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Bio-Active Materials For Root Canal Obturation The Filling System With Cold Free-Flow Gutta-Percha Gutta Flowbioseal (Clinical Cases Report).

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ABSTRACT

Given the increased interest of clinicians and researchers in the bio-active methods of root canal's obturation, the new bio-active system of cold free-flow gutta-percha was created by the Coltene/Whaledent AG company. The system is based on the already existing GuttaFlow and GuttaFlow2 and absorbed all the best qualities of its predecessors. GuttaFlowbioseal is created according to the formula "syler+filler+bio-glass". already according to the results to date, we can confidently say about the extremely high clinical efficiency of the system, especially in terms of osteoinduction. Unfortunately, we received the first clinical experience with the system in October 2016. Accordingly, given that 9 months are necessary for a full evaluation of bone tissue regeneration, the first significant results were obtained in July-August 2017. Therefore, the number of results for a representative statistical processing is not yet sufficient.

Keywords: root canal, obturation, dimethylsiloxane, bio-glass, protocol of root filling, endodontics.

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INTRODUCTION

In our previous cases we have already described about the properties and clinical capabilities of the GuttaFlow and GuttaFlow2 systems, based on polydimethylsiloxane. Polydimethylsiloxane (PDMS) is a chemical compound, a linear polymer of the dimethylsiloxane [1, 2, 3]. The properties are due to the chemical capabilities of the substance. The amount of dimethylsiloxane units in the structure can reach up to 15 000. Depending on the chain length of the polymer, the substances with different physical properties can be obtained. Depending on the chain length of the polymer, substances with different physical properties. The viscosity of such compounds increases with increasing length, which corresponds to a transition from a very moving, gasoline-like liquids, to more viscous oils and, finally, to resinous substances [3, 4, 5].

MATERIAL AND METHODS

The systems GuttaFlow and GuttaFlow2, based on the RoekoSeal, operate on the principle of absolute bioinertness. All materials and substances, used in clinical dentistry, can be conditionally divided into 3 large groups:

- Bio- inertive – do not interact with surrounding tissues;
- Bio-resorptive – during the contact with surrounding tissue are absorbed and/or destroyed;
- Bio-active – affect the surrounding tissues during the contact with them.

Given the increased interest of clinicians and researchers in the bio-active methods of root canals obturation, the new bio-active system of cold free-flow gutta-percha was created by the Coltene/Whaledent AG company [6, 7, 8]. The system is based on the already existing GuttaFlow and GuttaFlow2 and absorbed all the best qualities of its predecessors. GuttaFlowbioseal is created according to the formula “silyler+filler+bio-glass” and contains of:

- fragmented gutta-percha (filler, a particle size is 30 μm);
- zinc oxide;
- barium phosphate;
- bio-glass;
- sealer, which consists of:
 - ✓ polydimethylsiloxane;
 - ✓ silicone oil;
 - ✓ paraffin oil;
 - ✓ zinc dioxide (X-raycontact slowness);
 - ✓ platinum catalyst;
 - ✓ coloring pigment;
 - ✓ micro crystals of silver (bactericidal effect).

Such an arrangement provides to the system in addition to unique properties of GuttaFlow, a number of additional characteristics, such as there is no need for a mechanical compaction , the presence of a prolonged bactericidal effect, as well as:

- Obturation on the principle of "no heating – no shrinkage" (0.2% expansion);
- Excellent fluidity;
- Simplicity and speed of clinical use;
- The ability to absorb hydroxyapatite crystals on the biocrystal particles (for the importance of this property and its role in determining the clinical effectiveness of the system, see below).

The properties of bio-glass as a material, capable of contacting the native bone, were first described in 1969 (L. Hench). It consists of silicon, calcium oxide, hydroxyphosphates and sodium phosphates. Today, due to the expressed osteoinductive effect, bio-glass is widely used in medicine (traumatology, dentistry). Due to its high pH, antibacterial properties are strongly pronounced. Thus, GuttaFlowbioseal has unique chemical, physical and bioactive properties regarding the formation of hydroxyapatite crystals, the main structural unit of hard tooth tissues, which ensures the maximum quality of sealing and the biocompatibility of the material

[9,10].

As already mentioned, GuttaFlowbioseal contains a finely dispersed gutta-percha, polydimethylsiloxane, platinum catalyst, zirconia, silver (preservative), and colorant. In addition to all the above, the new system contains finely dispersed particles of bioactive glass-ceramic, which provides the formation of hydroxyapatite crystals at the material-dentin boundary, periodontal material boundary, which causes high-quality adhesion to the dentin and tightness of the obturation. In addition, the presence of silver particles in ceramics, according to some data has the effect of "conservation" of the tooth canal. Nowadays, only MTA and bio-glass have similar regenerating properties [11, 12].

CLINICAL CASES AND RESULTS

The tooth 4.5 for 7 years served as a retainer teeth of the clasp prosthesis, experienced additional loads. It is evident that the slight excretion of the material by the apex did not affect the periodontal condition. At the same time, the material is absolutely not absorbed, which once again provides its absolute bioinertness.

The step-by-step protocol for activating the new system is absolutely identical to GuttaFlow2. Before using the syringe-applicator, the protective cap should be removed and replaced with a mixing tip (automix). When the piston is pressed, the evenly mixed material without bubbles leaves the mixing tip in a 4:1 ratio. Flexible mixing tips can only be used once and must be disposed of after use.

1. The root canal is biomechanically processed (it is extremely important to ensure the dryness of the canal). For insurance, after the removing the last paper pin in a dry condition, we lay down another one of the same size with an exposure of 40 seconds. If it leaves dry and dense, we proceed to obturation.
2. Determination of the gutta-percha master-pin (MAF).
3. We distribute the GuttaFlowbioseal on the mixing block and introduce it into the canal on the master pin.
4. We introduce the master pin for the entire working length, adapt it.
5. Introduce the tip of the mixing tip to the maximum possible depth (no closer than 5 mm to apex, the size of the spout corresponds to ISO file 80) and print the sealant until it appears in the the mouth of the canal with a gradual and smooth outlet of the spout.
6. Cut the master pin heated to 200°C.

Clinical example with GuttaFlowbioseal

In 2016, the system was applied for clinical approbation at the Postgraduate Dentistry Department of the VSMU named by N.N. Burdenko. In both cases, endodontic treatment was primary, apexlocator behaved as usual (J Morita Denta Port ZX). There were no clinical complaints after the root obturation (Fig. 1-2).

Case 1: Patient K., 47, complained of spontaneous irradiating pain in the region of the lower jaw on the left, amplifying from the temperature stimuli. Visual and instrumental examination revealed a cavity in tooth 3.8. After the standard diagnostic protocol, a diagnosis was "chronic fibrous pulpitis 3.8" (Figure 4a). At the insistence of the patient, endodontic treatment was performed. The machining preparation was carried out using the HyFlex CM and Hyflex EDM systems (both manufactured by Coltene/Whaledent). The preference of the system is obvious. When the "carpet track" was formed to 0.15, when analyzing the pronounced bending (Fig. 4b), it was decided to select a rotary tool for increased flexibility and an obturation system that does not require condensation, which is impossible under the given conditions. In our opinion, GuttaFlowbioseal is brilliant coped with the task posed, making a reliable obturation not only the entire length of the canals, but also a pronounced "delta" in the apical part (Figure 4c).

Case 2: Patient G., 49, with the acute pain in the tooth 4.6. According to the patient, the tooth had previously been treated for a complicated caries. For 10 years it was covered with a metal-ceramic crown. The pain began 3 days ago, the patient turned to the clinic, where she was treated continuously. After the CBCT study, the patient was applied to the department.

The initial situation is shown in the screenshot (Figure 5a). After the standard diagnostic protocol, a

diagnosis was "chronic granulomatous periodontitis of the tooth 4.6." The tooth was previously treated with resorcinol-formalin method. At the insistence of the patient, repeated endodontic treatment was performed. The "carpet track" created to ISO 0.15 with a hand tool (Reamer and H-file). The subsequent machining was carried out using the HyFlex CM system. Irrigation is standard (5% hypochlorite, 17% EDTA, water, voice endoactivator).

1 visit. Canal rupture. Irrigation. Preliminary machining. Temporary obturation of Ultracal for 14 days.

2 visit. There are no complaints. The final mechanical and chemical treatment. Obturation. Radiographic monitoring (Figure 5b). On the mesial root, the material is excreted into the periapical tissues and "covers" the resorbed apical part of the root. Control after 6 months. Fig. 5c presents the X-ray situation after the repeated endodontic treatment 6 months after. The positive dynamics of regenerative processes is traced. Control after 3 months. Fig. 5d presents an X-ray situation 9 months after repeated endodontic treatment.

Case 3: Patient F., aged 36, complained of acute pain in the 3.7. The case is very similar to the previous one. According to the patient, the tooth had previously been treated for complicated caries. The pain began 5 days ago. After the standard diagnostic protocol was delivered diagnosis "chronic granulating periodontitis 3.7" Unfortunately, the picture with the original situation was in the hands of the patient and was lost to her.

The idea of the initial state of the tooth can give a diagnostic a snapshot (Fig. 6a) taken from the canal rupture. Root canals were previously obturated with endometasone. At the insistence of the patient, repeated endodontic treatment was performed. The preparation and creation of the "carpet track" to ISO 0.15 was carried out with a hand tool (Reamer and H-file). The subsequent machining was carried out using the HyFlexCM system. Irrigation is standard (5% hypochlorite, 17% EDTA, water, voice endoactivator).

1 visit. Canal re-treatment. Irrigation. Preliminary machining. The turnout after 2 days.

2 visit. There are no complaints. Mechanical preparation of the root canals. Irrigation. Temporary obturation of Ultracal for 14 days.

3 visit. There are no complaints. The final mechanical and chemical treatment. Obturation. Radiographic monitoring (Figure 6b).

In the absence of complaints X-ray control after 9 months. Fig. 6c shows the X-ray situation after 9 months after repeated endodontic treatment. Complete regeneration of bone tissue can be traced.

Case 4: Patient S., 27 years old. There are no complaints. Radiographic picture in area 3.7 is found by accident during the CBCT of the paranasal sinuses. The screenshot is shown in Fig. 7a. Due to the absence of a clinic, a decision was made to conduct a repeat endodontic treatment in one visit. The root canals are sealed with zinc-eugenol paste. The retreatment and creation of the "carpet track" to ISO 0.15 was carried out with a hand instruments (Reamer and H-file). Subsequent machining preparing was made using the HyFlex CM system. Irrigation was standard (5% hypochlorite, 17% EDTA, water, endoactivator). Irrigation. Preliminary and final mechanical and chemical treatment. Obturation. X-ray inspection (Fig. 7b). In the absence of complaints, x-ray monitoring after 6 months. Fig. 7c shows the X-ray situation after 6 month after endodontic retreatment. The positive dynamics of regenerative processes is traced. If there are no complaints, the control will be after 3 months. The term of 9 months will come only in November 2017, so the result will be presented in the next publication.

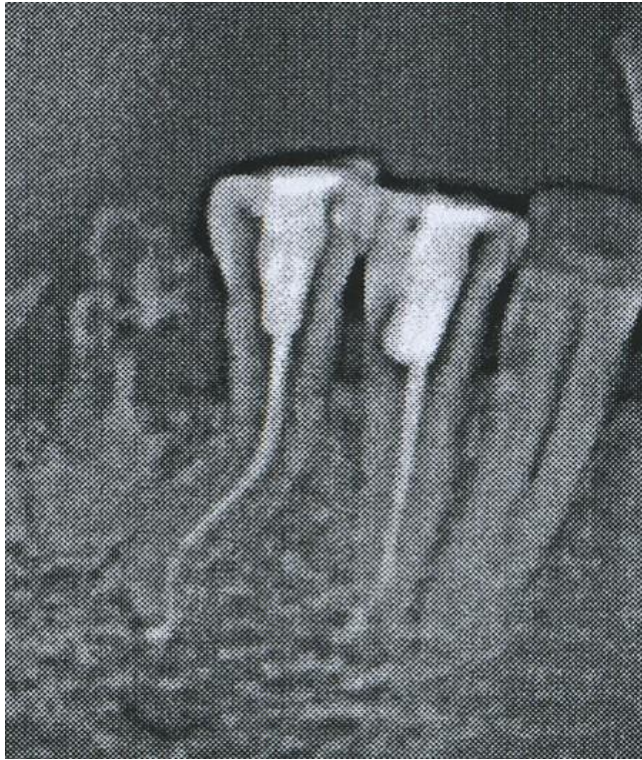


Fig 1, a



Fig. 1, b



Fig. 2

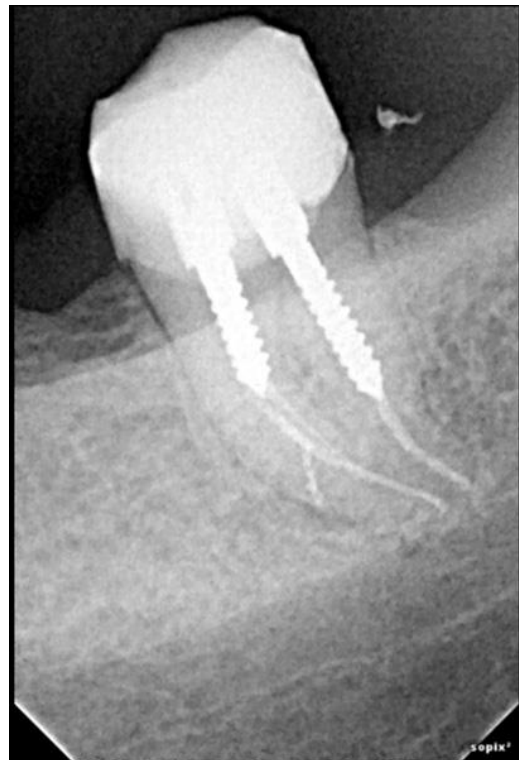


Fig. 3



Fig. 4, a



Fig. 4, b



Fig. 4, c

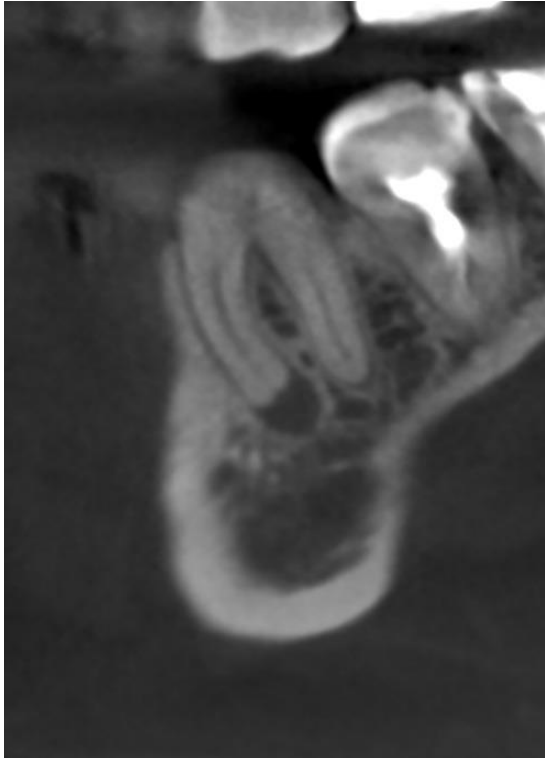


Fig. 5, a



Fig. 5, b



Fig. 5, c



Fig. 5, d



Fig. 6, a



Fig. 6, b



Fig. 6, c

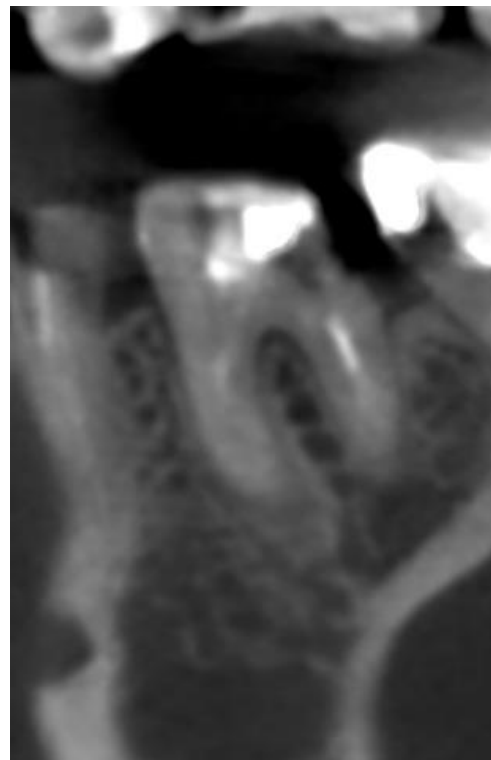


Fig. 7, a



Fig. 7, b



Fig. 7, c

Resume: Unfortunately, we received the first clinical experience with the system in October 2016. Accordingly, given that 9 months are necessary for a full evaluation of bone tissue regeneration, the first significant results were obtained in July-August 2017. Therefore, the number of results for a representative statistical processing is not yet sufficient. But, already according to the results to date, we can confidently say about the extremely high clinical efficiency of the system, especially in terms of osteoinduction.

DISCUSSION

GuttaFlowbioseal is a logical continuation of the existing materials GuttaFlow and GuttaFlow 2 and in addition to its own unique osteoinductive qualities, it has the same excellent obturation properties as its predecessors:

- two-in-one: a combination of a siler and a gutta-percha (although it is more accurate to say three-in-one: a combination of a siler, gutta-percha and bio-glass);
- excellent flow characteristics;
- water solubility tends to zero;
- reliable three-dimensional obturation of the root canal system;
- high bioactivity;
- reliable isolation of dentin and protection against re-infection of periodontal disease;
- Excellent radio opacity.

Contraindications – any clinical forms of GuttaFlow and polydimethylsiloxane-based silers should not be used for endodontic treatment of infant teeth as the material does not undergo resorption together with the process of resorption of the roots of temporary tooth. Relative contraindications are hypersensitivity to silver and polydimethylsiloxane. Adverse effects are unknown. Those. Precautions correspond exactly to the entire GuttaFlow family.

For GuttaFlowbioseal, all the modified (author's) canal obturation techniques used for GuttaFlow 2 are applicable. For example, the negative pressure technique (AntonisChaniotis). It is also possible to use additional options, such as GuttaFlow 2 Primer. Clinical protocols for the application of the above options are

described in detail in the previous work (see the list of references). And in conclusion we consider it necessary to supplement the list of publications where the reader could draw additional information of interest to him. We express a firm belief that the availability of the GuttaFlowbioseal system in the arsenal will significantly expand the clinical possibilities of your endodontic practice, since there is nothing physiological than your own tooth.

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