Nephro-Urol Mon. 2021 February; 13(1):e111895. doi: 10.5812/numonthly.111895.

Published online 2021 February 16. **Research Article**

Dopamine and Drip Lasix in Pediatrics with Oliguria: A Clinical Trial Study

Maryam Ghaderi Dehkordi [1], Parsa Yousefichaijan [2], Yazdan Ghandi [3], Fatemeh Dorreh [4], Saeed Alinejad [1] and Masoud Rezagholizamenjany [5,*]

[1]Department of Pediatric, School of Medicine, Arak University of Medical Sciences, Arak, Iran
[2]Amir Kabir Hospital, Department of Pediatric Nephrology, Arak University of Medical Sciences, Arak, Iran
[3]Amir Kabir Hospital, Department of Pediatric Cardiology, School of Medicine, Arak University of Medical Sciences, Arak, Iran
[4]Department of Pediatric, Arak University of Medical Sciences, Arak, Iran
[5]School of Medicine, Arak University of Medical Sciences, Arak, Iran

[*]*Corresponding author*: School of Medicine, Arak University of Medical Sciences, Arak, Iran. Email: masoudrezagholi074@gmail.com

Received 2020 December 05; **Accepted** 2021 January 15.

Abstract

Background: Urine volume less than 1 mL/kg/h is called oliguria. The treatment of these patients is very important.
Objectives: This study aimed to compare efficacy of dopamine and drip Lasix in children with oliguria.
Methods: This study was performed as a clinical trial in the NICU, PICU, neonatal and pediatric wards of Amirkabir hospital in Arak. Children with oliguria with less than 1 mL/kg/h during treatment were considered the study group. Sixty children who met the inclusion criteria were selected and randomly divided into two groups, including 30 children in the dopamine group and 30 children in the Lasix group. In the dopamine group, the drug was administered at a dose of 3 μg/kg/min, in the second group, drip Lasix was administered at a dose of 0.05 mg/kg/h.
Results: In this evaluation, after evaluating the patients in both groups, it was observed that mean $\pm$ SD of age was 2.76 $\pm$ 1.85 years, and 51.7% of children have female gender (P = 0.438). The mean $\pm$ SD of creatinine in children after receiving dopamine and drip Lasix was 0.87 $\pm$ 0.2 mg/dl (P = 0.0001) and 0.84 $\pm$ 0.17 mg/dl (P = 0.000), respectively.
Conclusions: Both drip Lasix and dopamine improved the condition of patients with oliguria. In addition, there was no statistically significant difference between these two drugs, so both drugs could improve the condition of patients.

Keywords: Dopamine, Drip Lasix, Oliguria

1. Background

Acute kidney failure (acute renal injury) is a condition in which kidneys cannot preserve the normal homeostasis of electrolytes and water. Kidney failure occurs when the kidneys are unable to excrete metabolic wastes or perform regulatory functions (1). In acute renal failure, substances that are naturally excreted in the urine accumulate in body fluids, causing endocrine and metabolic dysfunction as well as impaired water and electrolyte regulation and acidosis. Kidney failure, as an acute or chronic condition, manifests to oliguria or anuria (2, 3).

Oliguria, as urination less than 1 cc/k/h, occurs in 25% of male and 7% of female infants during labor. Approximately 95% of healthy and premature infants urinate in the first 24 hours and 98% in the first 48 hours of birth (4). Accordingly, the importance of oliguria and anuria is determined. For a proper treatment of a patient with acute renal failure (ARF), fluids should be consumed, and the rate of urinary excretion should be carefully monitored (5). Energy intake should be 35 - 50 Kcal/kg/day, and salt intake should be up to 2 to 4 g/day. In addition to fluids, diuretics, such as furosemide infusion, are also used. Dopamine at a low dose of 3 μg/kg/min can preferably dilate the renal arteries and lead to diuresis when a person is unresponsive to dopamine, it is recommended to dialysis (6, 7). Based on the etiology of oliguria and anuria, different therapeutic methods are used.

2. Objectives

The aim of this study was to compare dopamine and drip Lasix efficacy in children with oliguria.

3. Methods

This study was performed to evaluate dopamine and furosemide efficacy on renal function in oliguria cases.

In this study, patients with oliguria or anuria in Amirkabir hospital in Arak, whose urine volume were less than 1 mL/kg/h and met the inclusion criteria, were included in the study. These cases were the hospitalized children who were admitted to NICU, PICU, and the wards of infants and pediatrics. In total, 60 cases with oliguria were required to be studied, based on the inclusion criteria. Then, cases were randomly divided into two groups, and their urinary volume improvement was assessed after the treatment.

In the first group, dopamine was administered at a dose of 3 μg/kg/min, and in the second group, Lasix drip was administered at a dose of 0.05 mg/kg/h. Then, the improvement of urinary volume in the two groups of patients was evaluated after drug administration. For this purpose, the patients' urine volume was evaluated in 4 - 6 hours intervals, and the recovery rate was recorded.

3.1. Statistical Analysis

After collecting the data, they were analyzed with SPSS software (version 23) using Chi-square (Qualitative data) and Independent Sample T-test (Quantitative data).

4. Results

Of 60 evaluated cases with oliguria [dopamine (n = 30) and Lasix (n = 30) groups], the mean and standard deviation (SD) of age in total, dopamine, and drip Lasix groups were 2.76 $\pm$ 1.85, 2.83 $\pm$ 1.93, and 2.70 $\pm$ 1.81 years, respectively (P = 0.74), as well as in gender, 31 cases (51.7%) in total, 17 cases (56.7%) in the dopamine group, and 14 cases (46.7%) in the Lasix group were female, and the others were male (P = 0.43) (Table 1). The values of indicators related to the improvement of urinary status, including creatinine, sodium, potassium, time of first urination, and the amount of enhancement in urine volume before and after the treatment, are also seen in Table 2 and 3. Based on statistical evaluations, these indices did not show a statistically significant difference between the two groups before and after the treatment (P > 0.05).

5. Discussion

Oliguria, as urine excretion less than 1 cc/kg/h, may be due to acute kidney injury (AKI). Approximately 25% of male and 7% of female infants urinate during labor, and approximately, 95% of healthy and premature infants urinate in the first 24 hours and 98% in the first 48 hours of birth. Accordingly, urine volume reduction is determined. For a proper treatment of a neonate and child with acute renal failure (ARF), fluids should be consumed, and the rate of urine excretion should be carefully monitored. Treating these patients is often challenging, which highlights the importance of paying attention to new treatments.

In the current study, we observed that the mean $\pm$ SD of creatinine in children after receiving dopamine and drip Lasix was 0.87 $\pm$ 0.2 mg/dl and 0.84 $\pm$ 0.17 mg/dl, respectively. Also, other evaluated indices, including urea, sodium, potassium, the rate of urine improvement, and volume of urine improvement, did not show statistically significant differences in the two groups; thus, dopamine and drip Lasix had similar performance in neonates with oliguria and anuria.

Keiseb et al. examined the effects of dopamine and furosemide on patients with oliguria and observed that the recovery rate was 20% in 80 cases at 4 hours of a period of follow-up. Also, they mentioned that there was no statistically significant difference in the mean of urine output, change in urine output and the mean of urea and creatinine in both groups (8). Moreover, Bell et al., regarding the effect of dopamine on oliguria, reported that the two groups were similar in baseline characteristics and renal function. They also stated that there was not a statistically significant difference between the dopamine and placebo groups in the serum creatinine concentration (9). In another study, Sirivella et al. stated that injection of mannitol, furosemide, and dopamine in three groups increased diuresis in patients with postoperative renal failure while decreased the need for dialysis in most patients (10). Lindner et al., regarding the therapeutic effects of furosemide and dopamine combination, stated that this combination was uniformly associated with the reduction of serum creatinine levels (11). Also, Lassnigg et al. examined the efficacy of dopamine or furosemide in the prevention of AKI after cardiac surgery and found that plasma creatinine enhancement was twice as high in the furosemide group compared with dopamine and placebo groups (P < 0.01) (12). Based on the discussed studies that were consistent with the results of the present study, dopamine and drip Lasix could improve patients' condition with oliguria and anuria.

5.1. Conclusion

Based on the present study and in comparison to other studies in this field, both drip Lasix and dopamine improved the condition of patients with oliguria. In addition, there was no statistically significant difference between these two drugs, so both drugs could improve the condition of patients; however, further studies are needed to compare two drugs in oliguria and anuria.

Acknowledgments

This work was performed in partial fulfillment of the requirements for Maryam Ghaderi Dehkordi, in School of Medicine, Arak University of Medical Sciences, Arak, Iran.

Table 1. Age and Gender of Evaluated Cases

Variables	Groups			P-Value
	Dopamine	Lasix Drip	Total	
Age (y)				0.74 [a]
Mean	2.83	2.70	2.76	
SD	1.93	1.81	1.85	
Gender				0.43 [b]
Male	13 (43.3)	16 (53.3)	29 (48.3)	
Female	17 (56.7)	14 (46.7)	31 (51.7)	

[a] Using Independent Sample T-test.
[b] Using Repeated Measure test.

Table 2. Creatinine, Urea, and Electrolytes Before and After Treatment in Two Groups

Variables	Group			P-Value [a]
	Dopamine	Lasix Drip	Total	
Creatinine (mean ± SD)				0.84
Before	1.36 ± 0.31	1.24 ± 0.25	1.30 ± 0.28	
After	0.87 ± 0.20	0.84 ± 0.17	0.85 ± 0.19	
Urea (mean ± SD)				0.65
Before	40.56 ± 1.19	40.53 ± 1.13	40.54 ± 1.16	
After	23.83 ± 4.45	23.73 ± 4.45	23.78 ± 4.45	
Sodium (mean ± SD)				0.56
Before	141.96 ± 1.42	141.70 ± 1.53	141.83 ± 1.48	
After	140.70 ± 1.72	140.93 ± 1.55	140.81 ± 1.64	
Potassium (mean ± SD)				0.68
Before	3.98 ± 0.11	4.00 ± 0.21	3.99 ± 0.16	
After	4.16 ± 0.24	4.09 ± 0.21	4.12 ± 0.22	

[a] Using Independent Sample T-test

Table 3. Urination Condition of Evaluated Cases in Two Groups

Variables	Group			P-Value [a]
	Dopamine	Lasix Drip	Total	
Time of first urination				0.97
Mean	16.56	16.50	16.53	
SD	9.13	9.19	9.08	
Urine Volume				0.42
Mean	7.34	6.83	7.08	
SD	2.69	2.16	2.44	

[a] Using Independent Sample T-test

Footnotes

Authors' Contribution: All authors equally contributed to the manuscript preparation and submission.

Clinical Trial Registration Code: IRCT20130518013366N12

Conflict of Interests: The authors declare they have no conflict of interests.

Ethical Approval: The present study was approved by the Ethics Committee of Arak University of Medical Sciences, with the ethics code: IR.ARAKMU.REC.1398.165. The principles of confidentiality were observed at all stages of the study. At all stages, researchers complied with the Helsinki declarations. No additional costs were imposed on patients. In the process of the treatment, no changes were made, and routine treatment was performed on patients of the two groups.

Funding/Support: This study was funded by Arak University of Medical Sciences.

Informed Consent: Written informed consent was obtained from all participants.

References

1. Allegaert K, Smits A, van Donge T, van den Anker J, Sarafidis K, Levtchenko E, et al. Renal precision medicine in neonates and acute kidney injury: How to convert a cloud of creatinine observations to support clinical decisions. *Front Pediatr*. 2020;**8**:366. doi: 10.3389/fped.2020.00366. [PubMed: 32850523]. [PubMed Central: PMC7399072].
2. Yousefichaijan P, Rezagholizamenjany M, Rafiei F, Taherahmadi H, Rafiei M. The relationship between blood biomarkers level and the prognosis of nephrotic syndrome in the children. *Int J Pediatr*. 2016;**4**(9):3489–97.
3. Pham JT, Jacobson JL, Ohler KH, Kraus DM, Calip GS. Evaluation of the risk factors for acute kidney injury in neonates exposed to antenatal indomethacin. *J Pediatr Pharmacol Ther*. 2020;**25**(7):606–16. doi: 10.5863/1551-6776-25.7.606. [PubMed: 33041715]. [PubMed Central: PMC7541026].
4. Wu Y, Hua X, Yang G, Xiang B, Jiang X. Incidence, risk factors, and outcomes of acute kidney injury in neonates after surgical procedures. *Pediatr Nephrol*. 2020;**35**(7):1341–6. doi: 10.1007/s00467-020-04532-4. [PubMed: 32232634].
5. Yousefichaijan P, Safi F, Saleh Jafari A, Movahedkia R, Rezagholizamnjany M, Rafiei M, et al. Etiology of hydronephrosis in neonates. *Nephrourol Mon*. 2018;**10**(2). doi: 10.5812/numonthly.65307.
6. Alinejad S, Yousefichaijan P, Rezagholizamenjany M, Rafie Y, Kahbazi M, Arjmand A. Nephrotoxic effect of gentamicin and amikacin in neonates with infection. *Nephrourol Mon*. 2018;**10**(2). doi: 10.5812/numonthly.58580.
7. Yousefichaijan P, Rezagholizamenjany M, Kahbazi M, Rafiei M, Taherahmadi H, Kaviani P, et al. The effect of vitamin A on clinical manifestations of recurrent pyelonephritis in children. *Nephrourol Mon*. 2020;**12**(3). doi: 10.5812/numonthly.103278.
8. Arulkumaran N, Lightstone L. Severe pre-eclampsia and hypertensive crises. *Best Pract Res Clin Obstet Gynaecol*. 2013;**27**(6):877–84. doi: 10.1016/j.bpobgyn.2013.07.003. [PubMed: 23962474].
9. Bellomo R, Chapman M, Finfer S, Hickling K, Myburgh J. Low-dose dopamine in patients with early renal dysfunction: A placebo-controlled randomised trial. Australian and New Zealand intensive care society (ANZICS) clinical trials group. *Lancet*. 2000;**356**(9248):2139–43. doi: 10.1016/s0140-6736(00)03495-4. [PubMed: 11191541].
10. Sirivella S, Gielchinsky I, Parsonnet V. Mannitol, furosemide, and dopamine infusion in postoperative renal failure complicating cardiac surgery. *Ann Thorac Surg*. 2000;**69**(2):501–6. doi: 10.1016/s0003-4975(99)01298-9. [PubMed: 10735688].
11. Lindner A. Synergism of dopamine and furosemide in diuretic-resistant, oliguric acute renal failure. *Nephron*. 1983;**33**(2):121–6. doi: 10.1159/000182925. [PubMed: 6835459].
12. Lassnigg A, Donner E, Grubhofer G, Presterl E, Druml W, Hiesmayr M. Lack of renoprotective effects of dopamine and furosemide during cardiac surgery. *J Am Soc Nephrol*. 2000;**11**(1):97–104. [PubMed: 10616845].