

# Aesthetic Dentistry as an Independent Field of Dental Science and Practice

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**Annotation:** The need to define aesthetic dentistry as a field that has a history of development, a theoretical basis and the effectiveness of the practical implementation of the proposed developments and recommendations is shown. Presented stages of development of aesthetic dentistry in history, odontological parameters, history of teeth whitening, characteristics of tooth color, stages of development of filling materials and aesthetic designs. The principles on which modern aesthetic dentistry is based are formulated.

**Keywords:** filling materials, teeth whitening, aesthetic dentistry.

The active development of technical means and materials science for dentistry determined the rapid introduction of new clinical methods of restoration of teeth and dentition defects. High efficiency aesthetic designs turned out to be attractive to patients stimulated the majority of dentists to master and use practice of modern materials, primarily light-curing composites. In the current situation of mass the use of photopolymers, as well as various auxiliary means, devices and devices, the shortage of basic theoretical and scientific knowledge in the field of shape formation and color science becomes noticeable. The separation of aesthetic dentistry into a separate branch of dental science and practice makes it possible to increase the level of theoretical training and practical skills of specialists working in field of aesthetic restoration.

**Historical aspects of the development of aesthetic dentistry.** The development of aesthetic dentistry is associated with history of mankind. Anatomists, artists, sculptors and doctors sought to measure the human body and face and find them optimal proportions. Thanks to this, canons began to appear (literally "prescription") - a set of artistic techniques or rules. The basis each canon was given a module - the size of any part of the human body or face.

**Ways of development of filling materials.** In ancient times, carious defects in teeth were sealed with stones. Later, wax, resin, and mastic began to be used for this purpose.

Advances in the chemistry of high-molecular compounds have made it possible to create materials based on acrylic polymer-monomer cold-curing systems. They are more aesthetically pleasing and resistant to mechanical and chemical influences than cements. Epoxy resins have a successful combination of good adhesion and low toxicity.

In the 70s of the 20th century, the production of photocurable composites began. Highest results achieved by using microfilled hybrid materials. The process of their improvement is continuous, improving strength, aesthetics characteristics, increases biological compatibility and quality of adhesion to tooth tissues.

**History of teeth whitening.** Pearly white teeth throughout history of the development of society were considered an integral part of human beauty.

The population's demand for teeth whitening has increased significantly in recent years. At the same time, the number of doctors recommending vital bleaching.

**Shape formation and color science as a theoretical basis for aesthetic dentistry.** One of the main concepts of modern dentistry is the aesthetic function of the tooth. It implies harmony of size, shape, relief, position of the tooth in the arch; optical properties of dental tissues, including a special range of

color shades, fluorescence, opalescence and shine of the enamel.

Mathematical terms are used to describe the anatomical characteristics of a tooth. Surfaces are compared to flat geometric figures, and shapes and relief are compared to volumetric bodies. Flat figures are formed by points, located on the same plane. A circle is defined as a set of points on a plane that are equidistant from the center. An oval is an elongated circle, and a regular oval is an ellipse.

Even a minimum of knowledge in the field of mathematics allows us to describe the basic geometric shapes of tooth surfaces as flat figures. In rectangular teeth, the transverse dimensions of the vestibular surface in the gingival, equatorial region and at the cutting edge are close in meaning. The lateral surfaces are almost parallel, the length of contact with adjacent teeth is significant. With a triangular crown, the transverse dimensions of the vestibular surface increase from the neck to the incisal edge: the crown expands. The proximal surfaces diverge. Contacts between teeth are point-like. Oval shape crowns are characterized by close values of the transverse dimensions of the vestibular surface in the cervical region and near the cutting edge. The biggest diameter - in the equator region. The proximal surfaces appear in the form of convex arcs, with point contacts with adjacent teeth.

The visual perception of the geometric shape of the tooth may be influenced by his individual characteristics. The dome-shaped gingival margin, characteristic of 56% of incisors, resembles a wedge or triangle in shape. 39% of the crowns have a rounded periodontal edge, 5% have a flattened, almost rectilinear contour. The shape of the cutting edge can be smooth, convex, concave, or embossed.

Teeth, being three-dimensional bodies, have spatial characteristics: height, thickness, width, relief. An example of geometric volumetric figures (the latter studies the branch of mathematics - stereometry) are polyhedra. In particular, a straight prism represents a body enclosed between parallel polygons. A triangular right prism has triangles as its bases. If the base is a rectangle, then it is rectangular parallelepiped. If all sides are equal, it is a cube.

The pyramid also represents a three-dimensional body. At its base is a polygon, the vertices of which are connected to one point lying outside this plane.

A cylinder is obtained by rotating a rectangle around one of its sides. The ball can be obtained by rotating a semicircle around its diameter. A cross section of a ball with any plane will result in a circle.

Describing the shape of teeth is difficult due to the presence of protrusions, depressions, and roughness on its surface. However, with careful analysis, you can find sections that are close in shape to a cylinder (in the cervical region), a cone (in the area of the tuberosities chewing teeth), flattened prism (in the area of the cutting edge). In accordance with this, all teeth are divided into groups that differ in the shape of the crown: spade-shaped (incisors), cone-shaped (fangs), cylindrical double-tubercular (small molars - premolars), cylindrical multi-tubercular (large molars - molars).

The relief also has three-dimensional characteristics.

Description of the optical characteristics of a tooth also requires the use of special terms and concepts. An integral understanding of the laws of formation and perception of color is given by color science, which includes sections of physics (optics), physiology and psychology (vision), painting theory, and philosophy.

The patterns of refraction of light rays explain the appearance of color.

Since the angle of refraction depends on the wavelength, or color, of the beam, when passing through a prism, white light undergoes decomposition into the colors of the rainbow (the phenomenon of dispersion).

To build modern color systems, primary (primary) colors are used: 700 nm (red), 546 nm (green), 435 nm (blue). By mixing the rays of two primary colors, you can obtain the desired shades of the derivative color. They are called secondary (composite). Primary colors cannot be obtained by mixing.

In physics (optics) all colors are accepted placed on a straight line in accordance with the wavelength

(from red to violet). In color science, they are arranged in a circle: contrasting colors are located opposite each other. The sequence of tones in any color wheel is the same, the number is no more than 160 (the limit of discrimination by the eye).

The original colors of the dyes are different from the color rays: red (magenta), blue (cornflower blue) and yellow. When two primary colors are mixed, shades of a derivative (secondary, composite) are obtained.

The chromatic circle is built using three primary colors. Secondary colors are made by mixing primary colors: yellow and red will produce orange; red and blue - purple; yellow and blue – green.

When mixing secondary colors with the tertiaries receive the main ones.

The color of a particular object is formed by interaction with rays of light.

A certain color characteristic of a given object is objective, or proper (trees are green, the sky is blue). A tooth's own color is formed due to its optical properties.

When the rays of the spectrum are completely reflected by the surface, the object is perceived as white or gray, and when completely absorbed - as black. White, gray and black colors are called achromatic. Simple gray tones contain black and white pigments. They are always opaque (opaque): transparent no white dye. Complex gray tones are a mixture of basic (primary) colors.

Tones that have a color tint are classified as chromatic. Latest have three properties: color tone (hue), lightness and saturation.

The hue is determined by the wavelength and denotes the hue - the name of the color. Lightness depends on the color and texture of the surface: smooth reflects more light than rough. Saturation characterizes the degree to which chromatic light differs from gray or approaches a pure spectral color. The colors of the spectrum of sunlight serve as a standard.

The most trained observers are able to distinguish 150 shades by color tones, 25 by saturation, and up to 64 by lightness.

The qualitative characteristics of tooth color can also be tone, lightness, and saturation. Visually perceived tones, or shades, can be characterized like white, yellow, gray, blue, brown. By lightness they are characterized as follows: yellow - varies; gray, blue – they can be light; brown - very light.

The main shades of a tooth are explained by the characteristics of the structure and composition of the tooth. Thus, the maximum reflection of all colored rays by the surface, as well as the scattering abilities of the enamel, determine the white color. In addition, having a tendency to internally scatter light, enamel gives blue shades to the color scheme, as well as the ability to opalescent.

The color of dentin is revealed due to the light transmission of enamel. The incisal area does not have dentin, so it appears more transparent. The middle part of the tooth often contains the bulk of yellowish dentin, which determines the color of the tooth as a whole. The cervical area of the tooth has a thinner layer of enamel, so the color of the underlying dentin is more clearly expressed.

Age-related differences in the optical properties of a tooth can be presented as follows. A young tooth with its surface reflects more light than a mature one, while having a high scattering ability. Its dentin contains less pigments. As a result, white color predominates in the reflection spectrum. For a mature tooth characterized by reduced scattering the ability of enamel and increased selective reflection of dentin, which forms the inherent shade of the tooth. Dentin layer exposed as a result of physiological abrasion of teeth gives the cutting edge a dark yellowish, brownish tint. In addition, the color of sclerotic and secondary dentin is often yellow-brown. Darkening is enhanced by pigments, easily penetrating into exposed dentin.

In ensuring the aesthetic function, the phenomenon of irradiation is important - the influence of color on visual perception volumetric parameters of the tooth. Thus, warm colors (yellow - orange) seem to protrude, while cold colors (blue) recede into the depths.

Since dental structures must imitate living teeth in tone, saturation, and lightness, dentists must have knowledge in the field of shape formation and color science.

The rapid development of manual skills by specialists in the field of aesthetic dentistry is ahead of their acquisition of theoretical knowledge and scientifically based recommendations, including due to insufficient resources special educational, scientific and methodological literature.

### **The principles on which it is based modern aesthetic dentistry**

Theoretical knowledge obtained from modern literary sources, the results of scientific research, and clinical observations allow us to formulate the principles of aesthetic dentistry.

Achieving treatment results that are as close as possible to natural ones parameters of the dentition - the basic principle, or starting position, of aesthetic dentistry. To therapeutic restorations and orthopedic structures requirements are imposed for maximum similarity with the optimal characteristics of teeth in color, shape, and relief.

The principle of conscious cooperation between the patient and the dentist implies conscientious and regular performance of procedures. In particular, the choice of shades of color, size and shape designs are carried out jointly by the dental professional and the patient to reach consensus.

The principle of color imitation ensures the modeling of a restoration (structure) with high aesthetic parameters, implying the selection of shades of material that exactly match the optical properties of dentin and enamel, followed by imitation of the color of lost tooth tissue. Recommended correct lighting, eliminating contrast, using a gray background when determining tooth shades. Layer-by-layer shaping the restoration and reproducing the nuances of color makes it possible to ensure that the structure replicates the natural appearance of the teeth.

The principle of reproducing natural volumetric parameters involves first planning the sizes, shapes, surface relief with subsequent reconstruction of macro- and microstructures on restorations or alveolar processes. The morphological features of the modeled restoration should repeat parameters of an intact tooth, therefore it is necessary to maintain the geometric shape, signs of belonging side, mamelons. Large elements structures are modeled with opaque materials. Individual characteristics (surface topography, shape of cutting edges, transparency) are formed with enamel shades in compliance with the rule of preserving the volume of natural tissue.

The principle of adhesive preparation means increasing the area of contact "filling - tooth" in order to significantly increase the surface energy, which provides high-quality connection of the composite with tooth tissues. The objectives are achieved by excision of hard tissues to intact structures, creating a bevel of the enamel or giving a certain shape to the cavity, as well as acid etching and application of the adhesive system.

The principle of minimizing consequences polymerization shrinkage is based on the property of the material to shrink in volume during the curing process. At the stage of tooth preparation, reducing the effects of shrinkage is achieved by excision of thinned protrusions, rounding internal corners of the cavity. Absence complex design reduces tension in tooth tissues. Risk of peeling fillings, the formation of a gap at the border with the tooth, the appearance of hyperesthesia is reduced when using gaskets made of chemically curing materials: when curing, they are "attracted" towards the heat source – the pulp. During the curing process of a composite, one of the techniques for reducing shrinkage is "soft start" method.

Knowledge of the principles of aesthetic dentistry allows you to choose the most correct methods of influence to ensure maximum efficiency.

### **Aesthetic dental restoration**

Thanks to the high qualities of photopolymers, in addition to conventional fillings, more complex aesthetic designs are available that involve reproducing the shapes, sizes, relief, and color shades of natural teeth.

Restoration ensures restoration and restoration of the tooth in its original form or close to it. Veneers (laminates) are used to cover primarily the vestibular surface of teeth. Reconstruction provides for a radical restructuring restructuring for the purpose of improvement, improvement and is indicated in case of significant violation of the shape, size, change in the position of the tooth, the presence of defects in the dentition, a combination of deviations from aesthetic parameters. Adhesive bridges make it possible to solve the problem of restoring the continuity of the dentition with minimal invasive intervention on hard tissues. Splinting structures provide strengthening of mobile teeth.

In addition to the classic stages of working with composites, aesthetic dentistry requires the development and implementation of methods that improve color characteristics. Thus, the color neutralizing technique involves a combination of bleaching and subsequent filling of the defect or covering the pigmented areas with dyes with further restoration of the tooth. Color restoration technique – reproduction in simulated restorations with pronounced individual characteristics of the tooth. Color-correcting technique – modeling of initially missing parts of the dentition (tooth or part thereof).

The process of using photopolymers in dentistry requires compliance with work steps that are associated with the characteristics of the curing of materials. On the other hand, technology execution of aesthetic design due to the peculiarities of the structure and functioning of dental tissues. Providing optimal restoration conditions significantly reduces the risk of errors and associated complications and ensures highly effective results.

Recreating the anatomical formations of a tooth during restoration is a complex and responsible process. The first stage is modeling the base restorations, including contours of the geometric shape of the dentin and mamelons at the incisal edge, with clear identification of the lateral and inferior boundaries of the dentin layer. The second involves the formation of signs of teeth belonging to the side. Third – reproduction individual characteristics of the tooth, including the periodontal contour, macrorelief, shape of the cutting edge. The sequence of restoration of morphological elements corresponds to the order of odontoscopic examination and planning the anatomical shape of the restoration. There is a gradual transition from recreating large details (the geometric shape of the vestibular surface) to the reproduction of medium (signs of the angle and curvature of the crown), and then to the modeling of smaller (enamel ridges, teeth in the area of the cutting edge) elements.

Thus, analysis of literary sources and own work experience shows the need definitions of aesthetic dentistry as an independent field with its own history of development and theoretical basis. The improvement of materials, equipment, and accessories for dentistry had a significant impact on its development. The practical use of advanced methods for the treatment of caries and non-caries lesions of teeth allows us to ensure high quality such modern works as restoration, reconstruction, adhesive prosthetics, splinting using photopolymerizing materials.

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