq / L and after action is 133.89 + 3.88 mEq / L with p value is 0.131 and the potassium level is found to be 3.93 + 0.79 mEq / L and after action the potassium content was 3.70 + 0.59 mEq / L with a mean value of 0.22 and a p value of> 0.05 was obtained, while the chloride content before the action was 103.59 + 3.54 mEq / L whereas after the action the value was 103.56 + 3.40 mEq / Lwith p value is 0.131, so it can be concluded that there is no statistically significant difference between electrolyte levels

and the location where PCNL was performed. So that in this study there was no significant difference between the electrolyte values before and after the PCNL action.

V. CONCLUSION

There is no meaningful difference between electrolyte levels before and after PCNL based on the duration of action.

ACKNOWLEDGMENT

The authors gratefully acknowledge that this study support by Department of Surgery, Adam Malik General Hospital Medan, Indonesia.

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AUTHORS

First Author – M. Bob Muharly Rambe, Department of Surgery, Adam Malik General Hospital Medan, Indonesia. Email: dr.bobrambe@gmail.com

Second Author – Dhirajaya Dharma Kadar, Department of Surgery, Urology Division, Adam Malik General Hospital Medan, Indonesia. Email: dhira303@yahoo.com

Third Author – Ramlan Nasution, Department of Surgery, Urology Division, Adam Malik General Hospital Medan, Indonesia. Email: ramlan_doc@yahoo.com

Correspondence Author M. Bob Muharly Rambe, email: dr.bobrambe@gmail.com, phone number: +628136260014