

Lymphocytopenia may be a new indicator for infected obstructed kidneys secondary to urinary stone disease

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Abstract

Objective: Infected obstructed kidney (IOK) is a urological emergency. We wanted to look at the role of serum inflammatory markers in these patients.

Materials and Methods: Patients with IOK requiring percutaneous nephrostomy (PCN) at our university hospital were identified, and data were collected on lymphocyte count, C-reactive protein (CRP) and microbiology results.

Results: Thirty-nine patients had PCN for IOK. Lymphocytopenia was seen in two-thirds of these patients. Severe lymphocytopenia was associated with a significant rise in CRP in all cases and following PCN, lymphocytopenia improved in the majority of cases.

Conclusions: Lymphocytopenia seems to be associated with the severity of infection and could be a surrogate marker on its own or in conjunction with CRP for initial diagnosis and monitoring response to treatment in patients with IOKs.

Key Words: Calculi, infected obstructed kidney, lymphocytopenia, nephrostomy

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INTRODUCTION

Renal colic secondary to urolithiasis represents a common urological emergency, occasionally presenting as infected obstructed kidney (IOK) that needs urgent assessment and surgical decompression. Delay in early diagnosis and treatment of IOK can lead to loss of renal function and or severe sepsis, which can even lead to death.^[1] Diagnosis is aided by serum inflammatory markers such as leucocyte count, C-reactive protein (CRP), lymphocyte and neutrophil count, and radiological imaging by ultrasound and computed tomography

scan. Emergency surgical decompression for these cases is achieved by a percutaneous nephrostomy (PCN) or a ureteric stent insertion.^[2,3]

We wanted to see if there was a correlation between serum inflammatory markers such as lymphocyte count and pyonephrotic obstructed kidneys secondary to urinary stone disease.

MATERIALS AND METHODS

Between August 2009 and August 2012, patients with IOK and sepsis requiring PCN at our university hospital were identified. Electronic data for these patients was obtained from radiology reporting system (computerized radiology information system), microbiology results and inpatient records. Data were collected on radiological findings (stone size, site), pre- and post-PCN serum and urine microbiology culture results, blood parameters (creatinine, leukocyte, neutrophil, lymphocyte counts and CRP [CRP, mg/L]) and final treatment outcome. Lymphocytopenia was defined in our institute as

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lymphocyte count <1.6 cells/μL and severe lymphocytopenia as lymphocyte count <1 cells/μL. All results were recorded on Excel spread sheet and were analyzed using Statistical Package for the Social Sciences (SPSS) version 19.

RESULTS

Thirty-nine patients had PCN for IOK secondary to stone disease [Table 1]. The mean age was 55 years (range: 22–92 years) with 12 males and 27 females in our study. All patients had stone disease with a mean stone size of 14 mm (range: 4–50 mm). Of these 18 were renal stones (staghorn stone - 5; pelviureteric junction stone - 13) and 21 were ureteric stone (proximal ureter - 7; mid ureter - 4; distal ureter - 5; vesicoureteric junction - 5).

Microbiology culture results were available for 38 of these patients. Of these 20 (53%) had a positive culture on microbiology. Positive results were seen in 16 mid-stream urine, 14 nephrostomy and 9 blood cultures. Only one patient had culture positive results in all three specimens. The commonest organisms were *Escherichia coli* (n = 18), *Proteus* (n = 4) and *Enterococcus* (n = 4) species. Although pus/discolored nephrostomy fluid were seen in 11 patients, only 5 were culture positive.

Pre-nephrostomy the mean lymphocyte count was 1.3 (range: 0.1–3.8) and the leucocyte count, neutrophil count and CRP were 14.3 (1.8–34.6), 11.6 (1.4–31.6), and 205 (4–483) respectively. Lymphocytopenia was seen in 25 (64%) and a significant rise in CRP (CRP > 40) was seen in 31 (79%). Severe lymphocytopenia was associated with a rise in CRP in all cases [Figure 1] and following PCN, lymphocytopenia improved in majority of cases 22/25 (88%). Post-nephrostomy the mean lymphocyte count improved to 1.6 (range: 0.6–5.2) and the leucocyte count, neutrophil count and CRP were 12 (5.3–31.7), 8.5 (3.6–20.1), and 165 (11–418), respectively.

DISCUSSION

This study represents the first in literature to investigate the link between lymphocytopenia and IOK. In our cohort of patients,

Table 1: Patient demographics and stone characteristics

Age	Mean - 55 years (range: 22-92)
Male:Female	12:27
Right:Left	21:18
Stone size	Mean - 14 mm (range: 4-50 mm)
Stone site	Staghorn stone - 5
	PUJ - 13
	Proximal ureter - 7
	Mid ureter - 4
	Distal ureter - 5
	VUJ - 5

PUJ: Pelviureteric junction, VUJ: Vesicoureteric junction

nearly two-thirds of patients with IOK had lymphocytopenia. Lymphocytopenia was present in three-quarter of the patients with normal leucocytes and more than half of the patients with normal CRP. There was also a correlation of severe lymphocytopenia with patients with a CRP >40 [Figure 1]. All these patients had their lymphocyte and CRP counts improved or normalized after treatment. Our finding could help identifying patients with potential obstructed infected kidney and prompt early drainage. Furthermore, it could predict patients that need close observation after drainage.

Lymphocytopenia is nearly always linked to human immunodeficiency virus infections, or due to idiopathic CD4 lymphocytopenia.^[4] It also can be found in patients with other conditions such as systemic lupus erythematosus, severe stress, intense physical exercise and sarcoidosis.^[5-8] This is due to the reduction in the number of T cell lymphocytes.

However, transient lymphocytopenia can occur in other infections and have been a subject of studies in other fields. Okamura *et al.*^[9] concluded that lymphocytopenia can be a marker for in-hospital deaths due to tuberculosis infections. He found it to be statistically significant along with hypoalbuminemia. Another study done by de Jager *et al.* has concluded that absolute lymphocytopenia is associated with patients having severe Legionnaires' disease.^[10] In addition, Fox *et al.* used lymphocytopenia as an early marker in patients with H1N1 flu infections. They also noticed that the number of lymphocyte count improved and nearly normalized when patients recovered.^[11] Sharon *et al.* further confirmed this, while studying similar population.^[12]

Sereti provided an explanation for the presences of lymphocytopenia in severe infections.^[13] He demonstrated how T-lymphocytes do redistribute as a response to interleukin-7, which could be produced at the tissue level as a response to infection. He hypothesized that lymphocytes do redistribute to local lymphoid tissues, skin and gut due to infections rather than the absolute reduction in lymphocyte numbers. One other

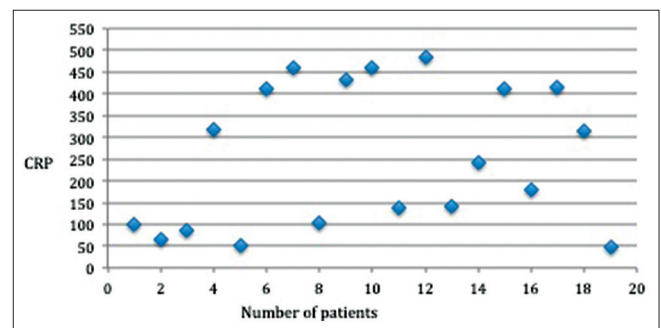


Figure 1: C-reactive protein (mg/L) in patients with severe lymphocytopenia

aspect to be investigated using this finding is to check if the level of lymphocytopenia can predict the severity of infection and if patients could have a scoring system to predict the severity of infection and arrange appropriate follow up.

Other markers have been investigated as guidance for drainage procedure. However, this has never been translated into practice. Angulo *et al.*, concluded that a mean CRP level of 139.6 mg/L (confidence interval, 13–183.1) is a significant indication for urinary diversion.^[14] In our study, mean CRP was 205 (4–483) and this probably is comparable, however we found that lymphocytopenia could help identifying patients with normal CRP.

Although our study provides insight into the correlation of lymphocytopenia with IOK, prospective studies on a larger number of patients are needed to validate this. Being a retrospective study, there was no control group and other confounding variables such as co-morbidity index was not analyzed.

CONCLUSION

Lymphocytopenia seems to be associated with the severity of infection and may be a surrogate marker on its own or in conjunction with CRP for initial diagnosis and monitoring response to treatment in patients with IOKs.

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