GENERAL INFORMATION

Endodontic treatment with the endoalex [O (oxide) + Ca (Calcium) + Ex (expansive)] technique is based on the following chemical-physical reaction:

\[ \text{Calcium Oxide - CaO} - \text{combining with two volumes of water - } 2\text{H}_2\text{O} - \text{forms calcium hydroxide - Ca(OH)}_2 \text{ - the volume of which is obviously greater than the Calcium Oxide in the reaction:} \]

\[ \text{CaO} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2\text{O} \]

In the main root canal, Calcium Oxide used in the form of a paste, is placed in the accessible areas of the endodontium (provisional space) without necessarily having to make a deep opening to the apex. The paste, gradually mixing with the endodontic liquid, becomes a hydroxide and penetrates all accessible and inaccessible zones (dental tubules), i.e. areas which cannot be reached (or are hard to reach) using any type of mechanical treatment, causing lysis of existing necrotic substances and antimicrobial alkalisation.

The CaO will therefore expand without “pressing”. The calcium hydroxide will then combine with the CO\textsubscript{2} generated from the lysis of the endodontic organic substances, and form calcium carbonate (CaCO\textsubscript{3}); this will fill the small dental canals, the gaps caused by decalcification and the inaccessible spaces in the endodontium.

Since Calcium Oxide is a powder (Endoalex Plus), it must be mixed with a liquid (Endoalex Liquid) so it can be put into the canal, and this slows down and delays the reaction, which is by nature exothermic.

COMPOSITION FORMULA

ENDOCALEX PLUS POWDER:
- Calcium oxide 67%
- Zinc Oxide 33%

The powder can be used for additional treatments provided the vial is closed tightly immediately after use.

ENDOCALEX PLUS LIQUID:
- Propylene glycol 75%
- Distilled water 25%

INDICATIONS

1 - Endodontic treatment based on the calcium oxide technique

ENDOCALEX PLUS is a fully biocompatible material, with a slow, non-exothermic andatraumatic reaction.

The calcium hydroxide formed by the reaction, being calcium oxide expanded by hydration, penetrates the endodontium in every direction, along the walls and into the apices, to all areas that cannot be accessed by mechanical tools.

Endoalex Plus is mainly used for the conservative treatment of teeth affected by pulp tissue necrosis of various origins, with or without reactive periapical involvement; Endoalex Plus is also highly effective for cases of (partial or total) obstruction of the canal lumen (reactive dentinal obliterations, fragments of metal materials or gutta-percha cones, etc.).

The lower expanding potential of Endoalex Plus compared to Endoalex 6-9 makes it particularly suitable for treating single-root teeth (including premolars), especially if affected by chronic periapical inflammation.

Endoalex Plus is recommended for the endodontic treatment of denture pillars (preferably single-root and premolar) used to house gold stump or Richmond pins in cases where drilling the canal has led to doubts about actual pulp asepsis.

In this case, a metal pin must be added 15 days after the calcium oxide treatment has been completed, making sure that the pin does not invade the third apical of the canal.

2 - Use as an “intermediate treatment”

In the context of current endodontic treatment techniques, Endoalex Plus is applied as an “intermediate treatment”. Unlike calcium hydroxide, Endoalex Plus exploits its characteristics of expansion and simultaneous formation of OH\textsuperscript{-} ions in the tooth. After opening the pulp chamber and preparing the root canal, temporary treatment is performed with Endoalex Plus, a cotton pellet and temporary obturation on closing the pulp chamber. If sodium hypochlorite and EDTA have been used for preparing the root canal, the residue must be made inert and removed by physiological flushing and the root canal must be dried with sterile paper points before Endoalex Plus is applied. Sodium hypochlorite residue does not prevent Endoalex from expanding, but EDTA residue interferes with Endoalex’s chemical transformation process.

Endoalex Plus is removed after 8-10 days (calcium carbonate or semi-fluid residue) by alternating sodium hypochlorite washes with K-file up to the length of the work. Endoalex Plus is then applied again or the permanent obturation is performed with the preferred technique.

SIDE EFFECTS

No side effects.

Contraindications with other dental materials: do not use cements containing eugenol; this is to prevent the formation of Ca eugenate.

PROCEDURE USING THE CALCIUM OXIDE TECHNIQUE

Warning

Do not use in the case of acute-stage infected teeth. In these circumstances, practise technical and therapeutic measures that will enable you to perform the procedure at a later stage, when the infection is no longer in the acute stage.

When using the calcium oxide technique, a suitable course of antibiotics should be prescribed (1-2 g orally for 4 days), prior to treatment or concurrently, as infected endodontic material may cause an abscess-type reaction. The patient should be informed about this possibility, to prevent any unnecessary alarm.

Preparation

Open the pulp chamber; remove its content and that of the root canals; carry out mechanical reaming of the actual canal roots with hand tools. With the “calcium oxide technique” it is not necessary to ream to the apex: on the contrary the expanding material should preferably penetrate, atraumatically, the entire endodontic area. Mechanically clean the accessible part only (“temporary” space). Do not use antiseptics (which are coagulants and toxic). Only sodium hypochlorite solutions may be used: in this case rinse with water and do not dry. If air is blown an air bubble may form; this would obstruct the expansion as it would form an isolating cushion between the Calcium Oxide and endodontic liquid.

Do not use cotton pallets to clean the accessible part of the endodontium (water must remain). Use sterile paper points to eliminate saliva, blood and pus.
Preparing the paste
This is a simple operation. Mix the powder with the liquid using a sterile glass slide and spatula. Briefly mix the paste using the spatula; add liquid or powder to change the paste consistency as required by the dentist, depending on the canal size and existence of any periapical granuloma.

Immediately after mixing the paste, insert it into the canal.

Putting the paste into the root canal
Use an inserter a size smaller than the canal, i.e. the “temporary” space, or a suitable paste inserter, to prevent air bubbles forming which could isolate the paste and prevent it coming into contact (a fundamental requirement) with the water of the inaccessible endodontium, which in turn would prevent or obstruct expansion.

In any case, the paste must not be packed, to prevent traumas or the inclusion of air bubbles. When filling the root canal, take care to prevent the paste from exceeding the apical. This could cause a bone alkalosis crisis which would in any case end after a couple of days.

As the treated root canal may need to be reamed again at a later stage, and despite the fact that the Calcium Carbonate forming from Endocalex Plus is easy to remove using mechanical means, a suitable diameter and length cone can be inserted into the calcium oxide paste, if required; gutta-percha cones must not invade the third apical of the canal.

Isolating the paste
Cover the paste with a small cotton pallet (not cotton wool) to prevent contact between the temporary filling material and Endocalex, and thus prevent the risk of compressing the walls.

Temporary cavity obturation
This can be performed using any type of any temporary cement not containing eugenol (eugenol would immediately form quick-setting calcium eugenate, causing irreversible staining of the tooth), or gutta-percha instead.

Permanent canal obturation
We suggest treating the tooth in minimum two sessions. The first session is for endodontic preparation of the area to treat and insertion of Endocalex Plus; the second session, after 10-15 days, is for control and the permanent obturation. In the event of necrosis, a second and third administration of Endocalex Plus is preferable.

If after 10-15 days the content of the temporary space seems fluid, this means there is a solution of calcium hydroxide.

This may occur in cases where the liquid has remained (e.g. where there is a large granuloma). In these conditions a second or even a third insertion of Endocalex Plus is preferable. An additional amount of Endocalex Plus may consume all the available remaining water (after expansion, organic lysis and carbonization). In this case fluidification stops and the paste hardens to form a calcium hydroxide cement.

The permanent obturation can be guaranteed using Endocalex Plus, with the reservation that it cannot meet all the properties required of a filling material today, e.g. permanence over time and radiopacity. The permanent obturation should be performed with your preferred technique after removing the Endocalex.

Permanent obturation of crowns
The reconstruction material should preferably be sealed with a base (e.g. zinc oxyphosphate cement).

It is a known fact that endodontic treatment accentuates the fragility of crowns over time, especially after obturations or particularly extensive re-construction work. It is therefore advisable, when practising a permanent obturation or crown denture, to make use of root canal screws during the last session. Zinc oxyphosphate cement is recommended for cementing.

Canal radiopacity after calcium oxide treatment
On the basis of the radiological observation of calcium oxide expansion, it has been noted that the dentine mass becomes slightly more opaque. Since the radiopaque element of CaO is calcium (i.e. the same element forming the dentine), it is obvious that canals filled only with calcium hydroxide cannot be distinguished by contrast from a radiological image. This is the reason why zinc oxide has been added in suitable doses; however the radiopacity cannot be compared to that of gutta-percha cones (70-75% of ZnO). Although canal radiopacity is of no therapeutic interest, it is of interest for demonstrative purposes, as it provides indisputable proof of the state and effectiveness of the root treatment practised.

Within the context of post-calcium oxide treatment measures, the problem of canal radiopacity acquires particular significance. In fact, the small dentinal canals, secondary canals of the apical delta and the respective holes are filled by biophile calcium hydroxide; sometimes, only the main route canals remain accessible. It is therefore preferable to fill these main root canals with gutta-percha or gutta-percha and cement cones.

Storage
Store in a dry place. Vials must be closed tightly immediately after use. The powder must be protected from humidity.

Packaging
Powder (6.0 g): 10 vials;
Liquid (10 ml): 1 bottle.

Limitation of liability
This product must be used by dentists only. Correct use of the product means compliance with the technical indications specified as the instructions for use in the packaging. The instructions provided by the manufacturer on correct product use do not relieve the dentist of the need to test the product in order to establish compliance concerning its use and procedures, as well as the protection of any third party rights. The dentist shall be fully responsible for selecting this product for its intended use, as well as for any improper use of the product. The manufacturer is only responsible for replacing the product if not perfectly stored. The faulty product (i.e. not stored in perfect conditions) must be returned in its original packaging to the manufacturer.

Use by date: see date on the packaging

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