



Ready to use

- **A synthetic alternative to autologous spongy bone – mouldable, hydrostable and osteoinductive**

Quality made in Germany

QD



SBX Putty

The new generation in bone regeneration



Nanostructure – optimal bone healing

NanoBone® technology:

Nanostructured hydroxyapatite (HA) and a high-porosity silica gel matrix result in an extremely high inner surface which is the key to biological efficiency /1/.

In the initial stage and with vascularisation of the defect, the silica gel matrix is replaced with a matrix of autologous proteins /2/. This is followed by an accumulation of proteins that are important for bone remodelling: BMP-2, osteopontin, osteocalcin /3/. As a result, NanoBone® becomes osteoinductive /4,5/.

- Fast bone formation
- Osteoinductive
- Resorption through osteoclasts

Inner surface of NanoBone® in a comparison /1/

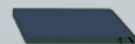
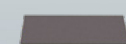
NanoBone®
206.8 m²/g



Sintered HA ceramics

0.4 m²/g

5.2 m²/g



Bovine origin

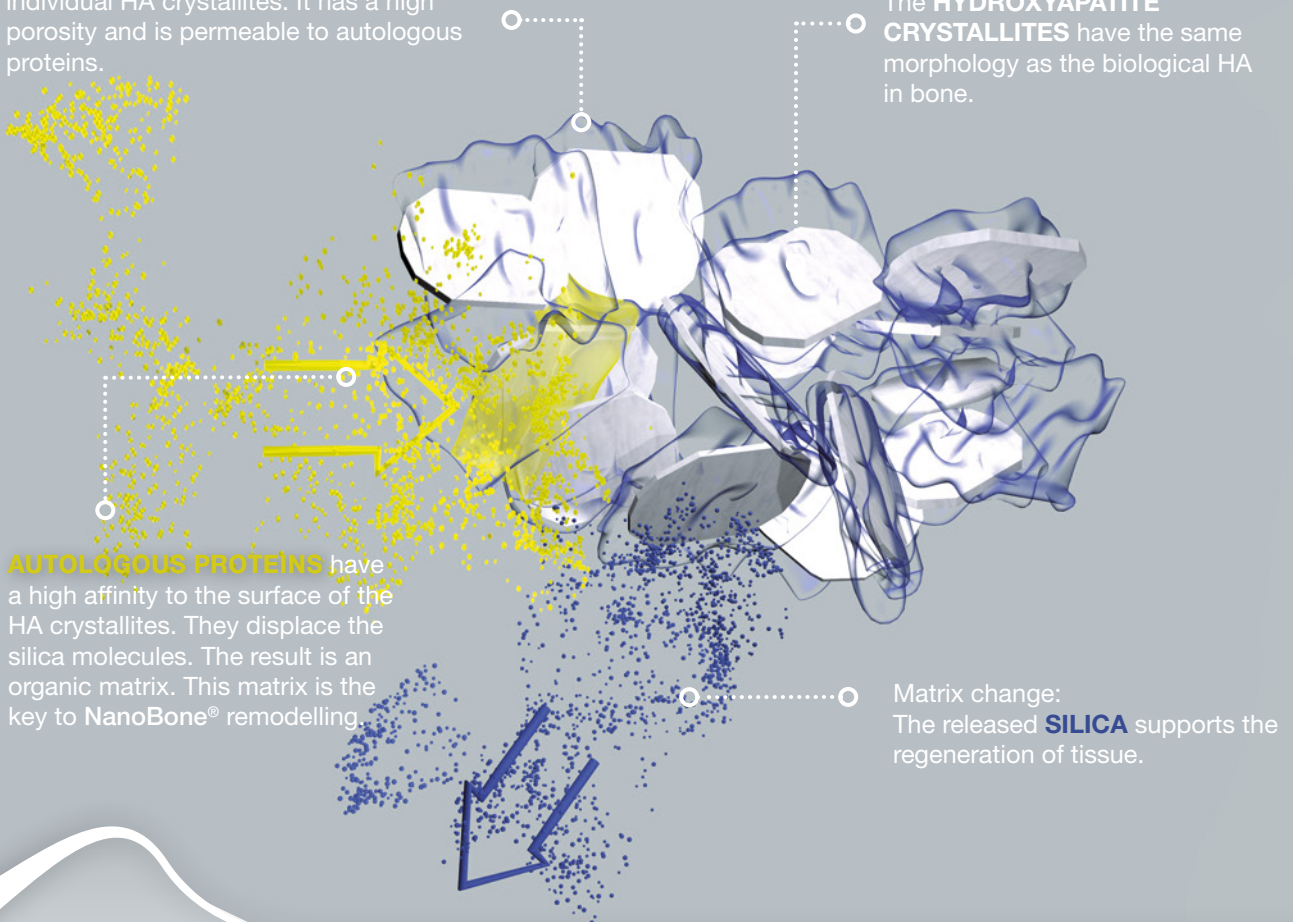
Silicate substitution

The **SILICA GEL MATRIX** embeds the individual HA crystallites. It has a high porosity and is permeable to autologous proteins.

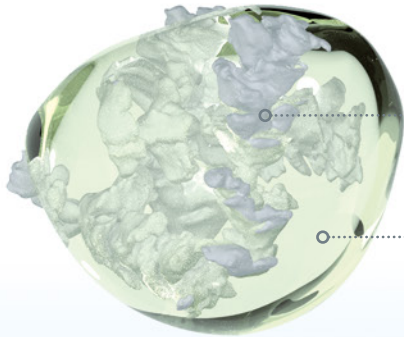
The **HYDROXYAPATITE CRYSTALLITES** have the same morphology as the biological HA in bone.

AUTOLOGOUS PROTEINS have a high affinity to the surface of the HA crystallites. They displace the silica molecules. The result is an organic matrix. This matrix is the key to NanoBone® remodelling.

Matrix change:
The released **SILICA** supports the regeneration of tissue.



■ Microstructure – perfect handling



○ The pack of fir-cone-shaped **granules** produces a structure resembling spongy bone.

○ **Hydrogel** on polymer silica base holds the granules together. This results in perfect handling: **NanoBone® | SBX Putty** is **mouldable, cohesive, hydrostable** and stays in heavily bleeding defects.

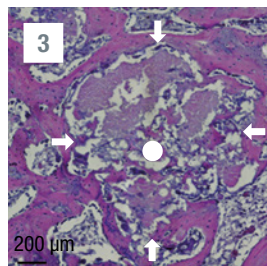
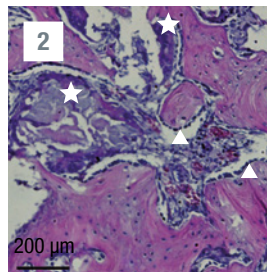
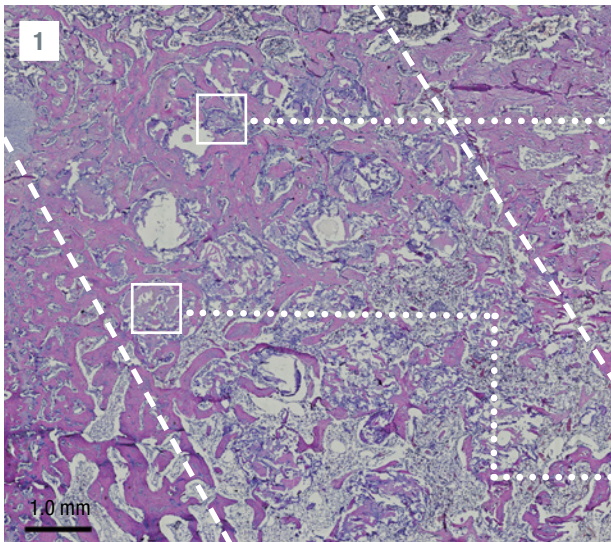
The hydrogel replaces the mixing with blood. It is resorbed as quickly as the haematoma. The release of silica during resorption supports the neovascularisation of the defect – **an optimal start of bone healing.**

■ ready to use | perfectly mouldable | hydrostable



Histological evaluation

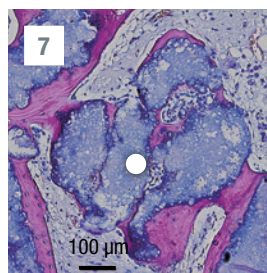
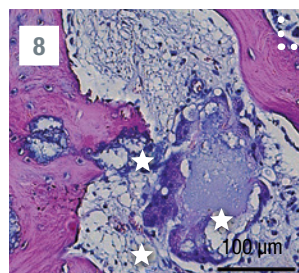
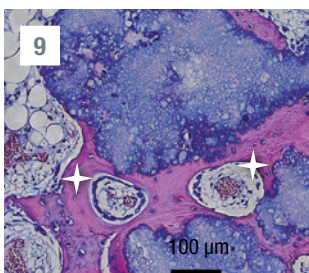
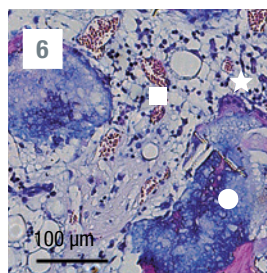
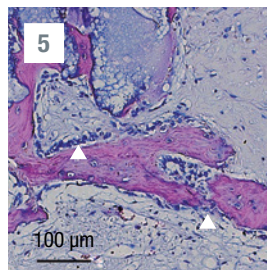
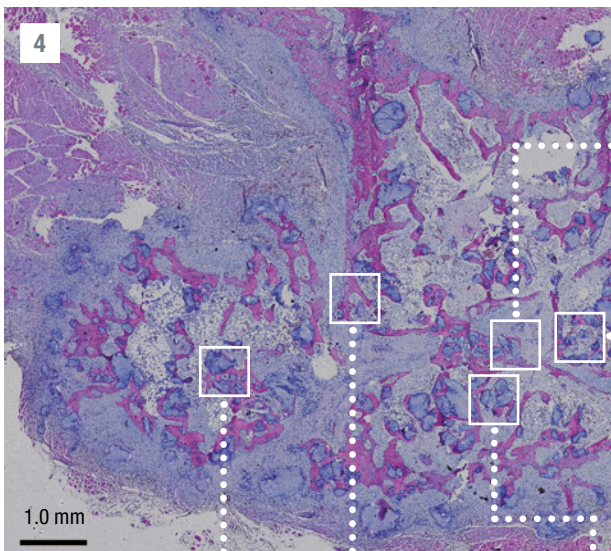
Rabbit femur model



- Defect limits
- ★ Osteoclasts
- ▲ Osteoblast seam
- Bone tissue in granule
- Granule limits
- ✦ Osteon
- Blood vessels

- 1 | Haematoxylin and eosin (HE) stain of the defect area 4 weeks after surgery. Spongy bone has grown throughout the defect.
- 2 | Granulate decomposition by osteoclasts.
- 3 | Granule, partially resorbed and mixed with bone tissue.

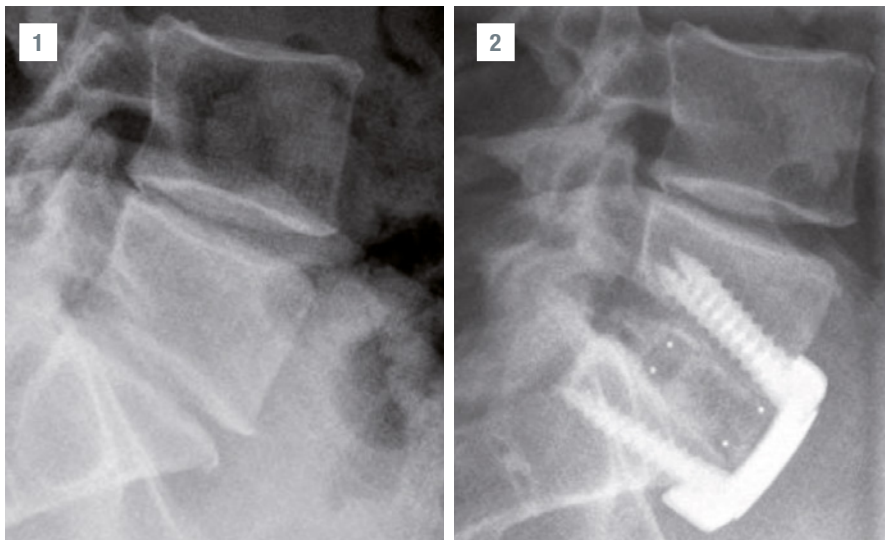
Osteoinduction – ectopic bone formation in sheep neck muscle



- 4 | HE stain of bone formed ectopically in muscle 12 weeks after surgery; processes correspond to those in bone defect healing
- 5 | Bone growth through osteoblast seam
- 6 | Granulate resorption through osteoclasts; excellent vascularisation
- 7 | Bone tissue grown through granules
- 8 | Granulate decomposition by osteoclasts in addition to bone formation
- 9 | Osteons: bone remodelling

■ Studies confirm NanoBone® efficiency

NanoBone® ALIF study

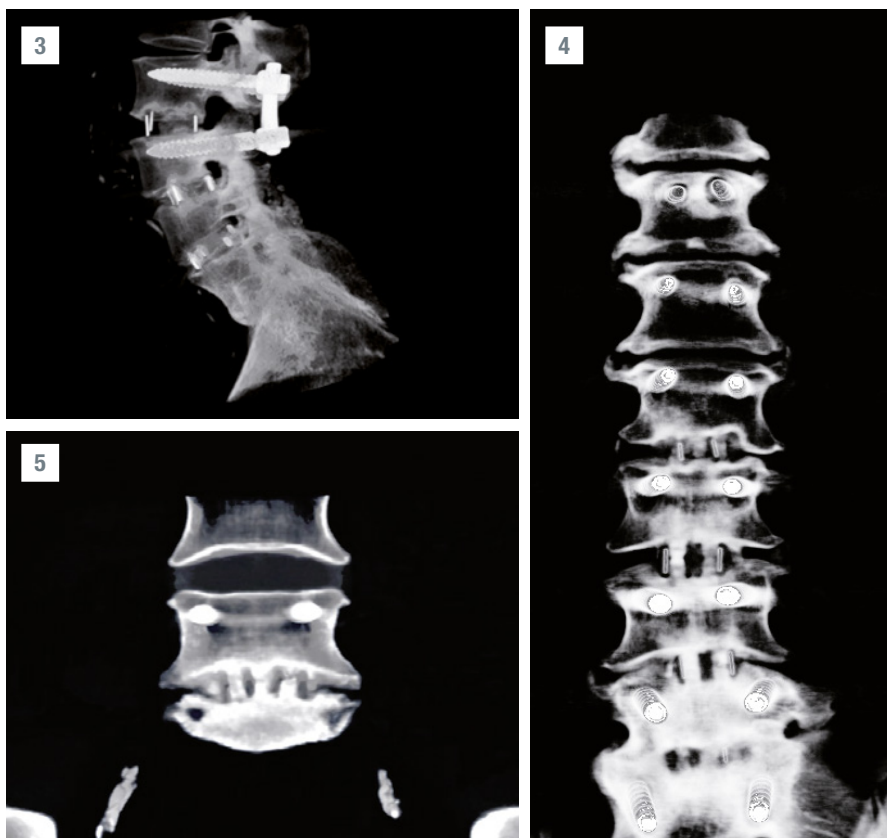


A prospective randomised ALIF study showed that NanoBone® yields results that are comparable to those of an allograft. After 6 months, a fusion rate of 96 % was reached in the NanoBone® group /6/.

1 | Status before surgery

2 | 6 months after surgery

NanoBone® PLIF study



A prospective CT-controlled clinical study on intercorporeal fusion showed a fusion rate of 90 % (27 out of 30 segments) after 9 months.

The clinical Oswestry Disability Index (ODI) score gained 28 % for the total collective, the value for the Visual Analog Scores (VAS) even 47 % /7/.

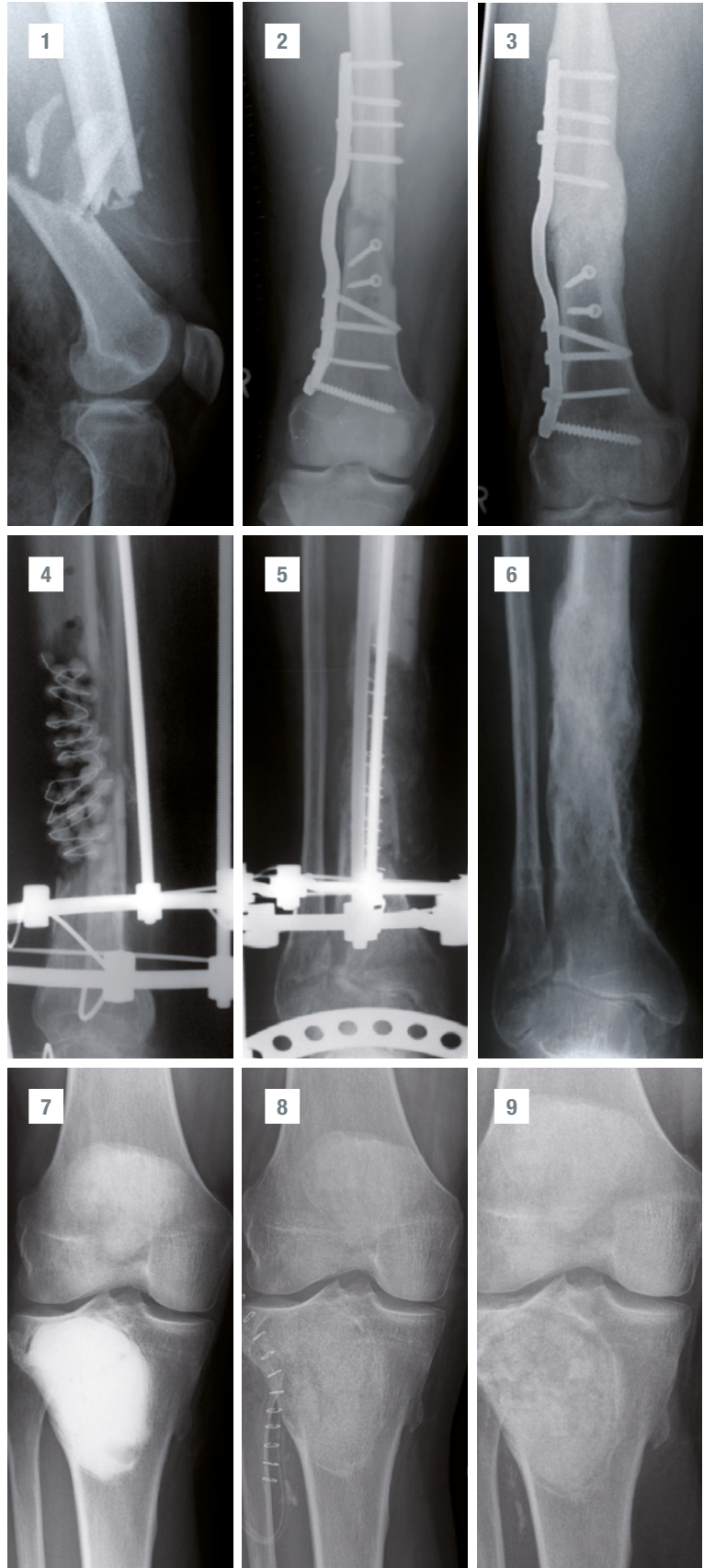
3 | Intercorporeal spinal fusion with L3-4 connection instability after L4-S1 fusion, 9 months after surgery

4 | Intercorporeal L5-S1 spinal fusion, 9 months after surgery

5 | Multisegmental degenerative L2-S1 instability, 9 months after surgery

Indication examples

- Depressed tibia plateau fracture
- Radial fracture
- Pseudarthrosis
- Cyst fills
- Spinal stabilisation
- Defect fill after tumour removal
- Acetabulum reconstruction
- Displacement osteotomy
- Pathologic fractures
- Bone necrosis



A clinical study showed that NanoBone® yields a result with regard to complications and fracture healing rate that is at least comparable with that of standard spongiosaplasty ^{18/}.

Femoral shaft fracture

- 1) Before surgery
- 2) After surgery
- 3) Follow-up after 1 year

Infected tibia fracture

- 4) Infection cleaning with Septopal chains
- 5) Defect fill with NanoBone® after infection cleaning
- 6) Follow-up after 1 year

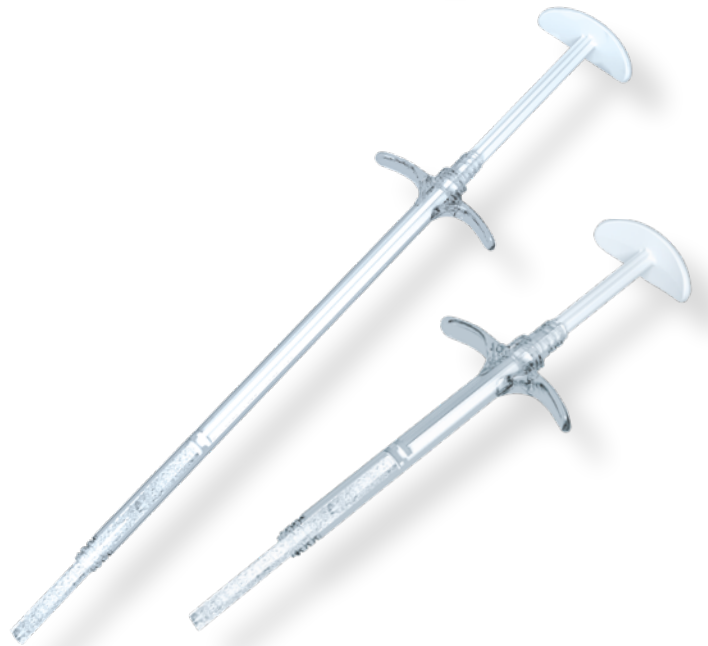
Giant cell tumour with cement filling

- 7) Before surgery
- 8) Defect fill with 50 ml NanoBone® Putty after surgery
- 9) 18 weeks after surgery

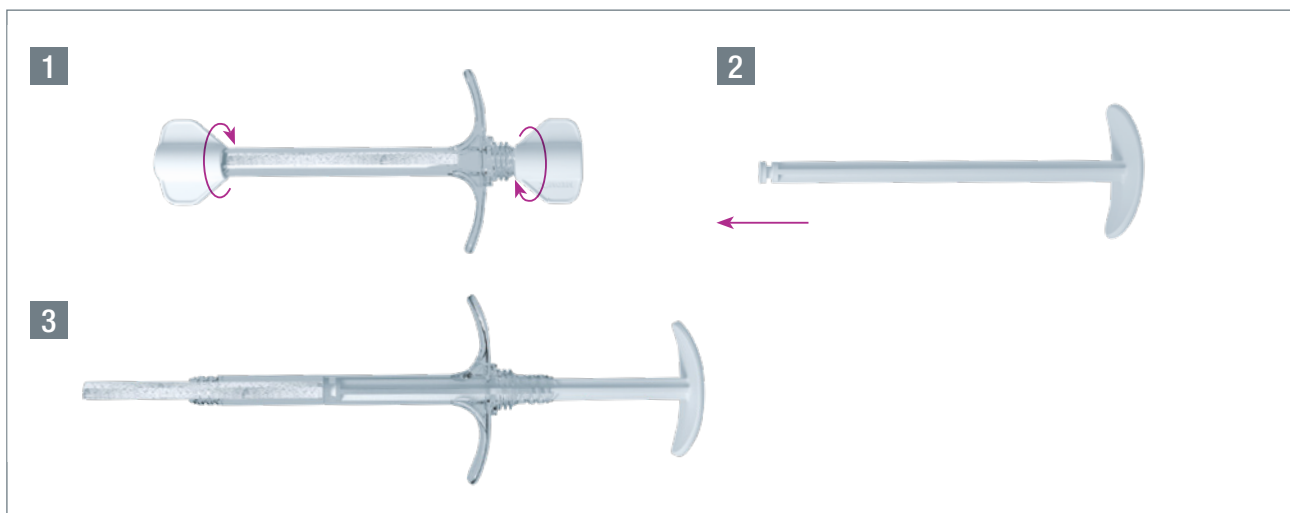
■ NanoBone® SBX Putty in QD applicator

Why NanoBone® QD?

- Easy and intuitive application
- Exact placement of NanoBone® | SBX Putty
- Controlled and exact portioning
- Smaller Access to the site of application possible (outer diameter of the applicator only 8 mm)
- Allows retrograde filling of bone defects
- Treatment of bone defects difficult to access thanks to long applicator with extended reach: 185 mm (filling volume 5 ml) or 100 mm (filling volume 1 ml and 2.5 ml)



■ optimal bone healing with perfect handling



References

/1/ Kirchoff M et al. | J Biomed Mater Res B Appl Biomater. 2011 Feb;96(2):342-50
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/3/ Götz W et al. | Clin Oral Impl Res 2008; 19;1016-26
/4/ Götz W et al. | Folia Histochem Cytobiol. 2010;48(4): 589 (589-596)

/5/ Gerber T et al. | Key Engineering Materials Vols. 493-494 2012; pp 147-152
/6/ Rickert M et al. | Clin Spine Surg. 2019 Aug; 32(7):E319-E325
/7/ Hebecker R et al. | Poster, DGNC 2008
/8/ Kienast B et al. | Trauma Berufskrankh (2016) 18: 308-318

- Please do not hesitate to contact us if you have any questions regarding application, product and/or ordering of **NanoBone[®] products**

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Order number	Description	Volume
200049	NanoBone [®] SBX Putty	1.0 ml
200051	NanoBone [®] SBX Putty	2.5 ml
200052	NanoBone [®] SBX Putty	5.0 ml
200053	NanoBone [®] SBX Putty	10.0 ml

ITEMS LIST FOR NanoBone[®] QD

Order number	Description	Volume
200070	NanoBone [®] QD	1.0 ml
200071	NanoBone [®] QD	2.5 ml
200072	NanoBone [®] QD	5.0 ml
200073	NanoBone [®] QD	10.0 ml*

* 2 x 5.0 ml cartridges in sterile packaging

NanoBone[®] – Your advantages at a glance

- Controlled osteoinduction
- Optimal handling
- Economically efficient in use
- Powerful nanostructure
- Fast bone formation
- Full remodelling