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

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Abstract:

BACKGROUND: 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).

METHODS: 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.

RESULTS: 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.

CONCLUSION: 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.