

# Bone Tissue Engineering with BMPs

Are there any advantages of using rhBMP-2 instead of DBM (demineralized bone graft) and the transplantation of autogenous bone?

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For a long time all bone surgery fields have been working on bone reconstruction. The techniques of augmentation as well as the necessary materials have been subject to big change lately. At present, quite a number of bony defects are still reconstructed by transplantation of autogenous bone. Furthermore, synthetic materials as well as allogene and xenogene substances and, just recently, growth factors like bone morphogenetic proteins, were used.<sup>1-11</sup> For oral and cranio-maxillofacial surgery, diverse articles on these various materials were published for appraisal. Please refer to the latest paper of Horch and Pautke.<sup>12</sup>

For tissue engineering, a suitable augmentation material must show the following qualities,

- The material should be synthetically producible and completely absorbable or biodegradable.
- The proteins used for growth stimulation should be produced genetically and not be allogene or xenogene.
- In addition, cellular and acellular components from the patient, such as PRP (platelet rich plasma, mesenchymal stem cells) are accepted.<sup>13</sup>

The transplantation of autogenous bone is known worldwide as the "golden standard". All surgeons have a lot of experience with this method. The disadvantages of autogenous bone transplantation, however, must not be ignored due to the following,

- Usually two surgical operations are necessary, the first for harvesting the bone removal, the second for implantation. In this context it must be mentioned that for the oral surgery, as well the augmentation of large bony defects, bone removal from iliac crest or lower leg—ie, far away from the actual surgery area—is usually required. However, it is sufficiently known that these areas cause patients symptomatic diseases.

- The risk of infection and necrosis after transplantation of vital cells is considerable and must be applied for vital bone transplantation as well as for mesenchymal stem cell transplantation.

- The resorption of transplanted autogenous bone of up to 30% should be kept clearly in mind while planning the surgery.<sup>13</sup>

Compared to the transplantation of autogenous bone, the augmentation with demineralised bone matrix (DBM) needs no bone removal but allografts obtained from dead bodies that are prepared accordingly. When offered commercially, it is acellular and also contains small quantities of growth factors. DBM will be resorbed completely by the recipient organism.

However, the danger of allergic reactions, especially against gentamicin, used during DBM extraction, has to be pointed out. There might also be a risk of immune reactions against allogene proteins. The fact that the allogene material does not fulfill the



Fig. 1



Fig. 2

Fig. 1\_Preoperative OPG.

Fig. 2\_OPG directly postoperative.