Background
In patients with insufficient bone volume for implant placement, bone augmentation procedures may be performed either prior or during implant placement. In case of dehiscence or fenestration, regeneration of the compromised area can be achieved by filling the bone defect with particulate graft material and protecting the graft by a barrier membrane. The membrane maintains the space for bone regeneration and prevents ingrowth of faster regenerating connective tissue. Resorbable collagen membranes are widely used for bone augmentation due to their biocompatibility and because they do not require an additional surgery for membrane removal.

Aim
The aim of this randomized, controlled multi-center and non-inferiority study is to evaluate the bone formation and soft tissue healing after 6 months in dehiscence defects treated with either cross xenoprotect (CXP; Nobel Biocare AB, Göteborg, Sweden) or Bio-Gide (BG; Geistlich, Wolhusen, Switzerland). This poster describes the interim bone augmentation outcomes of an ongoing 5-year study.

Material and Methods
- The study enrolled patients in need of a single tooth implant-supported restoration with expected dehiscence defects in the anterior and premolar areas of the maxilla or the mandible.
- Implants (NobelReplace CC) were placed in a two-stage surgery with delayed loading.
- Autogenous bone chips were placed on the surface of the dental implant, and anorganic bovine bone mineral (Bio-Oss, Geistlich, Wolhusen, Switzerland) was placed on top of the bone chips. After placement of the particulate bone graft, the collagen membrane (either CXP or BG) was positioned and fixed using either periosteal vertical mattress sutures or titanium cortical bone pins (Figure 1).
- Primary outcome measure was the defect height (Figure 2a) at 6 months following the augmentation procedure.
- Secondary outcome measures included bone formation with respect to defect width (Figure 2b), defect depth (Figure 2c), and infrabony defect (Figure 2d) at 6 months after the augmentation procedure, soft tissue health during the healing time and implant survival rate.

Figure 1: Schematic representation of the guided bone regeneration procedure: (a) placed implant and measured defect height, (b) fill the defect with autogenous bone chips on the implant surface and anorganic bovine bone matrix on top, (c) cover the defect and implant site with the collagen membrane.

Results
- 7 centers enrolled 67 patients in the study. 49 patients met the inclusion criteria of the bone defect size at the time of surgery. 24 patients were treated with CXP and 25 patients with BG. 35 implants were placed in the maxilla (17 defects were covered with CXP and 18 with BG) and 14 in the mandible (7 defects covered with each membrane). 47 patients attended the re-entry surgery.
- The defect size decreased significantly in all tested dimensions in both treatment arms (all p<0.05).
- In the CXP arm, the defect height at implant insertion was 5.1 ± 2.1 mm (n=24) and reduced at re-entry by 87% to 1.0 ± 1.3 mm (n=23). In the BG arm, the defect height at implant insertion was 4.9 ± 1.9 mm (n=25) and reduced at re-entry by 83% to 1.7 ± 2.1 mm (n=24) (Figure 3).
- Wound dehiscence was observed in 4 patients in the CXP arm and in 7 patients in the BG arm (Figure 4).
- Membrane exposure rate was highest at week 3 in both arms, reaching 16.7% for BG and 9.3% for CXP.
- The implant survival rate was 100% up to 1-year follow-up.

Figure 3: Bone gain from implant insertion to re-entry.

Figure 4: Frequency of wound dehiscence during the healing process.

Conclusions
- The observed trend towards higher mean bone gain and lower exposure rate with CXP compared to BG should be further investigated.
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References

Clinical Case: CXP arm
A 64 year old male received a NobelReplace CC 10mm x 4.3mm implant at position 24 with the insertion torque of 35 Ncm. The bone graft was immobilized with CXP, which was fixed with sutures.

Clinical Case: BG arm
A 46 year old female received a NobelReplace CC 13mm x 4.3mm implant at position 12 with the insertion torque of 30 Ncm. The bone augmentation was immobilized with BG, which was fixed with sutures.