Local application of BMP-2 specific plasmids in fibrin glue does not promote implant fixation.

Abstract:

BMP-2 is known to accelerate fracture healing and might also enhance osseointegration and implant fixation. Application of recombinant BMP-2 has a time-limited effect. Therefore, a gene transfer approach with a steady production of BMP-2 appears to be attractive. The aim of this study was to examine the effect of locally applied BMP-2 plasmids on the bone-implant integration in a non-weight bearing rabbit tibia model using a comparatively new non-viral copolymer-protected gene vector (COPROG). Sixty rabbits were divided into 4 groups. All of them received nailing of both tibiae. The verum group had the nails inserted with the COPROG vector and BMP-2 plasmids using fibrin glue as a carrier. Controls were a group with fibrin glue only and a blank group. After 28 and 56 days, these three groups were sacrificed and one tibia was randomly chosen for biomechanical testing, while the other tibia underwent histomorphometrical examination. In a fourth group, a reporter-gene was incorporated in the fibrin glue instead of the BMP-2 formula to prove that transfection was successful. Implant fixation strength was significantly lower after 28 and 56 days in the verum group. Histomorphometry supported the findings after 28 days, showing less bone-implant contact. In the fourth group, successful transfection could be confirmed by detection of the reporter-gene in 20 of 22 tibiae. But, also systemic reporter-gene
expression was found in heterotopic locations, showing an undesired spreading of the locally applied
gene formula. Our results underline the transfecting capability of this vector and support the idea that
BMP-2 might diminish osseointegration. Further studies are necessary to specify the exact
mechanisms and the systemic effects.

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