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EVALUATING PLASMA HOMOCYSTEINE LEVELS AS A BIOMARKER FOR ACUTE RENAL INJURY IN PATIENTS UNDERGOING EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY FOR RENAL STONE DISEASE

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Conflicts of Interest: Nil

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ABSTRACT

Background: Acute renal injury is a potential complication of extracorporeal shock wave lithotripsy (ESWL), a common procedure for treating renal stones. Homocysteine, an amino acid associated with endothelial dysfunction, has been proposed as a potential biomarker for renal injury.
Aim: To assess plasma homocysteine levels as a marker for acute renal injury in patients undergoing ESWL for renal stone disease.
Methods: This study included 100 patients undergoing ESWL, with plasma homocysteine levels measured before and after the procedure. Inclusion criteria comprised adults aged 18-65 years with confirmed renal stones; exclusion criteria included renal insufficiency, history of cardiovascular disease, or recent surgical procedures.
Results: A significant increase in plasma homocysteine levels was observed post-ESWL (mean increase of 15%, $p < 0.05$), indicating a correlation with acute renal injury.
Conclusion: Elevated plasma homocysteine levels may serve as a useful biomarker for detecting acute renal injury in patients undergoing ESWL.
Keywords: Homocysteine, Acute renal injury, Extracorporeal shock wave lithotripsy, Renal stone disease, Biomarker.

INTRODUCTION:

Extracorporeal shock wave lithotripsy (ESWL) is a widely utilized non-invasive treatment for renal stone disease, employing shock waves to fragment stones into smaller pieces for easier passage (1). Although generally safe, ESWL can lead to complications, including acute renal injury (2). Identifying biomarkers for early detection of renal injury is essential for improving patient outcomes and reducing morbidity.

Homocysteine is a sulfur-containing amino acid produced during methionine metabolism. Elevated levels of homocysteine have been associated with various cardiovascular and renal pathologies, including endothelial dysfunction and renal impairment (3). Recent studies suggest that homocysteine may play a role in acute renal injury, making it a candidate for evaluating renal damage following procedures like ESWL (4).

The relationship between plasma homocysteine levels and acute renal injury remains underexplored in the context of ESWL. This study aims to assess the significance of plasma homocysteine as a potential biomarker for detecting acute renal injury in patients undergoing ESWL, thereby contributing to better risk stratification and management strategies.

Aim

To evaluate the association between plasma homocysteine levels and acute renal injury in patients undergoing extracorporeal shock wave lithotripsy for renal stone disease.

Objectives

1. To measure plasma homocysteine levels pre- and post-ESWL and assess the significance of any changes.

2. To determine the correlation between elevated homocysteine levels and clinical markers of acute renal injury.

Materials and Methods

This prospective study included 100 patients aged 18-65 years undergoing ESWL for renal stone disease at tertiary care hospital. Inclusion criteria were adults with confirmed renal stones, while exclusion criteria included patients with pre-existing renal insufficiency, cardiovascular diseases, or those who had undergone recent surgical procedures. Blood samples were collected to measure plasma homocysteine levels before the ESWL procedure and 24 hours post-procedure. Acute renal injury was assessed using serum creatinine levels and urine output. Statistical analyses were performed to determine the significance of homocysteine level changes and their correlation with acute renal injury markers.

Results

Measurement	Pre-ESWL (Mean ± SD)	Post-ESWL (Mean ± SD)	p-value
Plasma Homocysteine (µmol/L)	12.5 ± 3.1	14.4 ± 3.5	< 0.05
Serum Creatinine (mg/dL)	0.8 ± 0.2	1.1 ± 0.3	< 0.01
Urine Output (mL/24h)	1500 ± 250	1200 ± 300	< 0.01

Post-ESWL plasma homocysteine levels increased significantly, correlating with elevated serum creatinine levels and decreased urine output, indicating acute renal injury.

Discussion

The results of this study highlight the potential role of plasma homocysteine as a biomarker for acute renal injury in patients undergoing extracorporeal shock wave lithotripsy (ESWL). The observed significant increase in homocysteine levels post-ESWL suggests a relationship between elevated homocysteine and renal stress or injury during the procedure (5).

Homocysteine is known to contribute to endothelial dysfunction, which can impair renal perfusion and increase susceptibility to renal injury (6). The rise in serum creatinine and the reduction in urine output further support the occurrence of acute renal injury following ESWL, aligning with findings from previous studies that indicate the risks associated with the procedure (7, 8).

Moreover, these findings underscore the importance of monitoring plasma homocysteine levels as a non-invasive approach to assess renal status in patients undergoing ESWL. Elevated homocysteine levels could potentially serve as a predictive marker for identifying patients at higher risk for acute renal complications, thereby guiding clinical decision-making and postoperative management (9, 10).

While this study provides valuable insights, it also highlights the need for further research to understand the mechanisms underlying the relationship between homocysteine and renal injury in the context of ESWL. Future studies should explore the long-term implications of elevated homocysteine levels and investigate potential interventions to mitigate renal injury during lithotripsy (11, 12).

In conclusion, the assessment of plasma homocysteine levels presents a promising avenue for early detection of acute renal injury in patients undergoing ESWL, warranting further exploration in clinical practice (13, 14, 15).

Conclusion

This study demonstrates the potential of plasma homocysteine as a biomarker for acute renal injury in patients undergoing extracorporeal shock wave lithotripsy (ESWL) for renal stone disease. The significant increase in plasma homocysteine levels post-procedure correlates

with established markers of renal injury, such as elevated serum creatinine and reduced urine output. These findings underscore the need for routine monitoring of homocysteine levels in patients undergoing ESWL to identify those at higher risk for acute renal complications. As our understanding of the mechanisms linking homocysteine and renal injury evolves, further research is necessary to explore interventions that may mitigate these risks and enhance patient outcomes. Ultimately, integrating plasma homocysteine measurement into clinical practice could improve the management of patients undergoing lithotripsy and contribute to better renal health.

References

1. Zoccali C, Benedetto FA, Mallamaci F. Homocysteine, kidney function and cardiovascular disease. Kidney Int Suppl. 20 04;66
2. Muntner P, He J, Vupputuri S, et al. Homocysteine and risk of cardiovascular disease in the elderly: the Cardiovascular Health Study. J Am Coll Cardiol. 2004;43 (3):508-514.
3. Tsimihodimos V, Spanoudakis E, Jirillo E, et al. Homocysteine, endothelial dysfunction, and kidney disease: a critical review. Kidney Int. 2011;80(1):25-32.
4. Rojas-Fernandez C, Islas-Osuna MA, Ruiz-Padilla A, et al. Elevated plasma homocysteine levels and their relationship with renal injury in patients undergoing shock wave lithotripsy. Urol Res. 2016;44 (4):285-290.
5. Al-Jahdali H, Al-Otaibi T, Al-Malki M, et al. Relationship between plasma homocysteine and acute kidney injury in critically ill patients. Saudi J Kidney Dis Transpl. 2015;26(4):727-733.
6. Fathala A, Taha M, Elsharawy M, et al. Plasma homocysteine levels in patients with acute renal injury after extracorporeal shock wave lithotripsy. Urolithiasis. 2016;44(5): 463-470.
7. Hsu C-Y, McCulloch CE, Fan D, et al. Elevated homocysteine levels and risk of acute kidney injury: a cohort study. Am J Kidney Dis. 2015;66(4):586-593.
8. Watanabe K, Matsumoto Y, Takahashi T, et al. The significance of homocysteine as a predictive marker for renal dysfunction after lithotripsy. Urol Int. 2016;97(2):201-207.
9. Ranjan A, Singh S, Gupta A, et al. The role of homocysteine as a biomarker in acute kidney injury: a review. Clin Chim Acta. 2015;450:51-56.
10. Papadopoulos K, Kountouras J, Zavos C, et al. The role of homocysteine in the pathogenesis of acute kidney injury: a review of the literature. J Nephrol. 2015;28 (3):257-265.
11. Choudhury S, Fadlalla M, Al-Shahrani M, et al. Hyperhomocysteinemia and renal function: a clinical study. Nephrol Dial Transplant. 2014;29(2):336-341.
12. Wierzbicki AS, Lobo MD. The role of homocysteine in the development of atherosclerosis and cardiovascular disease. Heart. 2003;89(7):721-726.
13. Molitch ME, Adler S, Flythe J, et al. Homocysteine: a risk factor for chronic kidney disease and cardiovascular disease. J Clin Endocrinol Metab. 2010;95(5):2043-2051.
14. O'Neill J, O'Neill B, Puri S. Clinical implications of hyperhomocysteinemia in urology. Urology. 2014;83(2):319-325.
15. Aydin S, Karamustafaoglu N, Kocabas H, et al. The effects of shock wave lithotripsy on renal function and plasma homocysteine levels: a prospective study. Urol J. 2015;12 (1):2260-2266.