OSTEOPAL® plus

Radiopaque bone cement
for filling and stabilising vertebral bodies
with an extended application time
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(Revision status: 2018-11)
Properties

OSTEOPAL® plus is a radiopaque, low-viscosity bone cement, based on polymethylmethacrylate with an extended application phase, used to fill and stabilise vertebral bodies. OSTEOPAL® plus contains zirconium dioxide as an X-ray contrast agent. The colouring agent chlorophyll (E141) is mixed with OSTEOPAL® plus to improve visibility of the surgical field.

The bone cement is prepared immediately prior to use by mixing the polymer powder component and the liquid monomer component. A low viscosity paste is created with the aid of an application system, placed in the vertebral body, where it cures.

Composition

A pack of OSTEOPAL® plus 1x20 contains a pouch of cement polymer powder and a brown glass ampoule containing the cement monomer liquid.

Constituents of the polymer powder:
- poly(methyl acrylate, methyl methacrylate), zirconium dioxide, benzoyl peroxide, colouring agent E141.

Constituents of the monomer liquid:
- methylmethacrylate, N,N-dimethyl-p-toluidine, hydroquinone.

The packaging for the cement powder is sterile. The outer, non-sterile aluminium protective bag contains a polyethylene-paper pouch, which is sterile on the inside. This pouch contains an additional sterile PE-paper bag that contains the cement powder.

The brown glass ampoule containing the sterile-filtered monomer liquid is also sterile packed in an ethylene oxide sterilised individual blister pack.

Indications

OSTEOPAL® plus is used for augmenting and stabilising of vertebral bodies.

- for compression fractures of the vertebral body
- for vertebral body tumours (metastases and myelomas)
- for symptomatic vertebral haemangiomas

In every case, the vertebroplasty and kyphoplasty only represent stabilising forms of treatment. This does not constitute therapy of the underlying disease (osteoporosis, tumour disease).

Contraindications

Haemorrhagic diathesis and infections represent absolute contraindications. Lesions of the vertebral body with epidural extension are relative contraindications due to the risk of spinal cord compression.

OSTEOPAL® plus must not be used

- in case of suspected or proven hypersensitivity to components of the bone cement
- during pregnancy and breast-feeding

Side effects

There are frequent reports of a temporary reduction in blood pressure immediately after implantation of PMMA bone cements. Less frequent cases of hypotension accompanied by anaphylaxis have been described; including anaphylactic shock, cardiac arrest and sudden death. These cardiovascular and respiratory side effects, also known as implantation syndrome or bone cement syndrome, result from infiltration of bone marrow components into the venous vascular system. In the case of pulmonary or cardiovascular complications, monitoring and possibly an increase in blood volume are necessary. In the event of acute respiratory insufficiency, anaesthesiological measures should be undertaken.

Moreover, complications which may occur with any surgical procedure are conceivable.

The requirements for a contemporary cementing technique must be taken into consideration when using OSTEOPAL® plus to limit undesirable side effects and to be in a position to guarantee stable and long-lasting anchoring of the bone cement in the vertebral body.

Interactions

Are not yet known.

Precautions

Use by surgical personnel

Prior to using OSTEOPAL® plus, the user should be familiar with its properties, handling and application. The user is recommended to practice the mixing and application process in advance. Detailed knowledge of the mixing systems and syringes for applying the cement is a prerequisite.

The monomer liquid is volatile and flammable. Suitable precautions should therefore be taken for use in the operating theatre. The monomer is a strong lipid solvent and should not come into direct contact with the body.

When handling the monomer or the cement, it is always necessary to wear protective gloves that ensure the necessary protection against ingress of the monomer (methylmethacrylate). PVP gloves (three-layer polyethylene, ethylene vinyl alcohol copolymer, polyethylene) and Viton butyl gloves are highly recommended over a long period of use. It is recommended to wear two pairs of gloves over each other (to be on the safe side), e.g. a polyethylene surgical glove over an inner latex standard surgical glove.

The use of latex or polystyrene-butadiene gloves alone is insufficient. In addition, the relevant information should be obtained in advance from the manufacturer/supplier.

The monomer vapours can irritate the respiratory tract and eyes, and possibly cause liver damage. Skin irritations have been obtained in advance from the manufacturer/supplier.

The monomer vapours can irritate the respiratory tract and eyes, and possibly cause liver damage. Skin irritations have been described which are attributable to contact with the monomer.

The manufacturers of soft contact lenses recommend removing these lenses from the eyes prior to handling MMA and the irritant vapours that result. As soft contact lenses are permeable to liquids and gases, they should not be worn in the operating theatre if polymethylmethacrylate is used.
Use on the patient
Blood pressure, pulse and breathing must be carefully monitored during and immediately after implantation of the cement. Every significant change in these vital signs must be rectified with the appropriate measures.

The leakage of cement can cause damage to the paravertebral structures. Complications, such as spinal cord compression, intercostal neuralgia, escape of cement into the intervertebral space, eritravertebral filling of veins and arteries (risk of embolism), infections and post-procedural pain are possible. In order to avoid the escape of cement and to recognise adverse events in good time, the application must take place using imaging methods (real time display). The means of immediate operative procedure to surgically rectify the complications described must also be available.

A thorough pre-operative radiological examination must be carried out to preclude possible risks (e.g. vertebral body lesions, vascularisation of the vertebral body or oedema). Insufficient filling of the vertebral body with bone cement can lead to insufficient acute pain reduction and reduced long-term stability of the vertebral body treated.

Incompatibilities
Aqueous solutions (e.g. containing antibiotics) must not be mixed with the bone cement, as they significantly impair the physical and mechanical properties of the cement.

Dosage
A dose is prepared by mixing the complete contents of a cement powder pouch with all the monomer liquid in an ampoule. The quantity to be applied depends on the respective anatomical conditions. There is no information available on the maximum amount of bone cement that can be inserted and the maximum number of vertebral bodies to be treated for a vertebroplasty or kyphoplasty. Generally one or two portions are used. However, this depends on the surgical technique applied, as well as the size of the respective vertebral body and the defect. At least one additional pack of OSTEOPAL® plus should be available before commencing the operation.

Procedure for use
Preparation:
Prior to opening the unsterile aluminium protective pouch, the contents are shaken or tapped down so that the contents are not damaged on opening. The inner polyethylene-paper pouch containing the powder and the ampoule must only be opened under sterile conditions. The sterile components (inner polyethylene-paper pouch and glass ampoule) are handed over under sterile conditions.

Opening under sterile conditions:
The outer peel-off pouch is opened under sterile conditions and in the intended place so that the inner polyethylene-paper pouch can be removed sterile. The blister pack is also opened under sterile conditions and at the intended place so the glass ampoule can be removed sterile.

Before opening the inner polyethylene-paper pouch, the contents are moved down by shaking or tapping to ensure that there is no loss of powder when the top edge is cut open.

To make it easier to open the glass ampoule, it has a predetermined breaking point at the transition to the head of the ampoule. A breaking aid (tube) is attached to the glass ampoule to make it easier to open the ampoule. The breaking aid is gripped rather than the ampoule head and the ampoule head is broken off beyond this. The broken off ampoule head remains in the breaking aid.

Mixing the components:
The liquid from the ampoule is put in a sterile mixing vessel. The powder from the open inner pouch is then added. The mixture is stirred with a sterile spatula or spoon until a homogeneous paste is produced. The mixture should be stirred for 30 seconds irrespective of the ambient temperature. Strict adherence with the instructions for mixing the powder and liquid components can minimise complications.

The cement components can be mixed in a mixing system with or without a vacuum. The mixing time for mixing with or without a vacuum is 30 seconds irrespective of the ambient temperature. Details on the mixing systems may be found in their instructions for use.

The processing time and polymerisation are strongly dependent on the temperature and environment. Higher temperatures accelerate the curing time, lower temperatures extend it.

Processing
The viscosity increases with advancement of polymerisation, i.e. the advancement of the processing phase. The cement paste should be put into an application system immediately after mixing, as it still has low viscosity and may be easy to aspirate. To avoid vascular escape of cement, the cement should be applied in a paste state. OSTEOPAL® plus can be inserted into the vertebral body with the aid of an application system approved for percutaneous vertebroplasty or kyphoplasty, which allows constant and controlled injection. The handling of the system is described in the manufacturer’s instructions for use.

During intravertebral application, constant X-ray screening (latero-lateral) in real time is necessary. In the event of paravertebral escape of cement, cement injection must be interrupted immediately and can be continued after the viscosity of the cement has increased. If the vertebral filling is not sufficient, a further contralateral approach is possible. After augmentation, a mandrin should be inserted in the injection needle so that no residues of cement remain in the soft tissue after removal of the injection needle.

The mixing, processing and curing times of OSTEOPAL® plus are shown in the diagram at the end of these instructions.

The values apply to using bone fillers with a diameter of 3.5 mm (MAXXSPINE Ltd, 65307 Bad Schwalbach, Germany).

The cement can still be removed from the bone fillers at the end of the processing period, but no longer binds free from creases. Therefore, the end of the processing time refers to the state of the cement, not to the possible end time for removing cement from the bone fillers.
There may be changes in the processing for other application systems. Cannulas with a diameter below 1.8 mm (13G) should not be used. The patient must remain immobilised until the cement is fully cured.

**Storage**

The cement must be stored unopened and protected from light at a maximum temperature of 25°C (77°F) in a dry, clean place in the original packaging.

**Shelf life/sterility**

The expiry date is specified on the folding box, the aluminium pouch and the inner pouch.

**Disposal**

Single components of the bone cement, cured solid material as well as (uncleaned) packaging material must be disposed by following the regulations of the local authorities.

**OSTEOPAL® plus** must not be used after the date specified. For production reasons, the shelf lives of the individual components may differ from that specified on the folding box. The content of non-used, opened or damaged packages must not be resterilised and must therefore be discarded. If the cement powder has turned yellow, **OSTEOPAL® plus** must no longer be used. Immobilised until the cement is fully cured.
Processing times for OSTEOPAL® plus

Test conditions: 55% humidity.

Registered certificate: 20163651269
Product standard: YZB/GER 3945-2015

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OSTEOPAL® plus

特性
OSTEOPAL® plus 是一款不透射线的低粘度聚甲基丙烯酸甲酯骨水泥, 可在延长应用阶段用于填充和固定椎骨。OSTEOPAL® plus 含有作为 X 射线造影剂使用的二氧化锆。此外, OSTEOPAL® plus 混入了叶绿素铜 (E141) 以提高手术区域内的可见度。使用前, 应通过混合聚合物粉末和液体单体备制骨水泥。由此可生成低粘度糊状骨水泥, 可帮助应用系统注入椎骨并硬化。

成分
一包 OSTEOPAL® plus 1x20 中装有一包骨水泥粉 (聚合物粉末) 和一个采用褐色安瓿瓶装的骨水泥液体 (单体液体)。

聚合物粉末成分
聚 (丙烯酸酯、甲基丙烯酸甲酯)、二氧化锆、过氧化苯甲酰、叶绿素铜 (E141)。

单体液体成分
甲基丙烯酸甲酯、N,N-二甲基对甲苯胺、对苯二酚。

骨水泥粉末采用无菌包装。外部未经灭菌的铝制保护袋中装有一只聚乙烯纸袋, 该纸袋内部经过灭菌处理。纸袋内还装有另一只聚乙烯纸袋, 其中装有骨水泥粉末。装有经无菌过滤的单体液体的褐色安瓿瓶则采用同样经过灭菌处理的氧化乙烯安瓿包壳包壳包装。

适应症
OSTEOPAL® plus 适用于填充和稳定椎骨。
- 椎骨压缩性骨折
- 椎体肿瘤 (肿瘤转移或骨髓瘤)
- 症候性椎骨血管瘤
任何时候, 采用椎体成形术和椎体后凸成形术仅能为椎骨提供稳定的保守治疗。因此, 其无法治愈原发病 (骨质疏松症、肿瘤)。本产品呈面团期使用。

禁忌症
禁忌症包括出血性素质及感染。相关禁忌症还包括因脊髓压迫且伴随延伸至硬脊膜的椎骨损伤。
以下情况不得使用 OSTEOPAL® plus:
- 疑似或确认骨水泥成分会导致过敏症
- 妊娠及哺乳期间

副作用
使用 PMMA 骨水泥时, 经常出现关于植入水泥后血压发生临时性下降的报告。极少数情况会出现伴随过敏反应的低血压, 其中包括过敏性休克、心脏停搏及突然死亡。此类心血管系统及呼吸系统的副作用 (也被视作植入综合症或骨水泥综合症), 是由于骨髓成分渗入静脉血管系统

<table>
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<tbody>
<tr>
<td></td>
<td>每小袋中的 26g 粉中含有</td>
<td></td>
</tr>
<tr>
<td>聚 (丙烯酸酯、甲基丙烯酸甲酯)</td>
<td></td>
<td>14.2g</td>
</tr>
<tr>
<td>二氧化锆</td>
<td></td>
<td>11.7g</td>
</tr>
<tr>
<td>过氧化苯甲酰</td>
<td></td>
<td>0.1g</td>
</tr>
<tr>
<td></td>
<td>每安瓿瓶中的 10ml 液体中含有</td>
<td></td>
</tr>
<tr>
<td>甲基丙烯酸甲酯</td>
<td></td>
<td>9.34g</td>
</tr>
<tr>
<td>N,N-二甲基-对甲苯胺</td>
<td></td>
<td>0.06g</td>
</tr>
<tr>
<td>其它成分</td>
<td>在粉中：叶绿素铜 (E141)</td>
<td>~1 ppm</td>
</tr>
<tr>
<td></td>
<td>在液体中：对苯二酚</td>
<td>~32 ppm</td>
</tr>
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所致。如果出现肺部、心血管系统并发症，则必须实施监测并可能需要提高血容量。发生急性呼吸衰竭时，应采取麻醉措施。

此外，每次外科手术时均应考虑是否会出现并发症。使用OSTEOPAL® plus时必须考量同期的粘接技术，以便避免出现意外副作用，并保障植入椎骨的骨水泥具有稳定、长效的固定效果。

相互作用
目前尚未知晓。

预防措施
由手术人员使用
使用OSTEOPAL® plus前，操作者应全面了解其特性、操作及应用。建议操作者事先熟悉混合及使用过程。使用前务必掌握与混合系统及水泥应用注射器相关的详细知识。

单体液体属易挥发且易燃的液体。在手术室内使用时应采取适当的预防措施。此外，单体是一种强脂溶剂，不得直接与身体接触。

处理单体或水泥时，务必穿戴防护手套，其可有效防止单体（甲基丙烯酸甲酯）渗入。较长时间工作时建议使用PVP材质的手套（三层聚乙烯、乙烯-乙烯醇共聚物、聚乙烯）及Viton®/丁基橡胶手套。建议同时穿戴两副手套（安全起见）；例如，在已穿戴的乳胶标准外壳手套上再套一副聚乙烯手套。

单独使用乳胶或聚苯乙烯二烯手套无法提供充分保护。此外，还应预先向制造商/供货商索取相应信息。单体蒸气会刺激呼吸道及眼睛并可能损伤肝脏。如果接触单体可能会产生皮肤刺激。

柔韧型隐形眼镜制造商建议：在处理MMA激性蒸汽前，必须摘除此类镜片。由于液体及气体会通过柔韧型隐形眼镜渗入，因此，在使用甲基丙烯酸甲酯时切勿在手术室内佩戴隐形眼镜。

用于患者
必须在植入骨水泥期间及完成植入后立即仔细监控血压、脉搏和呼吸。如果上述生命体征出现明显变化，则必须立即采取相应措施加以治疗。

脊柱旁的组织结构可能会因骨水泥外漏而受损。因此可能产生诸如脊柱压痛症、胸闷神经痛、水泥漏入椎间盘间隙、椎旁静脉及动脉（栓塞危险）、感染及术后疼痛等并发症。为了避免水泥溢出或正确诊断意外情况，必须采用成像程序（实时显示）完成应用。此外，还必须制定能以外科方式处置前述并发症的即时手术措施。手术前必须执行细致的放射检查以排除各类风险（例如椎体损伤、椎体血管化或水肿）。如果未能使用骨水泥完全填充椎体，则可能导致剧烈疼痛症状缓解不明显及椎体术后的稳定时间缩短。

不相容性
由于水性溶液会严重影响骨水泥的物理及机械特性，因此，切勿将其与水性（例如，含抗生素的）溶液混合。

剂量
将骨水泥粉袋内的所有内容物与安瓿瓶内的所有单体液体混合即可完成一剂的备制。根据实际解剖学情况准备骨水泥的填入量。并并未提供任何与骨水泥最大注入量及通过椎体成形术或椎体后凸成形术处置的椎体最大容量相关的信息，一般采用单侧或双侧注入。但该填入量取决于所用的外科技术，以及实际的椎体和缺损尺寸。手术开始前，应至少另行备制一包OSTEOPAL® plus。

备制
准备工作
打开未经灭菌处理的铝制保护袋前，可通过晃动或拍打将内容物移至底部，以确保打开时内容物完好无损。仅限在无菌条件下打开内部撕拉袋，以确保在无菌环境中取出内部聚乙烯纸袋。同样，应在无菌条件下打开泡沫包装，以确保在无菌环境中取出玻璃安瓿。打开内部聚乙烯纸袋前，可通过晃动或拍打将内容物移至底部，以确保在剪开纸袋上部边缘时不会造成聚合物粉末损失。

在无菌条件下打开
应在无菌条件下并干于指定场所打开外壳撕拉袋，以确保在无菌环境中取出内部聚乙烯纸袋。同样应在无菌条件下并干于指定场所打开泡壳包装，以确保在无菌环境中取出玻璃安瓿。

为了便于打开玻璃安瓿瓶，应事先在与安瓿瓶体相连的连接部位确定断裂点。可将辅助折断工具（小插管）插入玻璃安瓿，以便打开安瓿。此时应握住插入式辅助折断工具而非安瓿瓶头部，借助该工具向外折断安瓿瓶头部。

混合组件
将安瓿瓶内的液体倒入无菌混合容器。随后倒入内部袋中的聚合物粉末。使用无菌压舌板或刮匙进行搅拌，直至形成均匀的浆状物。此外，混合时无需考虑环境温度，搅拌30秒即可。严格遵守混合聚合物粉末及液体组件的说明可能并发症的发生机率降至最低。
还可使用配备或未配备真空功能的混合系统混合水泥组件。采用配备或未配备真空功能的设备进行混合时，其混合时间仍为30秒且无需考虑环境温度。请查阅混合系统的使用说明书了解该系统详情。

操作时间及聚合作用高度取决于组件和环境的温度。温度较高时将缩短硬化时间，温度较低时反之。

进程
粘度将随着聚合作用的进展（即加工阶段的进展）而不断增大。水泥浆状物混合完毕后，由于此时的粘度较低且易于抽吸，因此，应立即将其放入灌注工具系统。应于水泥处于膏状状态时完成应用，以避免水泥漏入血管。可借助经皮椎体成形术或椎体后凸成形术中允许使用的应用系统以恒定可控的方式将OSTEOPAL® plus注入椎体。阅读该系统制造商的使用说明书了解其操作方法。椎间应用期间，必须在实时显示中持续进行X射线透视（侧面横向）。

发生椎旁水泥外漏时，必须立即停止注射水泥并在提高水泥粘度后继续注射。如果未能完成填充椎骨，则可继续进行对侧填充。完成增大后，应在注射针头内插入一枚管心针，以确保拆除注射针头后不会在软组织内留下任何水泥残渣。

可查阅本使用说明书结尾处的图表了解OSTEOPAL® plus的混合、加工及硬化时间。数值适用于使用直径为3.5 mm的Bone Filler Device（MAXXSPINE有限公司，65307 Bad Schwalbach，德国）。

加工时间结束后，可使用Bone Filler Device涂抹水泥，但无法保证其平整性。因此，加工时间结束后表示水泥状态，并非表示Bone Filler Device的最终状态。使用其他应用系统时，加工情况可能有所变动。切勿使用直径低于1.8 mm（13G）的注射插管。水泥完全硬化前，患者必须保持静卧。

存放
应将水泥置于原始包装内并保存在密闭、遮光且温度不超过25°C（77°F）的干燥、整洁的场所。

有效期/无菌性
折叠盒、铝制袋及内袋中均标明了有效日期。指定日期到期后，则不得继续使用OSTEOPAL® plus。单个组件的有效期可能因生产情况不同而与折叠盒上标明的有效期不一致。切勿重新灭菌未使用完、已打开或已受损包装内的内容物，必须将其丢弃。如果发现水泥变黄，则禁止使用OSTEOPAL® plus。产品灭菌有效期限3年。

废弃处理
必须根据当地的规范性规定废弃处理骨水泥各组分、硬化骨水泥以及（未清洁的）包装材料。
OSTEOPAL® plus 的加工时间

测试条件：55 % 空气湿度。
SYMBOLS / 符号

Manufactuer/生产厂商

Sterilized using aseptic processing techniques/无菌处理

Sterilized using ethylene oxide/环氧乙烷灭菌

Consult instructions for use/参考使用说明书

Keep away from sunlight/避免光照

Keep dry/保持干燥

Do not store above 25°C (77°F)/请勿储存于25摄氏度（77华氏度）以上的环境

Do not re-use/请勿二次使用

Do not resterilize/请勿二次灭菌

Catalogue number/产品编号

Use by date/有效期

Batch code/批号

Flammable liquid – Flashpoint 10°C/易燃液体-闪点10摄氏度

Causes skin irritation/刺激皮肤

Do not use if the product sterile barrier system or its packaging is compromised/如果产品无菌屏障系统或其包装已受损，请不要使用