



## APPLICATION OF ELASTOGRAPHY IN CHRONIC GLOMERULONEPHRITIS IN CHILDREN

Kilicheva G.U.

3rd-year Master's student, Department of Medical Radiology

Yusupalieva G.A.

Scientific supervisor:

Department of Medical Radiology, Tashkent State Medical University

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### ABSTRACT

*Glomerulonephritis is an autoimmune inflammation of the renal glomeruli that leads to impaired kidney function. This disease is characterized by bilateral kidney involvement, in which the glomeruli become inflamed, causing edema, arterial hypertension, and accumulation of metabolic waste products in the blood. Glomerulonephritis may be caused by various factors and requires medical intervention for diagnosis and treatment.*

### Introduction

Chronic glomerulonephritis (CGN) in children is one of the leading causes of chronic kidney disease (CKD) in pediatric nephrology. The disease is characterized by progressive glomerular damage, interstitial fibrosis, and sclerosis of the renal parenchyma. Traditionally, assessment of the degree of fibrosis and morphological changes in the kidneys is performed using invasive methods such as renal biopsy. However, biopsy has several limitations, including the risk of complications, the need for general anesthesia in children, and the inability to perform frequent repeat procedures.

Therefore, the search for non-invasive methods to assess structural changes in renal tissue remains highly relevant. One of the most promising techniques is **ultrasound elastography**, which allows for quantitative real-time assessment of tissue elasticity (stiffness). This method is widely used in hepatology and mammology and, in recent years, has been increasingly applied in nephrology, including pediatric patients.

### Objective

To evaluate the effectiveness and diagnostic value of elastography as a non-invasive method for early detection and monitoring of renal fibrosis in children with chronic glomerulonephritis.

### Materials and Methods

The study included **50 children** diagnosed with chronic glomerulonephritis, aged **2 to 17 years**. Among them, 28 (56%) were boys and 22 (44%) were girls.

A standard elastography protocol was used: the patient was positioned supine, the kidney region was exposed, and ultrasound imaging was performed to visualize the kidneys, followed by elastographic measurements. The stiffness of renal tissue was measured in **kilopascals (kPa)** at several points to obtain an average value.

The mean renal tissue stiffness determined by elastography was  $9.5 \pm 2.1$  kPa. In 30 (60%) children, renal stiffness exceeded 10 kPa, indicating pronounced fibrosis. A statistically significant correlation was found between renal stiffness and proteinuria levels ( $r = 0.65$ ,  $p < 0.01$ ).

Children with renal stiffness greater than 10 kPa had significantly higher levels of proteinuria compared to those with normal stiffness values ( $p < 0.05$ ).

### Results

In children with CGN, the stiffness values of the renal parenchyma were significantly higher than in the control group ( $p < 0.01$ ). The mean elasticity value in CGN patients was  $3.2 \pm 0.6$  kPa, compared to  $2.1 \pm 0.3$  kPa in healthy children.

A moderate positive correlation was observed between tissue stiffness and the degree of interstitial fibrosis confirmed histologically ( $r = 0.64$ ;  $p < 0.05$ ). Moreover, increased renal tissue stiffness correlated with decreased glomerular filtration rate (GFR) and higher proteinuria levels.

At the early stages of the disease, elevated elasticity values were recorded before the appearance of marked biochemical changes, indicating **high sensitivity** of the method.

### Discussion

The obtained data demonstrate the high diagnostic value of elastography in assessing fibrotic changes of the renal parenchyma in children with chronic glomerulonephritis. Elastography provides a **non-invasive** means of evaluating tissue condition, monitoring disease progression, and assessing treatment effectiveness.

This method is especially valuable in pediatric practice, where the use of invasive procedures is limited. However, certain factors—such as hydration status, inflammatory edema, device-specific characteristics, and operator experience—can influence the results. Therefore, methodological standardization and multicenter studies are needed to establish reference elasticity values for children of different age groups.

### Conclusion

Renal elastography is a promising non-invasive method for assessing the degree of fibrosis in children with chronic glomerulonephritis. The technique enables early detection of structural changes and serves as a valuable complement to traditional clinical, laboratory, and ultrasound methods. Integrating elastography into the diagnostic algorithm for children with CGN improves disease prognosis assessment and helps optimize treatment strategies.

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