

DIAGNOSIS OF VARICOSE VEINS: TRADITIONAL AND INNOVATIVE METHODS

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Abstract: This article provides an in-depth analysis of diagnostic methods for varicose veins in modern medicine. Both traditional diagnostic methods (clinical examination, palpation, functional tests) and innovative technologies (duplex ultrasound dopplerography, computed tomographic venography, magnetic resonance tomography) are studied. The study compares the effectiveness, application areas, and clinical relevance of traditional and modern approaches, ultimately developing an optimal diagnostic algorithm. The article is of methodological value for researchers in phlebology as well as for practicing physicians.

Keywords: varicose veins, diagnostics, dopplerography, venography, ultrasound, tomography, innovation, clinical analysis, phlebology.

Introduction

Varicose veins are a chronic vascular disorder characterized by the dilation and deformation of superficial veins in the lower limbs, and they are among the most common circulatory system diseases worldwide. According to the World Health Organization (WHO), one in four women and one in six men in developed countries suffer from varicose veins. Early detection and accurate diagnosis of this condition significantly improve patients' quality of life and help prevent complications such as thrombosis, trophic ulcers, and phlebitis. The diagnosis of varicose veins has undergone a long evolutionary process in medical history. Initially, the diagnosis was based solely on clinical symptoms—such as visible vein enlargement, pain, heaviness, and skin color changes—but in modern times, advanced medical imaging technologies have become essential. Therefore, comparing traditional and innovative diagnostic approaches, identifying their advantages and limitations, remains a relevant scientific and practical issue. Today, innovative medical technologies such as duplex scanning, 3D venography, magnetic resonance imaging (MRI), and artificial intelligence-assisted vascular analysis offer great opportunities for the early detection of varicose veins. However, these methods are not always compatible with local infrastructure or economic conditions. Hence, accuracy, cost-effectiveness, and clinical feasibility serve as key criteria in choosing an appropriate diagnostic strategy. The aim of this study is to analyze traditional and innovative diagnostic methods for varicose veins, identify their differences, advantages, and disadvantages, and develop an optimal diagnostic mode.

Research methodology

The study is based on analytical, statistical, and comparative methods.

Literature Review: Over 50 national and international scientific articles published between 2015 and 2024 were analyzed.

Clinical Observation: Conducted on 120 patients (80 women, 40 men) diagnosed with varicose veins at the Phlebology Center of Tashkent Medical Academy.

Diagnostic Tests: Each patient underwent traditional (physical examination, Trendelenburg test, Perthes test) and innovative (duplex ultrasound, CT venography) diagnostic procedures.

Comparative Analysis: The obtained results were evaluated in terms of accuracy, duration, convenience, and invasiveness.

Statistical Processing: Mean values and confidence intervals were calculated using SPSS software; $p < 0.05$ was considered statistically significant.

Main part

1. Clinical characteristics of varicose veins

Varicose veins are typically associated with a loss of elasticity in the walls of the superficial veins of the lower limbs and the presence of blood reflux. The main risk factors include genetic predisposition, prolonged standing, pregnancy, hormonal changes, obesity, and physical inactivity.

Clinical signs include:

- ✓ Heaviness and fatigue in the legs;
- ✓ Evening swelling;
- ✓ Appearance of venous nodules;

Skin pigmentation and trophic changes.

The disease is classified into six stages according to the CEAP (Clinical–Etiological–Anatomical–Pathophysiological) system, which plays an important role in diagnosis.

2. Traditional diagnostic Methods

Traditional methods have been used by physicians for centuries. They are simple, inexpensive, and require no special equipment.

2.1. Clinical examination

The visual inspection and palpation of the patient's legs help identify venous enlargement, skin changes, edema, and trophic ulcers. The severity is assessed subjectively by the physician.

2.2. Trendelenburg test

Performed with the patient in a supine position; veins are compressed, and upon standing, the rate of vein refilling is evaluated. This helps identify valve insufficiency in the saphenofemoral junction.

2.3. Perthes test

Assesses the patency of deep veins during muscle contraction. It provides an approximate indication of thrombosis or deep vein insufficiency.

2.4. Classical phlebography

Radiographic imaging using contrast dye visualizes the venous network. While accurate, it is invasive and involves radiation exposure. Traditional methods are useful in detecting early stages but have limited accuracy, safety, and visualization compared to innovative approaches.

3. Innovative diagnostic methods

Modern diagnostic advancements include ultrasound dopplerography, duplex and triplex scanning, computed tomographic venography (CTV), and magnetic resonance venography (MRV).

3.1. Duplex ultrasound dopplerography

This is the most widely used and safest method. It evaluates venous blood flow, valve function, and the presence of reflux in real time with an accuracy of 95–98%.

3.2. Triplex scanning

An extension of duplex scanning that adds color Doppler and 3D mapping, which is especially valuable for surgical planning.

3.3. Computed tomographic venography (CTV)

Uses contrast material to visualize deep and superficial veins in high detail. It helps identify anatomical defects, thrombosis, and emboli.

3.4. Magnetic resonance venography (MRV)

Can visualize veins without contrast injection. It is radiation-free but expensive, used primarily in complex cases.

3.5. Artificial intelligence–assisted analysis

Recently developed software can automatically analyze ultrasound images, reducing human error and improving diagnostic speed.

4. Comparison between traditional and innovative methods

1.	Parameter	Traditional Methods	Innovative Methods
2.	Accuracy	60–75%	95–99%
3.	Invasiveness	Low or moderate	Low (ultrasound), high (CTV)
4.	Cost	Low	High
5.	Equipment need	Minimal	Advanced
6.	Diagnostic time	Long	Short
7.	Visualization	Limited	Real-time 3D

This comparison shows that traditional methods are practical and accessible, while innovative methods offer superior accuracy and visualization. An ideal diagnostic algorithm should combine both approaches.

5. Optimal diagnostic model

Based on the study results, the following step-by-step diagnostic algorithm is recommended:

Clinical examination – for preliminary assessment.

Duplex dopplerography – as the main diagnostic tool.

CT or MR venography – for complex or uncertain cases.

Phlebography – for preoperative precision when necessary.

This combined approach ensures diagnostic completeness and reliability.

Analysis and results

The diagnostic findings from 120 patients revealed:

Traditional tests detected varicose veins in 68% of cases.

Duplex dopplerography provided accurate diagnoses in 97% of cases.

CTV and MRV identified additional deep venous pathologies in 22% of patients.

The use of innovative methods reduced surgical errors by 30% and shortened diagnostic time by twofold.

The analysis indicates that diagnostic selection should consider the patient’s age, economic capacity, and clinical condition. Innovative methods are highly accurate but expensive; traditional methods are simple but limited. Therefore, a combined diagnostic approach yields the most effective results.

Conclusion

Varicose veins are a widespread yet often underestimated disease. For early detection, it is essential to integrate both traditional and innovative diagnostic methods. Duplex dopplerography is recognized as the current “gold standard,” while CT and MR venography provide added precision in complex cases. The study concludes that a comprehensive diagnostic system is the most effective approach in clinical practice. This ensures early detection, appropriate treatment selection, and a significant improvement in patients’ quality of life.

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