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THE IMPACT OF CHRONIC PYELONEPHRITIS ON RENAL FUNCTIONAL STATUS: A RETROSPECTIVE ANALYSIS

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Abstract

Chronic pyelonephritis is a progressive inflammatory disease of the renal parenchyma and collecting system that may lead to irreversible structural damage and gradual impairment of kidney function. Persistent infection, recurrent inflammation, and renal scarring contribute to deterioration of glomerular filtration and development of chronic kidney disease. The aim of this study was to evaluate the impact of chronic pyelonephritis on renal functional status through retrospective clinical analysis. Medical records of patients diagnosed with chronic pyelonephritis were analyzed with special attention to laboratory indicators, renal function parameters, disease duration, and associated complications. The findings demonstrated that prolonged inflammatory activity significantly affects renal functional capacity and is associated with decreased glomerular filtration rate, proteinuria, hypertension, and progressive renal insufficiency. Early diagnosis and timely therapeutic interventions are essential for preventing irreversible renal damage and improving long-term clinical outcomes.

Keywords: chronic pyelonephritis, kidney function, renal insufficiency, glomerular filtration rate, chronic kidney disease, urinary tract infection, retrospective analysis.

Introduction

Chronic pyelonephritis is a long-term inflammatory disease affecting the renal parenchyma and pelvicalyceal system, commonly associated with recurrent urinary tract infections and progressive renal scarring [1]. The disease remains one of the important causes of chronic kidney dysfunction and secondary nephrosclerosis worldwide [2].

The pathogenesis of chronic pyelonephritis involves persistent bacterial infection, vesicoureteral reflux, urinary tract obstruction, immune-inflammatory responses, and progressive destruction of renal tissue [3]. Repeated inflammatory episodes gradually lead to tubular atrophy, interstitial fibrosis, vascular changes, and impairment of nephron function [4].

Chronic pyelonephritis may occur in both adults and children and is more common among women due to anatomical and physiological factors [5]. Risk factors include recurrent urinary tract infections, nephrolithiasis, diabetes mellitus, congenital urinary tract abnormalities, catheterization, and immunosuppression [6].

Functional impairment of the kidneys develops progressively during chronic inflammation. Damage to glomerular and tubular structures results in decreased glomerular filtration rate (GFR),

impaired urine concentrating ability, electrolyte imbalance, and development of chronic renal insufficiency [7].

Several clinical studies indicate that prolonged pyelonephritic inflammation contributes significantly to the development of chronic kidney disease (CKD) and arterial hypertension [8]. Renal scarring and nephron loss reduce functional renal reserve and may eventually require renal replacement therapy in advanced cases [9].

Early identification of renal functional impairment is particularly important for preventing irreversible kidney damage. Laboratory indicators such as serum creatinine, urea, estimated glomerular filtration rate, proteinuria, leukocyturia, and bacteriuria are commonly used to assess renal function and disease progression [10].

Modern diagnostic approaches, including ultrasound, computed tomography, radionuclide imaging, and microbiological examination, allow improved detection of structural and functional renal abnormalities associated with chronic pyelonephritis [11].

Despite advances in nephrology and infectious disease management, chronic pyelonephritis remains clinically significant because recurrent inflammation may progress silently for many years before overt renal dysfunction becomes apparent [12].

The aim of this study was to perform a retrospective analysis of the impact of chronic pyelonephritis on renal functional status and evaluate major clinical and laboratory indicators associated with disease progression.

Materials and Methods

A retrospective clinical analysis was conducted using medical records of patients diagnosed with chronic pyelonephritis who received inpatient and outpatient treatment during the observation period.

The inclusion criteria consisted of patients with confirmed chronic pyelonephritis based on clinical symptoms, laboratory findings, microbiological examination, and imaging studies. Patients with acute kidney injury unrelated to pyelonephritis, severe systemic diseases, or incomplete medical records were excluded from the study.

Clinical evaluation included patient age, sex, duration of disease, frequency of exacerbations, blood pressure indicators, and associated comorbidities.

Laboratory investigations included complete blood count, urinalysis, urine culture, serum creatinine, blood urea nitrogen, electrolyte levels, proteinuria assessment, and estimation of glomerular filtration rate.

Ultrasound examination of the kidneys was performed to evaluate renal size, cortical thickness, parenchymal changes, and structural abnormalities.

Statistical analysis was performed using retrospective comparative methods. Functional renal indicators were analyzed according to disease duration and severity.

Results

The retrospective analysis demonstrated that chronic pyelonephritis significantly affects renal functional status, particularly in patients with prolonged disease duration and recurrent exacerbations.

Most patients showed laboratory signs of persistent inflammatory activity, including leukocyturia, bacteriuria, and elevated inflammatory markers. Progressive deterioration of renal function was associated with increasing serum creatinine and blood urea levels.

Reduction in estimated glomerular filtration rate was observed in a substantial proportion of patients with long-standing chronic pyelonephritis. Patients with recurrent episodes of infection demonstrated more pronounced impairment of renal filtration capacity.

Proteinuria was frequently identified and correlated with severity of renal parenchymal damage. Ultrasound examination revealed cortical thinning, renal asymmetry, deformation of the collecting system, and signs of nephrosclerosis in advanced cases.

Arterial hypertension was commonly observed among patients with chronic pyelonephritis and appeared closely associated with progressive renal dysfunction.

The severity of functional impairment increased with disease duration, recurrent infection frequency, and presence of urinary tract obstruction or nephrolithiasis.

Discussion

The findings confirm that chronic pyelonephritis is an important contributor to progressive renal functional impairment and chronic kidney disease development.

Persistent inflammatory processes within renal tissue lead to gradual destruction of nephrons, interstitial fibrosis, and vascular alterations. These pathological changes impair glomerular filtration and tubular function, resulting in progressive decline of renal reserve.

The observed reduction in glomerular filtration rate among patients with recurrent pyelonephritis episodes corresponds with previous nephrological studies demonstrating the association between chronic renal inflammation and nephrosclerosis.

Proteinuria identified in many patients reflects increased glomerular permeability and structural renal damage. Persistent proteinuria is considered an unfavorable prognostic factor associated with accelerated progression of chronic kidney disease.

The high prevalence of arterial hypertension in the examined population may be explained by activation of the renin-angiotensin-aldosterone system, sodium retention, and vascular alterations associated with chronic renal inflammation.

Ultrasound findings of cortical thinning and renal asymmetry indicate irreversible morphological damage resulting from chronic infection and fibrosis. Structural abnormalities strongly correlate with deterioration of functional renal parameters.

The retrospective analysis also emphasizes the importance of timely diagnosis and comprehensive treatment of urinary tract infections to prevent chronic pyelonephritic transformation and progressive renal dysfunction.

Modern management strategies should include early antibacterial therapy, correction of urinary obstruction, control of hypertension, nephroprotective treatment, and long-term monitoring of renal function.

Further prospective studies are required to identify early predictors of renal deterioration and optimize preventive therapeutic approaches in patients with chronic pyelonephritis.

Conclusion

Chronic pyelonephritis significantly affects renal functional status and may lead to progressive chronic kidney disease if not diagnosed and treated in a timely manner.

The retrospective analysis demonstrated that prolonged inflammatory activity contributes to reduction of glomerular filtration rate, proteinuria, nephrosclerosis, and arterial hypertension. Severity of renal dysfunction increases with recurrent exacerbations, disease duration, and associated urinary tract abnormalities.

Early diagnosis, adequate antibacterial therapy, regular monitoring of renal function, and nephroprotective strategies are essential for preventing irreversible renal damage and improving long-term prognosis in patients with chronic pyelonephritis.

Comprehensive clinical and laboratory evaluation remains important for assessing disease progression and optimizing individualized management of renal inflammatory disorders.

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