



Endosystem in Therapeutic Dentistry: An Argumented Choice

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Abstract : Currently, therapeutic dentistry is developing by leaps and bounds. With a huge amount of new filling materials and techniques that have appeared on the dental market, the dentist is faced with the task of making a correct, reasoned choice. As for the strength of the tooth, we can say that it is greatly reduced. This confirms the concept that there is a direct relationship between the volume of the remaining tooth tissue and its strength characteristics. Standard pins do not actually strengthen the root of the tooth, but rather serve to evenly distribute the load and improve the retention of the restoration [5]. In most cases, endodontic treatment of caries complications is carried out if the tooth crown is severely destroyed. The success of treatment largely depends on the quality of sealing (sealing) of the orifices of the root canals, which will prevent the penetration of intraoral fluid and oral microorganisms into the periapical region [3]. Before the restoration of teeth with a destroyed crown, the question arises of the need to use a pin construction. One of the evaluation criteria and factors that determine the indications for the use of pins is the volume of preserved hard tooth tissues. Unfortunately, it is not precisely established at what minimum volume a comparative analysis of the adhesive strength of materials of different composition and properties for restoration of the crown part of the tooth using endosystems. Extracted teeth were divided into two groups: Group I - titanium standard pins were used, which were fixed with glass ionomer cement; Group II - glass fiber pins were used, for fixation of which Relyx U200 cement was used. The best adhesion of the composite to the hard tissues of the tooth has been convincingly proven when using self-adhesive composite cement in combination with fiberglass posts.

Key words : root canal, post, fiberglass, endosystem.

One of the misconceptions regarding the strength of teeth after endodontic treatment is that the use of anchor pins strengthens the remaining tooth tissue. Foreign studies have shown that after endodontic treatment, the tooth loses 9% of its moisture, which has no particular clinical significance. As for the strength of the tooth, we can say that it is greatly reduced. This confirms the concept that there is a direct relationship between the volume of the remaining tooth tissue and its strength characteristics. Standard posts do not actually strengthen the root of the tooth, but rather serve to evenly distribute the load and improve the retention of the restoration [5]. In most cases, endodontic treatment of caries complications is carried out if the tooth crown is severely destroyed. The success of treatment largely depends on the quality of sealing (sealing) of the orifices of the root canals, which will prevent the penetration of intraoral fluid and oral microorganisms into the periapical region [3]. Before the restoration of teeth with a destroyed crown, the question arises of the need to use a pin construction. One of the evaluation criteria and factors that determine the indications for the use of pins is the volume of preserved hard tooth tissues. Unfortunately, it is not precisely established at what minimum volume the pins should be used. The decision made is based primarily on the doctor's personal experience and intuition. It is obvious that decisions are sometimes made not entirely justified [2]. The success of this type of restoration depends on: - the physical and electrochemical properties of the metals and the materials used; - the length and shape of the pin; - residual mass of the tooth root. Obviously, these parameters are directly dependent on the doctor's choice. It is very difficult to define what is the ideal post that would fit all clinical cases. But such a pin would have to meet the following requirements: - have a cylindrical-conical shape with a simulated head, adapted in height to the crown part of the tooth and having good retention in relation to the filling material; - it must be made of precious or semi-precious alloys or, even better, titanium; - its surface must undergo minimum sandblasting, it must have an evacuation groove; the pin must neither self-lock nor screw; - the pin should be of different sizes so that it can be adapted to the volume of the channel (diameter, length, and m - the manufacturer is obliged to provide a set with various working accessories that ensure the seating of the pin in its seat [1, 4].

Currently, there are many techniques and materials for fixing anchor pins and restoring decayed teeth. Composite luting materials can be a real alternative even in cases where their mechanical properties are not quite close to those of dentin; these materials can be self-adhesive, self-etching, or requiring an adhesive system. Both self-etching materials and those requiring a self-etching adhesive system are suitable for fixing fiberglass posts. Among them, we need to choose a system that provides the best edge fit [6]. The traditional total-etch procedure increases adhesion and prevents microleakage. However, in addition to the advantages, this procedure has its disadvantages: it causes significant decalcification. Self-etching adhesive systems have been developed to prevent over decalcification of the tooth. These systems are based on fixing the lubricated layer, its "perforation" to ensure the penetration of hydrophilic molecules, followed by the formation of a hybrid zone. The strength of adhesion of these materials is somewhat less than that of adhesive systems requiring total acid etching, but decalcification after their application is much lower [8]. The question is whether adhesive systems with lower adhesive strength but better biocompatibility can provide reliable protection against bacterial invasion in the root canal. Of particular interest was the study of the connections of pin structures with various fixing materials. The aim of the study was to analyze and compare edge microleakage during fixation of titanium pins on Fuji 9 glass ionomer cement and glass fiber pins on self-adhesive composite cement Relyx U200.

Materials and research methods

For testing, samples were prepared from teeth removed according to indications - incisors of the upper jaw and canines. To prepare a sample, the crowns of the tooth were removed using a diamond disc, the root canal of the tooth root was prepared using traditional instruments and techniques, taking into

account the type of post, which was then fixed in the canal for 2/3 of the root length using the test cement. The treatment of the walls of the root canal and the fixation of the post were carried out following the instructions of the manufacturer of a particular material. The teeth were divided into two groups: Group I, 30 teeth - titanium standard pins were used, which were fixed with glass ionomer cement; Group II, 30 teeth - fiberglass pins, for which the self-adhesive composite cement Relyx U200 was used. The final restoration was performed with 3M ESPE - Filtek Z550 composite material. Finishing grinding and polishing was carried out with Sof Lex discs. Then the studied samples were subjected to temperature treatment and were kept for a week in a solution of methylene blue. This choice is due to the fact that methylene blue is easy to visually detect and accurately measure the left trace. The methylene blue solution has a low molecular weight and penetrates deeper along the root fillings compared to other dyes. At the end of the specified time, the test material was washed with distilled water. After drying, thin sections of the teeth were made at the level of the necks. With the help of a diamond separation disc, the teeth were dissected in a vertical plane passing through their longitudinal axis. This provided a better extraction of the dye and made it possible to measure the depth of penetration of the dye into the tooth tissue. The data obtained as a result of the research were processed by the variational-statistical method on an IBM PC / AT "Pentium-IV" in the "Windows 2000" environment using the "Statistica 6" application package. Statistical analysis was carried out by the method of variation statistics with the determination of the average value (M), its mean error ($\pm m$), assessment of the reliability of differences in groups using the Student's test (t). The difference between the compared indicators was considered significant at $p < 0.05$, $t \geq 2$. Research results and their discussion The results of comparative tests of adhesive systems "dentin - cement - post" show: the spread of adhesive strength is very significant (as is most often the case when testing adhesive joints). The nature of the destruction of the adhesive joint is also unstable: destruction occurs along the interface of both "dentin - cement" and "pin - cement". The latter was most often observed when using metallic titanium pins. Fiberglass posts have a high adhesive strength rating. Also, when comparing the adhesive strength of fixation with different materials, it was noted that Relyx U200 cement provides the highest indicator. The data of our research are presented in the form of a pivot table. Analysis of the edge fit of the titanium pin in group I showed a higher percentage of microleakage, the average value of the penetration depth of the dye ranged from 4.2 to 5.6 mm. Defects were also found in the area of the interface between the media. The percentage of teeth in which microleakage was detected was 6.4%. It should be noted that in group II there is no clear interface between dentin - fixation material - post, which indicates perfect bonding without the formation of a media interface between dentin, the Relyx U200 fixation system and the fiberglass post. The adhesive strength was 1.32–2.12 mm. The adhesive strength in group I was 4.9 ± 0.7 , in group II - 1.72 ± 0.4 . This difference is statistically significant (in materials and methods for creating a durable and aesthetic restoration of the tooth in the final result. The dilemma faced by the practitioner in the field of post-endodontic restoration is positive. The variety of products and techniques can offer a practical solution to most restoration problems. have already benefited from the latest developments in post restoration technology and continue to reap the benefits of this research and development. Only a careful and thoughtful approach to the fixation procedure, taking into account all the above points, will ensure a reliable and long-lasting result.

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