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Experimental substantiation study of modular endoprosthesis diaphysal fixation

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Goal: Main tumor prosthesis complications are aseptic loosening (27%), implant failures (18,2%), periprosthetic fractures (8,1%) and infection (24,2%). Solutions of aseptic loosening and implant failures (prosthesis stems breakage) are correct choice of prosthesis stem diameter, the many-sided stems form, good adaptation of a zone of contact an endoprothesis-bone, extracortical petal system of fixing. The main goal of this study is to research the effect of additional extracortical fixation on segmental replacement prostheses with respect to bony ingrowth and extracortical bone bridging in a murine segmental defect model.
Materials and Methods: Unilateral segmental replacement prostheses were implanted into 20 rat femurs. It was clinical modeling of diaphysial femur resection and modular prosthesis replacement with and without extracortical bone bridging for distal prosthesis stems. The bone-implants blocks were retrieved at 6 month and examined radiolographically. Biomechanical bending and expansion loadings were analyzed for bone-prosthesis specimens as well.
Results: Two animal groups (Experimental group - with extracortical bone plate fixation prosthesis, Control group - without extracortical bone bridging prosthesis) were into experimental study. Experimental group: stable proximal prosthesis stem fixation has been detected in 7 animals, stable distal prosthesis stem fixation has been detected in 10 animals, prosthesis breakage has been detected in 1 animal and total prosthesis migration has not been detected. Control group: stable proximal prosthesis stem fixation has been detected in 4 animals, stable distal prosthesis stem fixation has been detected in 6 animals, prosthesis breakage has been detected in 2 animals and total prosthesis migration has been detected in 3 animals. Biomechanical study, radiographic and histologic specimens analyses showed significant prosthesis stability advantages and bone ingrowth for animals with extracortical bone plate fixation prosthesis.
Summary: Combine type of prosthesis fixation (intramedulary stem and extracortical bone bridging) makes possible to get better clinical results and decrease implants complication level.