

**THE USE OF GUTTA-PERCHA IN MODERN ENDODONTICS**

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**Annotation.**

Gutta-percha is one of the most widely used materials for root canal obstruction in modern endodontics. Due to its physico-chemical properties, biocompatibility and ease of use, it occupies a central place in endodontic treatment. The main purpose of using gutta-percha is to hermetically fill the root canal system after their mechanical and drug treatment. The article discusses the composition, properties, methods of application of gutta-percha, as well as modern technologies of its use in clinical practice. Special attention is paid to the advantages of the material, possible disadvantages and prospects for further development of endodontic technologies.

**Keywords:** endodontics, gutta-percha, root canal obturation, filling materials, fillers, dentistry.

**Introduction.** The success of endodontic treatment depends by 90% on high-quality cleaning and subsequent three-dimensional sealing of the root canal system. The main purpose of obturation is to prevent micro—flow of microorganisms and their toxins from the carious cavity into the periapical tissues. Historically, gutta-percha in combination with various silers was considered the "gold standard". However, modern dentistry requires materials that are not only inert, but also capable of actively interacting with tooth tissues.

Modern materials for filling channels are usually divided into two main groups:

Solid fillers (rods): mainly gutta-percha and polymer-based materials.

Sealers (sealants): materials that provide a connection between the channel wall and the main filler.

For many decades, gutta-percha has remained the main material for filling root canals. Its widespread use is due to a combination of properties such as biological inertia, plasticity, dimensional stability and compatibility with various endodontic sealers.

Despite the development of new biomaterials, gutta-percha continues to be the "gold standard" for root canal obstruction. Modern technologies have made it possible to improve the methods of its use and increase the effectiveness of endodontic treatment.

Gutta-percha is a natural polymer obtained from the latex of some tropical plants, mainly of the genus Palaquium. In its pure form, it is rarely used in dentistry. The main chemical component of the material is trans-1,4-polyisoprene, which has elastic and thermoplastic properties. Endodontic pins contain a mixture of several components:

- gutta-percha (about 20%)
- zinc oxide (60-75%)
- waxes and resins
- Radiopaque substances (e.g. barium sulfate)
- dyes and antioxidants

This composition provides the material with the necessary clinical characteristics. Gutta-percha has good properties for filling root canals. Biocompatibility - the material practically does not cause toxic or allergic reactions from the tissues. Radiopaque - due to the addition of special substances, gutta-percha is well visualized on radiographs. Thermoplasticity - at a temperature of about 60-65 ° C, gutta-percha becomes plastic, which makes it possible to adapt it to the shape of

the root canal. Chemical inertia - gutta-percha does not enter into active chemical reactions with body tissues. Dimensional stability - after cooling, the material retains its shape and volume.

However, gutta-percha does not adhere to the canal walls, so it is always used in conjunction with endodontic sealers. Various types of gutta-percha pins are used in modern dental practice.:

1. Standardized pins. They comply with the international ISO system and have a certain diameter and taper.

2. Non-standardized pins. They are used for additional channel filling during lateral condensation.

3. Accessory pins. They are used to seal the space between the main pin and the channel walls.

The color marking of the pins corresponds to the size of the endodontic instruments.

In modern endodontics, there are several methods of root canal obturation using gutta-percha. The method of cold lateral condensation is one of the most common. It involves inserting the main gutta-percha pin into the channel, followed by sealing additional pins using a spreader. The advantages of the method are simplicity of execution, good scalability of the process, and the availability of tools. The disadvantage is the possibility of forming microspaces between the pins.

The hot vertical condensation method makes it possible to achieve a more dense channel filling due to the thermoplasticity of the material. Advantages: high tightness, better filling of the lateral canals, adaptation to the anatomy of the root canal. The disadvantages are more complex execution techniques and the need for special equipment.

The injection technique uses molten gutta-percha injected into the canal using special devices. Advantages of the method: high the fluidity of the material, the ability to fill complex anatomical structures. However, with the wrong technique, it is possible to remove the material beyond the top of the root.

Modern endodontic instrument systems allow the use of a single pin method corresponding to the shape of the prepared channel. Advantages: simplicity, shorter treatment time, compatibility with modern sealers. The disadvantage is that the success of the treatment depends on the quality of the sealer used.

The development of endodontic technologies has led to the emergence of new forms of gutta-percha and improved methods of its application.

Modern innovations include:

- Thermoplastic obturation systems
- gutta-percha with improved fluidity
- bioactive coatings of gutta-percha pins
- Compatible with bioceramic sealers

Such developments make it possible to increase the tightness of the obturation and reduce the risk of reinfection of the root canal.

Despite its many advantages, gutta-percha has a number of disadvantages, including lack of adhesion and limited antibacterial properties. Modern research is aimed at improving the characteristics of the material by adding various components: chlorhexidine, calcium hydroxide, iodoform, silver nanoparticles or zinc oxide. Such modifications make it possible to increase the antimicrobial activity of the material and improve the sealing of the root canal.

Studies show that the addition of antibacterial substances can enhance the effect of gutta-percha against microorganisms involved in the development of endodontic infection. However, it remains a difficult task to completely eliminate pathogens such as *Enterococcus faecalis*.

Despite the appearance of new materials, gutta-percha remains the main component of endodontic obturation. This is due to its high clinical reliability and long-term use experience.

The main limitation of the material is the lack of adhesion to dentin. Therefore, the success of treatment largely depends on the quality of the sealer and the technique of obturation.

Modern research is aimed at improving the properties of gutta-percha, including increasing its antibacterial activity and adhesion ability. The use of bioceramic sealers and thermoplastic techniques can significantly improve the effectiveness of endodontic treatment.

**Conclusion.**

Gutta-percha remains one of the most important materials in modern endodontics due to its unique physico-chemical and biological properties. The use of various obturation methods, including cold and hot condensation, allows the material to be adapted to the anatomical features of the root canals.

Modern technologies and new combinations of materials open up prospects for further improvement of endodontic treatment and increase its effectiveness.

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