

Summary of safety and clinical performance SmartBone® ORTHO solid shapes

The SSCP is not intended to give general advice on the treatment of a medical condition. Please contact your healthcare professional in case you have questions about your medical condition or about the use of the device in your situation. This SSCP is not intended to replace an Implant card or the Instructions For Use to provide information on the safe use of the device.

1. Device identification and general information

1.1. Device trade name

SmartBone® ORTHO

1.2. Manufacturer's name and address:

Industrie Biomediche Insubri SA,
Via Cantonale 67,
6805 Mezzovico-Vira,
Switzerland.

1.3. Manufacturer's single registration number (SRN)

CH-MF-000049165

1.4. Basic UDI-DI

SmartBone® ORTHO microchips/granules: 764035005P900401OBK7G

1.5. Year when the first certificate (CE) was issued covering the device

2012

2. Intended use of the device

2.1. Intended purpose

SmartBone® ORTHO is intended to be used for bone regeneration in orthopaedic reconstructive surgeries, in elective cases, traumatology and oncology.

2.2. Indications and target populations

SmartBone® ORTHO can be used for bone regeneration in orthopaedic reconstructive surgeries, in elective cases, traumatology and oncology, in the following indications.

Filling of bone defects of the skeletal system of traumatic origin when:

- the trabecular bone architecture is disrupted by impaction forces;
- when there is a need to implement the bone mass during osteosynthesis;
- during revision surgeries (including cases of delayed unions and non-unions);
- as a filler at donor sites after harvesting of autologous bone;
- in skull bones reconstruction.

Filling bone defects in elective orthopaedic surgery, in reconstructive applications:

- during arthroplasty and revision arthroplasty to fill or reconstruct the acetabular bone or for replenishment of the femoral canal in impaction allografting;
- after wedge or pelvic osteotomies.

In spine surgery: for vertebral arthrodesis, fusion, and vertebral body substitution.

Filling of bone defects of the skeletal system of oncologic origin:

- after curettage of benign bone tumors and tumor-like lesions for structural scaffolding of curetted lesions;
- for reconstruction after geometric osteotomies for benign aggressive tumor resections;
- for en-bloc customized bone reconstructions in malignant tumor resections;
- skull bones reconstruction after resections.

Target population: male or female patients over 2 years of age and need a bone regeneration in orthopedic reconstructive surgeries, in elective cases, traumatology and oncology.

According to the instructions for use, SmartBone® ORTHO cannot be used to treat the following patients:

- pregnant or lactating women;
- subjects under 2 years of age (neonates and infants);
- subjects with known allergies to collagen and its derivatives;
- subjects with one or more condition listed in the contraindications.

2.3. Contraindications

SmartBone® ORTHO cannot be used in case of acute or chronic infections at the site of the implant (i.e., osteomyelitis).

SmartBone® ORTHO cannot be used in patients with known allergies to collagen and its derivatives.

Surgeons should be restrained in using SmartBone® ORTHO in the following cases, due to higher risks for complications and side-effects:

- systemic infections;
- uncontrolled metabolic diseases, such as diabetes, thyroid dysfunctions);
- severe kidney or liver diseases;
- bone metabolic diseases, osteomalacia and any medications that negatively influence bone healing (such as the use of bisphosphonates to treat osteoporosis);
- on-going treatment with gluco- and mineralocorticoids and with agents affecting calcium metabolism (e.g. calcitonin);
- autoimmune diseases;
- immunosuppressive therapy;
- scleroderma;
- local radiotherapy;
- heavy smokers;
- high LDL or low HDL cholesterol level;
- low blood levels of Vitamin D;
- abnormal uncontrolled blood pressure (high or low) or impaired microcirculation.

SmartBone® ORTHO cannot be used to treat pregnant or lactating women.

SmartBone® ORTHO cannot be used to treat children under 2 years of age (neonates and infants).

3. Device description

3.1. Description of the device

SmartBone® ORTHO is a composite biomaterial, made of:

- a bovine derived mineral matrix
- reinforced with medical grade biopolymers
- porcine derived medical grade gelatine.

All materials are in contact with patient's bone tissue.

The mix of biopolymers and gelatine create a film on the bone structure in order to obtain a bone substitute with the following characteristics:

- high mechanical performances, close to human healthy bone (i.e. proper load bearing resistance, tenacity to fixation screws, hammering and heavy surgical manoeuvring resistance, etc.);
- high ability of guiding the reparative growth of the natural patient bone; over the time SmartBone® is resorbed and substituted by new bone.

It is a resorbable, sterile, single-use medical device used in bone regeneration.

3.2. Information about medicinal substances in the device

SmartBone® does not contain medicinal substances.

3.3. Description of how the device is achieving its intended mode of action

Bone generally has the ability to regenerate completely, but it requires a very small fracture space or some sort of scaffold to do so. Indeed, bone grafting is possible because bone tissue has the ability to regenerate completely, as long as is provided the space into which to grow, in this case a bone graft. As native bone grows, it will generally replace the graft material completely, resulting in a fully integrated region of new bone.

That biologic effect is encouraged by the key role of the gelatine, that has specific molecular sites to favour the patient stem cells attachment to the scaffold SmartBone® ORTHO. In particular, that result is achieved activating two mechanisms: the osteoconduction (guiding the reparative growth of the natural bone) and osteoinduction (encouraging undifferentiated cells to become osteoblasts, the specific cells of the bone tissue).

SmartBone® ORTHO integration into the natural bone and hence its resorption is driven by its being progressively substituted with healthy living bone from host. This is a key feature of SmartBone® ORTHO and one of its major innovative claims.

The first weeks are then needed for cellular colonization of the scaffold SmartBone® ORTHO, which is also enhanced by the presence of gelatine; meanwhile, this time lag is also necessary for the degradation of the thin polymeric film, which progressively fades away leaving mineral structure for cells to promoting the formation of new living bone (also by means of formation of new vessels); the following couple of months are needed for the integration of the graft with the native patient bone, thanks also to vascularization and new bone formation inside the graft.

3.4. Description of accessories

No accessory is required for the use of SmartBone® ORTHO.

Devices such as membranes, screws, sutures, surgical instruments, osteosynthesis systems can be used along with SmartBone® ORTHO following the standard clinical practice.

4. Risks and warnings

Contact your healthcare professional if you believe that you are experiencing side effects related to the device or its use or if you are concerned about risks. This document is not intended to replace a consultation with your healthcare professional if needed.

4.1. How potential risks have been controlled or managed

The product has been placed on the market since the manufacturer has obtained a CE-mark in conformity to Medical Device Regulation 2017/745, released by a notified body that is an organisation designated by an EU country to assess the conformity of the products on the market.

The manufacturer has implemented a quality system management that ensures the released of safe and efficacy products; furthermore, the manufacturer is constantly monitored in its activities thank to

audits and surveillance by the notified body and the competent authorities.

4.2. Remaining risks and undesirable effects

Based on the clinical experience with the SmartBone® ORTHO the following risks and safety events are known for SmartBone® ORTHO.

Possible complications that can occur in any surgery include:

- swelling of the operative site
- intra-articular mobilization
- flap necrosis
- bleeding
- local inflammation
- bone loss
- infection
- pain
- lack or incomplete osteo-integration
- partial or complete graft resorption
- partial or complete loss of mechanical performances of the graft.

4.3. Warning and precautions

- The clinician cannot use SmartBone® ORTHO if the packaging is damaged or open.
- The clinician cannot use SmartBone® ORTHO if the bone graft is damaged.
- The clinician cannot use SmartBone® ORTHO in the case of impurities/contaminations inside the primary packaging.
- The clinician cannot use SmartBone® ORTHO after the expiration date indicated on the label.
- SmartBone® ORTHO is a single use medical device; any attempt to reuse the medical device is strictly forbidden; improper reuse of the device carries a very high risk of infection and/or incorrect tissue regeneration and can cause failure of the implant.
- The clinician cannot re-sterilize the product. The use of the products if removed from the packaging in advance can carry serious risks of infection.
- The clinician has to remove the product from the packaging only immediately prior to its use and only in a controlled environment (operating room).
- SmartBone® ORTHO must only be used by expert surgeons.
- SmartBone® ORTHO must not be mixed/used with other bone substitutes other than patient's autograft.
- The clinician cannot mix SmartBone® ORTHO with any saline solution or saline based preparations or suspensions or any other salty fluids or liquids.
- The clinician has to cover SmartBone® ORTHO with periosteum or with a protective membrane if in direct contact with non-bony tissues, e.g. connective tissue. Indeed, non-bony tissue in contact with the product does not promote the new bone formation but it supports its resorption.

To ensure bone tissue regeneration, SmartBone® ORTHO must be implanted exclusively in presence of viable bone tissue and in direct contact with the bone (if necessary, micro-fracturing or reaming the bone surface).

In case of extensive defects, the addition of autologous trabecular bone or bone marrow can promote the regeneration process.

Based on Local National Regulations, patients who have received SmartBone® ORTHO, that is a xenograft, cannot be blood nor organ donors.

The clinician should inform the patient about the animal origin of the device.

5. Summary of clinical evaluation and post-market clinical follow-up

5.1. Clinical background of the device

The clinical evidence that supports the safety, the efficacy and the clinical usage of the product, is based on a wide set of robust clinical data obtained from both clinical investigations and from the experiences of clinicians that have used SmartBone® ORTHO in their routinely clinical practice.

5.2. The clinical evidence for the CE-marking

For the first CE mark, the safe and efficient use of the product in the oral surgery was supported by the first clinical study, dating 2012, in which the aim was to obtain the experimental assessment of efficacy of SmartBone® in the bone regeneration of edentulous areas. The clinical, radiological and histological results confirmed that SmartBone® is a safe and successful bone graft, as a scaffold that strongly supported native bone growth, which progressively replaced the grafted material, resulting in a new bone formation

5.3. Safety

Prior to the place on the market of the device, and for all the time in which the device remains available on the market, the manufacturer has conducted a complete risk assessment on the product and on the manufacturing process in order to identify all potential hazards and analyse what could happen if a hazard occurs.

At the end of the entire process each risk has been reduced as much as possible. The residual risks are deemed acceptable and the measures for their avoidance and risk mitigation are described in the information materials supplied with SmartBone® ORTHO. The overall profile of benefits versus risk of the SmartBone® ORTHO continues to be favourable.

The identified residual risks are continuously monitored. The PMCF activities allow a continuous clinical and usage monitoring of the product on the market in order to have a constant confirmation of the safety and performance of SmartBone® ORTHO. With the aim to continuously collect clinical data that supported the safety and performance of the product, IBI has planned to conduct in particular the following clinical investigations:

- the continuous monitoring of the clinical investigation "Observational study on clinical data obtained from patients who underwent reconstructive surgeries with SmartBone", conducted in the Hospital CTO in Turin, Italy;

6. Possible therapeutic alternatives

When considering alternative treatments, it is recommended to contact your healthcare professional who can take into account your individual situation.

Clinicians can choose from other types of substitutes that can be divided into the following 6 main categories:

Autografts

Autologous bone graft is defined as the transplantation of bone tissue from one location to another in the same individual. Multiple clinical concerns, however, have largely limited the transfer of autografts, including the possibility of surgical complications and pain associated with the harvest site.

Allografts

Allografts derived from both living donors' and cadavers' bone duly sterilized.

Their limitations are related to the quality of the regenerated bone tissue in addition to requiring costly and laborious processing to eliminate its immunological capacity.

The fundamental problems of this grafting material are antigenicity and the potential for infectious agent transmission (such as HIV, hepatitis B, hepatitis C, and human T-lymphotropic virus), which is a major

consideration that is in fact minimized by recent strategies associated with tissue processing including sterilization and freezing. However, these procedures in turn decrease graft properties and mechanical strength, and indeed, real and perceived risks of disease transmission still exist.

Naturally derived biomaterials

Natural polymers are: collagen, fibrin, hyaluronic acid and elastin, as well as other natural polymers such as silk, chitosan and alginate.

They benefit from a low immunological potential but one of the major limitations is their weak physical property and mechanical instability, making them unsuitable for load-bearing applications.

Synthetic scaffolds

Synthetic bone grafts are a wide group, and the main types are bio-ceramics, bioactive glass, metallic materials and polymer organic synthetic materials.

Synthetic biomaterials have better controlled physical and mechanical properties, but poor biocompatibility compared against naturally occurring biomaterials.

Xenografts, i.e., bone segments taken from animal bones, duly acellularized and sterilized

Xenografts currently are mainly harvested from bovine or equine sources.

The xenografts are processed to remove all of the organic constituents of the material. The remaining material is composed of only the mineral constituents, as the bovine mineral matrix used to product SmartBone®.

A distinctive advantage of this bone graft is that it has an abundance of availability, and the material cost is far lower than that of allogenic bone.

Composite materials

The composite biomaterials, as SmartBone® ORTHO combine advantages of the other types of scaffolds and show good mechanical hardness and load-bearing capabilities as well as ideal biocompatibility.

7. Suggested profile and training for users

The clinician must ensure that the general rules of Good Clinical Practice for handling medical devices under aseptic conditions are observed when using SmartBone® ORTHO

The product is to be used in an operation room. The general principles of sterile handling, using sterile surgical instruments and patient medication must be followed when using SmartBone® ORTHO.

8. Revision history

Revision	Date	Description
0	30.03.2022	Document creation
1	11.11.2025	Update to address findings from Notified Body Split SSCP for healthcare professionals and patients