MTA CEMENTS
Mineral Trioxide Aggregate

MTA Universal
MTA Firm NORMAL SET
MTA Flow FAST SET
Technical Product Information

www.zendo-online.com
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Product description

The product range of MTA cements - Mineral Trioxide Aggregate - includes 3 different MTA cements.

MTA Universal Cement - a material with a medium consistency suitable for all indications.

The 2 other MTA cements are optimized for special indications:

MTA Firm NORMAL SET - repair of root perforations
MTA Flow FAST SET - pulp capping

All these MTA cements are delivered in easy to mix DirectCaps

Forms of delivery:
- 2 DirectCaps in an aluminium bag

Accessories:
- Application gun
MTA CEMENTS - Features and Benefits

Features:
• biocompatible and bioactive permanent cement
• excellent marginal adaptation due to bonding to dentin
• very low solubility
• bacteriostatic
• high radiopacity
• excellent handling
• excellent dimensional stability

Benefits:
• very easy to use
• convenient mix and fixed proportions with capsule
• real biological sealing
• excellent barrier against bacteria and fluids
• easy clinical documentation with radiographs
• excellent marginal sealing
MTA CEMENTS - Indications

All products are suitable for all the indications given in the scheme below. For each indication one product is highly recommended and indicated in the scheme below.

- **Pulp Capping**
  - MTA Flow FAST SET

- **Repair of Root Perforations**
  - MTA Firm NORMAL SET

- **Apexification (orthograde)**
  - MTA Universal

- **Root End Filling (retrograde)**
  - MTA Universal
MTA CEMENTS - Consistency

The pictures show the consistency of the different MTA cements. The unique flowable consistency of MTA Flow FAST SET makes this material optimal for pulp capping. The longer setting time of MTA Firm NORMAL SET is best for repair of root perforations. But nevertheless the type of cement that will be used for the given indication is a decision of the dentist as it depends on the individual clinical situation.

MTA Firm NORMAL SET

MTA Flow FAST SET
MTA CEMENTS - Working Time and Setting Time

<table>
<thead>
<tr>
<th></th>
<th>working time [min]</th>
<th>material ready for next clinical step [min]</th>
<th>setting time [min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTA Universal</td>
<td>2:00</td>
<td>5:00</td>
<td>17:00</td>
</tr>
<tr>
<td>MTA Firm NORMAL SET</td>
<td>2:00</td>
<td>10:00</td>
<td>15:00</td>
</tr>
<tr>
<td>MTA Flow FAST SET</td>
<td>2:00</td>
<td>2:45</td>
<td>03:00</td>
</tr>
</tbody>
</table>

MTA CEMENTS - Radiopacity

All MTA Cements show a very high radiopacity to facilitate easy and reliable postoperative diagnosis.

<table>
<thead>
<tr>
<th></th>
<th>Radiopacity [% Al]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTA Universal</td>
<td>450</td>
</tr>
<tr>
<td>MTA Firm NORMAL SET</td>
<td>&gt;500</td>
</tr>
<tr>
<td>MTA Flow FAST SET</td>
<td>400</td>
</tr>
<tr>
<td>ProRoot MTA (Dentsply)</td>
<td>250</td>
</tr>
</tbody>
</table>
MTA CEMENTS - Push-out bond strength

Push-out bond strength* was tested on extracted human teeth with single canals. The prepared roots were sectioned at different levels (thickness of slices 2 mm). The force required to dislodge the MTA cement from the root slice was measured with a Universal Testing Machine.

MTA Universal shows a push-out bond strength in the same range as Pro Root MTA. After removal of smear layer, push-out bond strength was significantly reduced.

* A.M. Wil-Ma'a'ita, A.J.E. Quailrough, D.C. Watts, Dental Materials, 29 (2013) 797-803
The radiographs show a tooth with a perforated root canal. The setting reaction takes place without shrinkage and thus results in an excellent physical sealing. It follows a biological sealing by building of a protective layer against bacteria with the formation of calcium hydroxide and apatite.
MTA CEMENTS - Clinical Studies Pulp Capping

Independent clinical studies show that MTA is more effective than calcium hydroxide to maintain the vitality of the pulp after direct pulp capping.

- After treatment of 149 patients between 2001 and 2006, 108 of them (122 treated teeth) were available for follow up. A successful outcome was recorded for 78% of teeth (54 of 69) in the MTA group and for 60% of teeth (32 of 53) in the calcium hydroxide group.

  J. Mente, Mineral Trioxide Aggregate or Calcium Hydroxide Direct Pulp Capping: An Analysis of the Clinical Treatment Outcome
  Journal of Endodontics; 36(5), 806-813, May 2010

- 376 patients received a direct pulp cap with calcium hydroxide (n=181) or MTA (n=195). After 2 years follow up the failure was 31.5% for calcium hydroxide versus 19.7% for MTA.

  T.J. Hilton, J.L. Ferracene and L. Manci, Comparison of CaOH with MTA for Direct Pulp Capping: A PBRN Randomized Clinical Trial
  Journal of Dental Research; 92 (1), 16S-22S, July 2013
## MTA CEMENTS - Overview of Properties

<table>
<thead>
<tr>
<th>Working Properties</th>
<th>MTA Universal</th>
<th>MTA Firm NORMAL SET</th>
<th>MTA Flow FAST SET</th>
<th>Pro RootMTA (Dentsply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Time [min]</td>
<td>2:00</td>
<td>2:00</td>
<td>2:00</td>
<td>5:00</td>
</tr>
<tr>
<td>Material Ready for Next Clinical Step [min]</td>
<td>5:00</td>
<td>10:00</td>
<td>2:45</td>
<td>4 h</td>
</tr>
<tr>
<td>Setting Time acc. ISO 6876 [min]</td>
<td>17:00</td>
<td>15:00</td>
<td>3:00</td>
<td>12:00</td>
</tr>
<tr>
<td>Amount per Capsule</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
<td>Handmix</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consistency Properties</th>
<th>creamy soft</th>
<th>creamy</th>
<th>creamy soft</th>
<th>creamy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc Diameter after 1 min</td>
<td>22</td>
<td>22</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>Disc Diameter after 3 min</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength after 24h [MPa]</td>
<td>18,5</td>
<td>31</td>
<td>7,5</td>
<td>37</td>
</tr>
<tr>
<td>Compressive Strength after 1 month [MPa]</td>
<td>38</td>
<td>in work</td>
<td>22</td>
<td>in work</td>
</tr>
<tr>
<td>Color</td>
<td>beige</td>
<td>beige-grey</td>
<td>grey-white</td>
<td>beige-grey</td>
</tr>
<tr>
<td>pH-Wert of Mixed Cement after 3 min</td>
<td>11,5</td>
<td>11,5</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Lactic Acid Solubility after 24 h [mm]</td>
<td>-0,254</td>
<td>0,000</td>
<td>0,000</td>
<td>-0,002</td>
</tr>
</tbody>
</table>
MTA CEMENTS - Competitive Products

Beside Pro Root MTA (Dentsply) some other products for the same range of indications are listed below:

<table>
<thead>
<tr>
<th>Dentsply</th>
<th>Pro Root MTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angelus</td>
<td>MTA-ANGELUS, MTA-FILLAPEX</td>
</tr>
<tr>
<td>Isusan</td>
<td>TECH BIOSEALER (endo, apex, capping and root end)</td>
</tr>
<tr>
<td>BioMTA</td>
<td>OrthoMTA, RetroMTA</td>
</tr>
<tr>
<td>Maruchi</td>
<td>EndoCem MTA</td>
</tr>
<tr>
<td>Avalon Biomed</td>
<td>MTA Plus</td>
</tr>
<tr>
<td>Septodont</td>
<td>Biodentine</td>
</tr>
</tbody>
</table>

For most of these materials the powder is pre-dosed, but normally these materials have to be mixed by hand on a glass plate.

Disadvantages
- lost of material
- inhomogeneous mixture
- time-consuming
- labor-intensive (cleaning of glass plate and mixing device)

EndoCemMTA (Maruchi) and Biodentine (Septodont) offer a vial with a pre-dosed amount of powder. After adding the liquid, the material is mixed in a mixing device.

All Zendo MTA cements are delivered in easy to use DirectCaps.

After a mixing time of 30 seconds, the material is extruded from the DirectCap with an optimal consistency.
Recommendations for Use

MTA Firm NORMAL SET – DirectCaps
Endodontic Repair Cement

MTA Firm NORMAL SET is an endodontic repair cement in DirectCaps. Due to its firm consistency in combination with a comfortable setting time MTA Firm NORMAL SET is the ideal choice for repair of root perforations. MTA Firm NORMAL SET powder consists of very fine hydrophilic particles of several hydraulic mineral oxides. After contact with MTA Firm NORMAL SET liquid it forms a gel that hardens to an impermeable barrier.

MTA Firm NORMAL SET is delivered in DirectCaps. DirectCaps are easily activated and the content of the capsule is easily ejected out with the DirectGun. Capsule mixing (mixing time 30 seconds) is achieved by a high frequency mixer with about 4,300 oscillations/min such as Capmix.

1. Indications
• Repair of root perforations during root canal therapy
• Root-end fillings
• Pulp capping
• Repair of root canals as an apical plug during apexification

2. Contraindications
Not known

3. Side effects
Not known

4. Activation and Mixing (see Instruction for DirectCaps)
Activate and mix the DirectCap according to the information in the DirectCap instruction. Mixing time for the DirectCaps is 30 seconds.

Attention:
Avoid lag times between the processes of activation, mixing and application as the material is in the process of setting, which may impair or prevent application of the material. The material must be extruded within 10 seconds after the end of mixing.
To prevent dehydration during setting, apply MTA Firm NORMAL SET intraorally immediately after mixing.

Working time of MTA Firm NORMAL SET 2:00 minutes (at 23°C).

5. Application
5.1. Repair of root perforations
Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points and isolate the perforation.
Fill the apical canal space up to the perforation completely with a suitable root canal filling material.
Mix MTA Firm NORMAL SET as described under point 4 and extrude it on a glass plate.
Apply MTA Firm NORMAL SET with suitable instruments into the perforation site and condense it.
Check the position of MTA Firm NORMAL SET in the root canal by an X-ray. If an adequate barrier has not been created, rinse MTA Firm NORMAL SET out of the canal and repeat the procedure.
Remove excess moisture with a damp cotton pellet or a paper point.
With a suitable instrument apply a small amount of MTA Firm NORMAL SET over the exposed pulp and remove excess moisture with a dry cotton pellet.
Not before 10 minutes after application of MTA Firm NORMAL SET place a small amount of a flowable light cure liner (e.g. LC IONLINE or LC IONLINE SE) and light cure.
Etch the remaining cavity walls according to the total-etch-technique with ETCHING GEL and apply a suitable bonding agent (e.g. TE BOND T1) according to the corresponding instructions.
Place a light cure composite (e.g. LC NANOFILL XP) according to the instructions and light cure.
Pulp vitality and status should be checked by X-ray at regular intervals.

5.4. Apexification
Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points.
For disinfection place calcium hydroxide paste in the root canal for one week. Seal the access opening with a temporary filling material.
Mix MTA Firm NORMAL SET as described under point 4 and extrude it on a glass plate.
With a suitable instrument apply a small amount of MTA Firm NORMAL SET over the exposed pulp and remove excess moisture with a dry cotton pellet.
Remove excess moisture with a damp cotton pellet or a paper point. Place a damp cotton pellet in the access to the root canal and apply a temporary filling material.
Alternatively seal the access preparation with a suitable root canal filling material and seal the cavity with a tight filling.
Both options can be done not before 10 minutes after placement of the MTA Firm NORMAL SET.
MTA Firm NORMAL SET repair material remains as a permanent part of the root canal filling.

Additional remarks
• Store MTA Firm NORMAL SET in the sealed packaging at a dry place prior to use.
• Intraoral application of MTA Firm NORMAL SET must be done immediately after mixing to prevent dehydration during setting.
• MTA Firm NORMAL SET can cause discoloration. Use MTA Firm NORMAL SET only in the root canal and/or the pulp chamber.

Storage
Store MTA Firm NORMAL SET at a dry place at 10 – 25 °C. Do not store below 10°C! Do not use after expiry date.
DirectCaps are for single use only.
Recommendations for Use

MTA Flow FAST SET – DirectCaps
Endodontic Repair Cement

MTA Flow FAST SET is an endodontic repair cement with in DirectCaps. Due to its unique flowable consistency in combination with a short setting time MTA Flow FAST SET is the ideal choice for pulp capping. MTA Flow FAST SET powder consists of very fine hydrophilic particles of several hydraulic mineral oxides. After contact with MTA Flow FAST SET liquid it forms a gel that hardens to an impermeable barrier.

MTA Flow FAST SET is delivered in DirectCaps. DirectCaps are easily activated and the content of the capsule is easily ejected out with the DirectGun. Capsule mixing (mixing time 30 seconds) is achieved by a high frequency mixer with about 4,300 oscillations/min such as Capmix.

1. Indications
- Repair of root perforations during root canal therapy
- Root-end fillings
- Pulp capping
- Repair of root canals as an apical plug during apexification

2. Contraindications
Not known

3. Side effects
Not known

4. Activation and Mixing (see Instruction for DirectCaps)
Activate and mix the DirectCap according to the information in the DirectCap instruction.
Mixing time for the DirectCaps is 30 seconds.

Attention:
Avoid lag times between the processes of activation, mixing and application as the material is in the process of setting, which may impair or prevent application of the material. The material must be extruded within 10 seconds after the end of mix.

To prevent dehydration during setting, apply MTA Flow FAST SET introradially immediately after mixing.

Working time of MTA Flow FAST SET is 2:00 minutes (at 23°C).

5. Application
5.1. Repair of root perforations
Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points and isolate the perforation.
Fill the apical canal space up to the perforation completely with a suitable root canal filling material.
Mix MTA Flow FAST SET as described under point 4 and extrude it on a glass plate.
Apply MTA Flow FAST SET with suitable instruments into the perforation site and condense it.
Check the position of MTA Flow FAST SET in the root canal by an X-ray. If an adequate barrier has not been created, rinse MTA Flow FAST SET out of the canal and repeat the procedure.
Remove excess moisture with a dam cotton pellet or a paper point.
Place a damp cotton pellet in the access to the root canal and apply a temporary filling material.
Alternatively seal the access preparation with a suitable root canal filling material and seal the cavity with a tight filling.
Both options can be done not before 2:45 minutes after placement of the MTA Flow FAST SET.
MTA Flow FAST SET repair material remains as a permanent part of the root canal filling.

5.2. Root-End Filling
Create an access to the root-end and resect the root with a surgical bur.
Use an ultrasonic tip to prepare a class I root-end cavity preparation to a depth of 3-5 mm.

Isolate the area and dry the root end cavity with paper points.
Mix MTA Flow FAST SET as described under point 4 and extrude it on a glass plate.
Apply MTA Flow FAST SET with suitable instruments and condense it using a small plugger.

Remove excess cement and clean the surface of the root with a moist piece of gauze.

Confirm placement of the MTA-repair material with an X-ray. The MTA Flow FAST SET repair material remains as a permanent part of the root canal filling.

5.3. Pulp Capping
Place rubber dam and prepare the cavity outline. If caries is present, remove it. Rinse cavity and exposed pulpal areas with a suitable disinfectant.
Mix MTA Flow FAST SET as described under point 4 and extrude it on a glass plate.

With a suitable instrument apply a small amount of MTA Flow FAST SET over the exposed pulp and remove excess moisture with a dry cotton pellet.

Not before 2:45 minutes after application of MTA Flow FAST SET place a small amount of a flowable light cure liner (e.g. LC IONONLINE or LC IONLINE SE) and light cure.
Etch the remaining cavity walls according to the total-etch-technique with ETCHING GEL and apply a suitable bonding agent (e.g. TE BOND T1) according to the corresponding instructions.
Place a light cure composite (e.g. LC NANOFILL XP) according to the instructions and light cure.

Pulp vitality and status should be checked by X-ray at regular intervals.

5.4. Apexification
Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points.
For disinfection place calcium hydroxide paste in the root canal for one week. Seal the access opening with a temporary filling material.
Mix MTA Flow FAST SET as described under point 4 and extrude it on a glass plate.

With a suitable instrument apply a small amount of MTA Flow FAST SET into the perforation site and condense it. Create a 3 – 5 mm barrier of MTA Flow FAST SET.

Check the position of MTA Flow FAST SET by an X-ray. If an adequate barrier has not been created, rinse MTA Flow FAST SET out of the canal and repeat the procedure.
Remove excess moisture with a dam cotton pellet or a paper point.
Place a damp cotton pellet in the access to the root canal and apply a temporary filling material.
Alternatively seal the access preparation with a suitable root canal filling material and seal the cavity with a tight filling.
Both options can be done not before 2:45 minutes after placement of the MTA Flow FAST SET.
MTA Flow FAST SET repair material remains as a permanent part of the root canal filling.

Additional remarks
- Store MTA Flow FAST SET in the sealed packaging at a dry place prior to use.
- Intraoral application of MTA Flow FAST SET must be done immediately after mixing to prevent dehydration during setting.
- MTA Flow FAST SET can cause discoloration. Use MTA Flow FAST SET only in the root canal and/or the pulp chamber.

Storage
Store MTA Flow FAST SET at a dry place at 10 – 25 °C. Do not store below 10°C! Do not use after expiry date.
DirectCaps are for single use only.
MTA Universal - DirectCaps
Endodontic Repair Cement

MTA Universal is an endodontic repair cement in DirectCaps. MTA Universal powder is consisting of very fine hydrophilic particles of several mineral oxides. After contact with MTA Universal liquid it forms a gel that hardens to an impermeable barrier.

MTA Universal is delivered in DirectCaps. DirectCaps are easily activated and the content of the capsule is easily ejected out with the DirectGun. Capsule mixing (mixing time 30 seconds) is achieved by a high frequency mixer with about 4,300 oscillations/min such as Capmix.

1. Indications
   • Repair of root perforations during root canal therapy
   • Root-end fillings
   • Pulp capping
   • Repair of root canals as an apical plug during apexification

2. Contraindications
   Not known

3. Side effects
   Not known

4. Activation and Mixing (see Instruction for DirectCaps)
   Activate and mix the DirectCap according to the information in the DirectCap instruction.
   Mixing time for the DirectCaps is 30 seconds.

   Attention:
   Avoid lag times between the processes of activation, mixing and application as the material is in the process of setting, which may impair or prevent application of the material. The material must be extruded within 10 seconds after the end of mix.
   To prevent dehydration during setting, apply MTA Universal intraoral immediately after mixing.

   Working time of MTA Universal is approx. 2:00 minutes (at 23°C).

5. Application
   5.1. Repair of root perforations
   Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points and isolate the perforation.
   Fill the apical canal space up to the perforation completely with a suitable root canal filling material.
   Mix MTA Universal as described under point 4 and extrude it on a glass plate.
   Apply MTA Universal with suitable instruments into the perforation site and condense it. Create a 3 – 5 mm barrier of MTA Universal.
   Check the position of MTA Universal in the root canal by an x-ray. If an adequate barrier has not been created, rinse MTA Universal out of the canal and repeat the procedure.
   Remove excess moisture with a damp cotton pellet or a paper point.
   Place a damp cotton pellet in the access to the root canal and apply a temporary filling material.
   Alternatively seal the access preparation with a suitable root canal filling material and seal the cavity with a light filling.
   Both options can be done not before 5 minutes after placement of the MTA Universal.
   MTA Universal repair material remains as a permanent part of the root canal filling.

   5.2. Root-End Filling
   Create an access to the root-end and resect the root with a surgical bur.
   Use an ultrasonic tip to prepare a class 1 root-end cavity preparation to a depth of 3-5 mm.
   Isolate the area and dry the root end cavity with paper points.
   Mix MTA Universal as described under point 4 and extrude it on a glass plate.

Apply MTA Universal with suitable instruments and condense it using a small plunger.
Remove excess cement and clean the surface of the root with a moist piece of gauze.
Confirm placement of the MTA-universal repair material with an x-ray. The MTA Universal repair material remains as a permanent part of the root canal filling.

5.3. Pulp Capping
   Place rubber dam and prepare the cavity outline. If caries is present, remove it. Rinse cavity and exposed pulpal areas with a suitable disinfectant.
   Mix MTA Universal as described under point 4 and extrude it on a glass plate.
   With a suitable instrument apply a small amount of MTA Universal over the exposed pulp and remove excess moisture with a dry cotton pellet.
   Not before 5 minutes after application of MTA Universal place a small amount of a flowable light cure liner (e.g. LC IONOLINE) and light cure.
   Etch the remaining cavity walls according to the total-etch-technique with ETCHING GEL and apply a suitable bonding agent (e.g. TE BOND T1) according to the corresponding instructions.
   Place a light cure composite (e.g. LC NANOFLIX XP) according to the instructions and light cure.
   Pulp vitality and status should be checked by X-ray at regular intervals.

5.4. Apexification
   Place rubber dam and clean the root canal system using intra-canal instruments and irrigate with NaOCl. Dry the root canal with paper points.
   For disinfection place calcium hydroxide paste in the root canal for one week. Seal the access opening with a temporary filling material.
   Mix MTA Universal as described under point 4 and extrude it on a glass plate.
   With a suitable instrument apply a small amount of MTA Universal into the perforation site and condense it. Create a 3 – 5 mm barrier of MTA Universal.
   Check the position of MTA Universal by an x-ray. If an adequate barrier has not been created, rinse MTA Universal out of the canal and repeat the procedure.
   Remove excess moisture with a damp cotton pellet or a paper point.
   Place a damp cotton pellet in the access to the root canal and apply a temporary filling material.
   Alternatively seal the access preparation with a suitable root canal filling material and seal the cavity with a tight filling.
   Both options can be done not before 5 minutes after placement of the MTA Universal.
   MTA Universal repair material remains as a permanent part of the root canal filling.

Additional remarks:
• Store MTA Universal in the sealed packaging at a dry place prior to use.
• Intracoronal application of MTA Universal must be done immediately after mixing to prevent dehydration during setting.
• MTA Universal can cause discoloration. Use MTA Universal only in the root canal and/or the pulp chamber.
• In order to obtain a creamy consistency, 1 or 2 drops of sterile water can be added to the mixed MTA Universal cement.

Storage
Store MTA Universal at a dry place at 10 – 25 °C. Do not store below 10°C! Do not use after expiry date.
DirectCaps are for single use only.
**Instruction for activating and mixing DirectCaps**

1. DirectCap before activation.

2. For activation of the DirectCap press the plunger on a hard and plane surface to the end into the DirectCap.

3. **Click once to standardize!**

   Insert the DirectCap into the DirectGun and click once to standardize. Note: The plunger must be at the same level as the bottom of the capsule.

4. Insert the DirectCap into a mixer (or an amalgamator), close lid and mix immediately (about 4300 oscillations / min). Mixing time: see corresponding recommendation for use.

5. Remove the pin from the nozzle. If not, capsule can burst.

6. Insert the DirectCap into the DirectGun. Pull the lever 2 times (2 clicks) to prime the DirectCap. Extrude the mixed material directly into the preparation. Unlock the gun (push button A) and remove the DirectCap.
Literature - MTA Cements

D. Troharsch, Mineral Trioxid Aggregate - Ein endodontischer Reparaturzement
ZWR - Das Deutsche Zahnärzteblatt 2012; 121 (5) Sonderdruck

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M. Parirokh, M. Tarabinejad, Mineral Trioxide Aggregate - Review Article Part I
Journal of Endodontics; 36(1), 16-27, January 2010

M. Parirokh, M. Tarabinejad, Mineral Trioxide Aggregate - Review Article Part II
Journal of Endodontics; 36(2), 190-202, February 2010

M. Parirokh, M. Tarabinejad, Mineral Trioxide Aggregate - Review Article Part III
Journal of Endodontics; 36(3), 400-413, March 2010

T. Damaschke, Anwendung eines neuen bioaktiven Kalziumsilikat-Zements zur direkten Pulpenüberkappung
ZWR - Das Deutsche Zahnärzteblatt 2012; 121 (7+8)

J. Mente, Mineral Trioxide Aggregate or Calcium Hydroxide Direct Pulp Capping: An Analysis of the Clinical Treatment Outcome
Journal of Endodontics; 36(5), 806-813, May 2010

T.J. Hilton, J.L. Ferracene and L. Manci, Comparison of CaOH with MTA for Direct Pulp Capping: A PBRN Randomized Clinical Trial
Journal of Dental Research; 92 (1), 16S-22S, July 2013
This presentation contains a survey of internal scientific product data.

This product information has been prepared by the manufacturer’s research and evaluation labs.

The information shows test results of random lots of presented materials tested under same conditions. Data were determined by best knowledge and effort.

This presentation is only for your information, not for publication purposes unless with prior written approval.

We do not guarantee that data in this presentation are error-free and also cannot be held responsible for any injuries resulting from the use or handling of this product or this presentation.