



可预防感染的组织工程骨在修复山羊大段骨缺损中的抗感染及成骨效果研究

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Research of the anti-infective and osteogenic effects of the infection-prevention tissue engineered bones on femoral large bone defects in goats

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摘要 目的 构建可预防感染的组织工程骨并评估其在修复山羊大段骨缺损中的抗感染能力及成骨效果。方法 设计可控性缓释抗生素系统“纤维蛋白凝胶修饰的藻酸盐-万古霉素缓释微球”(FG-Vanco-AB), 以此为基础构建可预防感染的组织工程骨并进行检测, 然后移植到山羊右侧股骨临界骨缺损的部位, 对侧作为对照将组织工程骨(不含可控性缓释抗生素系统)移植到同样的临界骨缺损区。抗生素发挥抗菌作用的标准浓度为5 mg/ml, 即对金黄色葡萄球菌的最低杀菌浓度, 术后通过高效液相色谱法检测骨缺损区局部、周围及血液中万古霉素浓度, 检测其缓释剂抗感染能力; 组织学、CT、ECT检测骨愈合情况, 以此来评价预防感染组织工程骨的成骨效果。结果通过扫描电镜、激光共聚焦以及体内示踪等检测, 种子细胞在体内及体外的存活情况与组织工程骨组类似; 山羊股骨右侧局部、左侧局部及血液中持续超过杀菌浓度的时间分别为28 d、2 d和7 d。万古霉素在股骨中的浓度自移植部位向两侧逐渐递减。山羊双侧股骨术后第28天及56天ECT检查结果均提示无明显区别, CT及组织学检查证明在术后第14天、28天、112天, 山羊双侧股骨缺损的修复是同步的, 并且在第112天时均被新生骨组织覆盖。结论 成功构建抗感染的组织工程骨, FG-Vanco-AB在移植的部位可以发挥杀菌作用, 并且不会影响组织的重建与修复。

关键词: [组织工程](#) [骨和骨组织](#) [迟效制剂](#) [感染](#)

Abstract: Objective To establish the anti-infective tissue engineered bones (TEBs) and evaluate the anti-infective and osteogenic effects of the infection-prevention TEBs on femoral large bone defects in goats. Methods Based on the controlled-release antibiotic system "fibrin gel-coated vancomycin alginate beads" (FG-Vanco-AB), the infection-prevention TEBs were established and evaluated. They were transplanted into the critical-size defects in the right femurs of goats. TEBs without the controlled-release antibiotic system were used as controls and transplanted into the left femoral defects. The breakpoint sensitivity of vancomycin (5 mg/mL) for S.aureus was used as a standard concentration. Postoperatively, the vancomycin concentrations in the lesion site, in the adjacent site and in the circulation, as well as the anti-infective effects of the infection-prevention TEBs were evaluated by High-performance liquid chromatography (HPLC). Bone healing was assessed by histology, CT and ECT. The results were used to evaluate the osteogenic effect of the infection-prevention TEBs. Results Results from ESM, CLSM and in vivo tracing showed that the in vitro and in vivo survival conditions of seeded cells were analogous to those of TEBs. The effective concentration (over the bactericidal concentration) of vancomycin in bilateral defects and in blood lasted for 28 days, 2 days and 7 days, respectively. The concentration of vancomycin in the femur decreased gradually from the grafted site to both ends. At 28 and 56 days postoperatively, the ECT results showed no significant difference between the right and left femurs. CT and histology demonstrated that at 14, 28 and 112 days after surgery, bone defects in the bilateral femurs were repaired synchronously, and were completely covered by new bone tissue after 112 days. Conclusion The anti-infective TEBs were successfully established. FG-Vanco-AB in the transplanted sites provided the local bone tissues with anti-infective capability whilst not interfered the process of bone reconstruction and wound healing.

Key words: [Tissue engineering](#) [Bone and bones](#) [Delayed-action preparations](#) [Infection](#)

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