ReViCal® Liner

Bioactive, light-cure underfilling material (protective liner) with MTA-filler

www.r-dental.com

Product information

Bite to Perfection

FANTESTIC® KwikkMix® KwikkModel® METAL-BITE® paper-app® P.U.M.A. soft® ReViCal® R-SI-LINE® tZeen® ZAKK® ZM-Bond®

ARROW TRAXX® ArtOral® Cal de Luxe® DirectCem®

ReViCal® Liner

Bioactive, light-cure underfilling material (protective liner) with MTA-Filler

Introduction

Preserving vitality also from deeply damaged teeth is one of the main objectives of modern dentistry. So at deep cavities with an underfilling (liner) and at the same time with an indirect pulp capping the tooth can be stimulated to create hard tissue (tertiary dentin).

Biochemistry

The pulp consists of a loose tissue with special cells, the odontoblasts, which are positioned at the outer layer of the pulp near the dentin. Odontoblasts secrete the dentin and the odontoblasts cones (Tomes-fibers) form the dentin tubuli [1]. There is a primary, secondary and tertiary dentin. While the primary dentin is a regular dentin created before tooth eruption, the secondary dentin is created lifelong. On the other hand tertiary dentin is an irregular dentin, created as a result of outer irritations, like caries, bacterial toxins or a cavity preparation. If the dentin tubuli are exposed by such irritations und interventions, the dentin creating odontoblasts are violated or destroyed and can cause inflammation. As a reaction to such irritations a reaction dentin and repairing dentin (Fibrodentin, Osteodentin) are created by the odontoblasts or odontoblasts-like cells as specific forms of tertiary dentin. Destroyed odontoblasts will be substituted by fibroblast-like cells, which create a collagen matrix. This collagen matrix will then be mineralized and result in a new entity of hard tissue ("hard tissue-bridge").

MTA

MTA, Mineral-Trioxid-Aggregate, is a modified, high pourity Portland cement, which is explored already in the 1990 years at the University of Loma Linda, USA, by Mahmoud Torabinejad for dental applications and endodontics [2]. It has become a popular alternative to calcium hydroxide and in the last years it was used in numerous studies as pulp capping material. The chemical, physical, antibacterial properties and the biocompatibility turned out to be excellent [3], [4], [5].

To compensate the disadvantages of an easy soluble and a prolonged hardening of a self-curing powder/liquid system, a resin-modified MTA was developed, which is nearly unsoluble and light-curable.

How differs ReViCal® Liner from ReViCal® in indication?

ReViCal® Liner

ReViCal® Liner is a bioactive, light-cure *liner* with MTA-filler and a high compression - and flexural strength (see figures), which at the same time functions as a *pulp capping material* for *indirect (Cp)* pulp capping.

Before applying the underfilling a (self-etching) enamel/dentin adhesive with high adhesion strength will be applied to the prepared cavity base and light-cured. **Then** the liner **ReViCal® Liner** will be applied and light-cured, followed by a definite filling treatment in this session with commercial composites.

ReViCal®

ReViCal® is contrary to this a bioactive, light-cure reinforced *pulp capping material* with MTA-filler indicated for a *direct (P)* and *indirect (Cp)* pulp capping.

After a precise application of **ReViCal®** it will be light-cured. Then a (self-etching) enamel/dentin adhesive with high adhesion strength will be applied to the cavity base and light-cured. The definitive filling treatment with composites can then be proceed directly in this session.

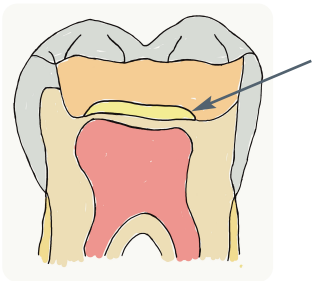
Summary

Steps:

Product	ReViCal ® Liner	ReViCal ®
Indication	**Underfilling (liner), Cp**	**Cp, P**
Step	Preparation cavity lege artis	Preparation cavity lege artis
1. Application	Adhesive system	**ReViCal ®**
2. Application	**ReViCal ® Liner**	Adhesive system
Step	Filling	Filling

In the case of a lining and indirect pulp capping the pulp is not opened. Selectivly near pulp infected (carious) dentin can be left, in order to avoid a pulp exposition [3], [6].

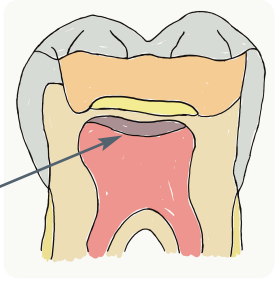
Underfilling Liner, Cp



Underfilling
Indirect pulp capping

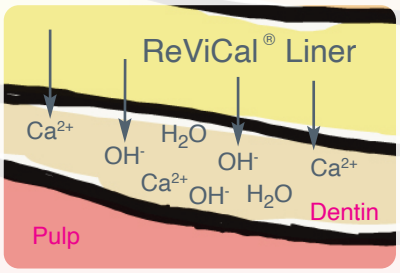
After application of an enamel/dentin adhesive **ReViCal® Liner** is applied directly to the cavity base („Base-Liner").

Thereby it results in a hard tissue-bridge ("dentin-bridge").

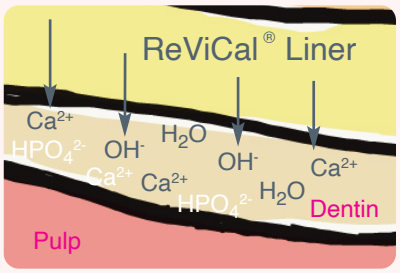


ReViCal® Liner consists of calcium oxide and calcium silicate on a chemical MTA base. Because of the aqueous components in the dentin fluid the MTA-Filler are hydrated after application of the **ReViCal® Liner** [7].

An exchange of ions occur, because **ReViCal® Liner** releases Ca^{2+}- and OH^--ions. The pH-Value increased locally on about pH 12.



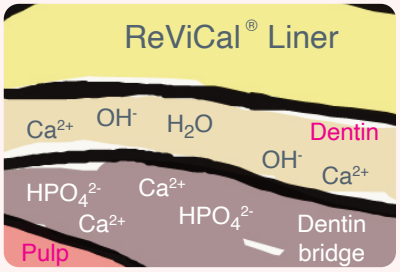
Because of this high alkaline pH-Value and moreover the natural gradient between inner and outer cell membrane and consequently the membrane potential will be disturbed. Therefore the cell metabolism, cell growth and cell division are prevented and thus a cell death is induced. In this way **ReViCal® Liner** works bactericidal to a high degree.



Mode of action underfilling materials

Pulp capping materials

The hydrated calcium silicate and the released Ca^{2+}-ions from calcium silicate set free phosphate ions, which result in the formation of hydroxyapatite. At last from an amorphous calcium phosphate a carbonized hydroxyapatite is formed [6], and in this way tertiary dentin is created as a barrier and a biological protection of the pulp ("hard tissue bridge", "dentin-bridge").



Before application of an underfilling material the prepared cavity will be conditioned with an enamel/dentin adhesive (e. g. the self-etching FANTESTIC ® UniversalBond). Then **ReViCal® Liner** will be applied as an underfilling (liner) and at the same time as an indirect pulp capping and light-cured (see the R-dental folder Product navigation - Dental treatment procedures - solutions). Then the filling treament with commercial composites can be proceed immediately in this session.

The **performance parameter** of **ReViCal® Liner** are shown below:

Density (20 °C):	1,88 g/cm³
Recommended light polymerization time:	~ 40 s
Depth of cure (light for 40 s):	≤ 1 mm
Compressive strength:	> 160 MPa
Flexural strength:	76 MPa
Calcium release:	204 µg/cm²
pH-Value:	about 12

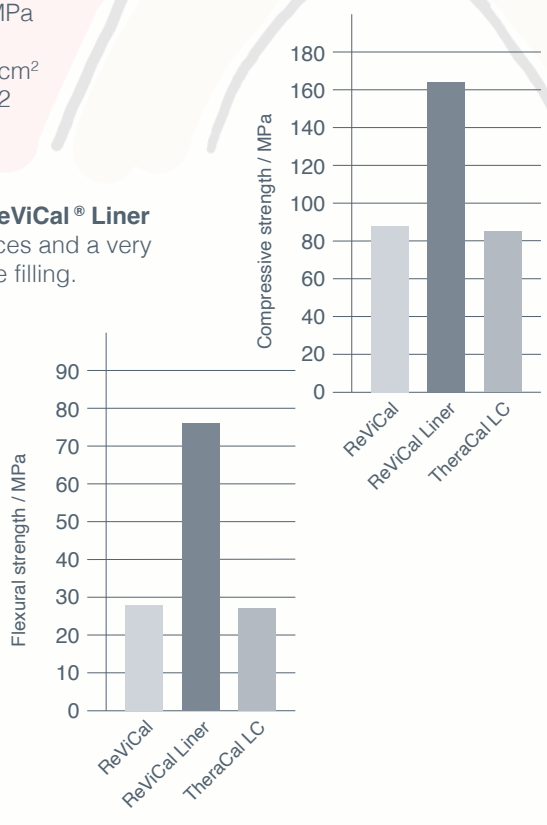
Performance parameter

Performance parameter compressive strength

With a compressive strength of more than 160 MPa **ReViCal® Liner** offers a secure protection against mechanical influences and a very good base for composites applied above for a definite filling. As comparison the compressive strength of ReViCal® and the documented compressive strength of TheraCal LC, Bisco, USA, are shown.

Performance parameter flexural strength

With a high flexural strength of 76 MPa **ReViCal® Liner** provides a very secure strength. As comparison the flexural strength of ReViCal® and the documented flexural strength of the pulp capping material TheraCal LC, Bisco, USA, are shown.

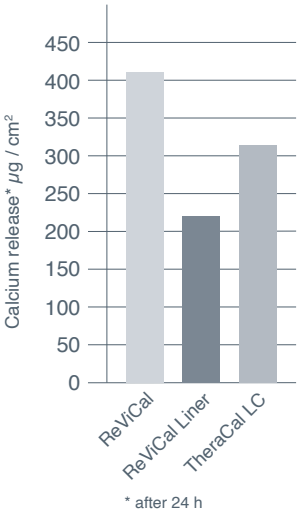


Graphics juxtaposition of important performance parameter

Graphics juxtaposition of important performance parameter

Performance parameter calcium release

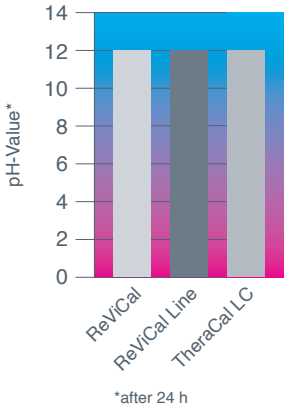
As a result of the calcium release of the pulp capping material the tooth is stimulated to create induced tertiary dentin as a protective barrier. Tertiary dentin is much harder than the primary and secondary dentin and as a consequence a biological protection of the pulp is generated. As comparison the compressive strength of the pulp capping materials ReViCal ® and TheraCal LC, Bisco, USA, are shown.



Performance parameter pH-Value

On the one hand the high alkaline pH-Value of about 12 has a bactericidal function; cell growth and cell proliferation of micro organisms are prevented.

Furthermore the alkaline milieu stimulates the self-healing of the pulp. Only after one period of several weeks the value neutralizes itself again gradually.



Benefits at a glance:

ReViCal ® Liner offers you

Benefits

- a bioactive, light-cure MTA liner and indirect pulp capping material, which stimulated the tooth by its bioactivity to create induced tertiary dentin at once,
- a strong bactericidal effect (see graphics) because of the high pH-Value of about 12,
- an excellent adhesion of ReViCal ® Liner to the previously applied adhesive system and to the commercial composites at definite filling treatment,
- a very high flexural strength (see graphics, compare TheraCal LC),
- a very high compressive strength of 160 MPa (see graphics, compare TheraCal LC),
- a ready to use application system in a handy 1 g-syringe,
- a precise and simple application thanks to the enclosed fine application cannulas,
- a precise application also in deep cavities because of the thixotropic property,
- a safe polymerization and curing depth with prescribed light curing and
- a definite treatment in the office in one session and a radioopaque material for an effective control.

ReViCal ® Liner must be stored sealed at 36 °F - 46 °F (2 °C - 8 °C) and only after the first application (to avoid condensation moisture) at 66 °F - 77 °F (19 °C - 25 °C).

Literature

Literature:

[1] Dammaschke, T., Prof. Dr., Dentin- und Hartgewebeneubildung nach indirekter und direkter Überkappung der Pulpa. Oralprophylaxe Kinderzahnheilkunde 2017; 39: 27-37 - DOI 10.3238/OPKZH.2017.0027-0037, Poliklinik für Parodontologie und ZE, Westfälische Wilhelms-Universität Münster.
[2] Torabinejad M., Hong C. U., McDonald F., Pitt Ford T. R., Physical and chemical properties of a new root-end filling material, J. Endod. 1995; 21: 349-353.
[3]. Hilton T. J., Keys to clinical success with pulp capping: A review of the literature, Operative Dentistry, 2009; 34-5: 615-625.
[4] Karadas M., Cantekin K., Gumus H., et al., Evaluation ot the bond strength of different adhesive agents to a resin-modified calcium silicate material (TheraCal LC), 2016, SCANNING VOL. 38: 403-411.
[5] Camilleri J., Pitt Ford T. R., Mineral trioxide aggregate: A review of the constituents and biological properties of the material, Int. Endod. J., 2006; 39: 747-754.
[6] Buchalla W., Frankenberger R., Galler K. M. et al.: Aktuelle Empfehlungen zur Kariesexkavation. Wissenschaftliche Mitteilung der Deutschen Gesellschaft für Zahnerhaltung (DGZ). Dtsch. Zahnärztl. Z . 2017; 72: 484–494.
[7] Niu L., Jiao K., Wang W. et al., A review of the bioactivity of hydraulic calcium silicate cements, J. Dent., 2014 May: 42(5): 517-533.

Order information

Order information:

Description:	Content:	REF
ReViCal ® Liner	1 syringe à 1 g + 12 application cannulas	RVC1005
ReViCal ® Liner	2 syringes à 1 g (2 g) + 24 application cannulas	RVC1010

* ReViCal is a registered trademark of R-dental Dentalerzeugnisse GmbH.
Product changes and errors excepted.
© R-dental Dentalerzeugnisse GmbH 2023. All rights reserved. V 08/2023.

Contact

Further products, information and R-dental catalogue (paper-app ®):
R-dental Dentalerzeugnisse GmbH • Winterhuder Weg 88 • 22085 Hamburg • Germany
T +49 (0)40-30707073-0 • F +49 (0)40-30707073-73 • E info@r-dental.com • I www.r-dental.com