Soft and hard tissue management in cases of severe alveolar ridge atrophy using CAD/CAM customized allogeneic bone grafts and 3D collagen matrix – a case series

Objective
The use of autologous soft and hard tissue grafts is considered as gold standard for preimplantological alveolar ridge reconstruction. Nevertheless, the use of autologous tissue does have limitations and drawbacks such as availability, increased operation time and risk of donor site morbidity. In this case series we present modern treatment alternatives for alveolar ridge reconstruction using CAD/CAM manufactured allogeneic bone grafts and 3D collagen matrices followed up for 14-37 month.

Methods
- Virtually planning and designing the freeze dried bone allograft (Fig. 1a, 2a, 3a)
- Special incision design (pillar incision) positioned in the vestibulum preserving intact periosteum of the full thickness flap
- Perforating cortical layers of recipient sites using a diamond bur to promote bleeding
- Rehydration of the sterile FDBA blocks in exudate serum obtained during PRF process
- Adaption and fixation with titanium osteosynthesis screws (Fig 1b, 2b)
- Covering grafted areas with resorbable barrier membrane of native pericardium
- PRF matrices on top for better soft tissue healing
- Reentry at least after 6 month of healing (Fig 3b)
- Implant insertion and fixation screw removing performing midcrestal incision
- Uncovering implants performing a partial vestibulum plastic surgery and using porcine 3D collagen matrices for regenerating a sufficient amount of attached gingiva surrounding the implants without autologous soft tissue grafts (Fig 1c, 2c, 3c)

Results
- frequent follow-up examinations (ranging from 14 to 37 month after the allograft insertion) showed uneventful healing process in all stages.
- No signs of any dehiscences, membrane exposures or inflammatory responses
- Bone quality as well as quantity showed a very stable and vital regeneration indicated by high vascularization
- Remodelling of allogeneic bone grafts
- Torque value during implantation from 25-50 N cm
- Clinical flow control presented optimal widening of attached gingiva in regenerated areas (Fig 1d, 2d, 3d)
- Final radiographic control showed stable osseointegration of all implants and high volume stability of the newly formed bone providing optimal results (Fig 1e, 2e, 3e)
- Until today there were neither implant failures nor significant bone loss after implant loading

Conclusion
The application of customized allogeneic bone blocks seems to represent a successful treatment approach for augmentation of severely resorbed alveolar ridges, showing highest volume stability and no signs of bone resorption after implant loading. The newly developed flap design seems to provide tension free wound closure avoiding membrane exposures. The use of the 3D collagen matrices for regenerating a sufficient amount of attached gingiva surrounding the implants was a painless and highly effective treatment alternative in soft tissue management.