Ceramic implants in spine surgery: Ceramics in lumbar segment stabilization

V Radchenko, G Gruntovsky, N Dedukh

Citation


Abstract

Introduction: More than 30 years our institute has been developing various aspects of reconstruction surgery of locomotion system using new artificial biomaterials. The basis for the biomaterials use was laid by multifold experimental researches.

Objective: To illustrate the data obtained during experimental researches of ceramic materials for using in spine surgery and to evaluate distant clinical results of their use. Materials and methods: Experimental researches were carried out on rabbits and rats with the use of different ceramic materials such as corundum ceramics, hydroxylapatite (HA), tricalcium phosphate (TCP), lamellar ceramics and silver alloyed ceramics. Morphologic and biomechanical research methods were used together with the methods of mathematical modeling. Analysis was carried out in 1000 patients to check the outcome of stabilizing reconstruction spine surgeries where ceramic grafts were used.

Results:. During experiments it was proved that in early postimplantation period HA and TCP did not disturb cell hemataxis into defect area (vertebra, femur head, femur distal metaphysis). Ceramics integration occurs due to the formation of connection zone where processes of cell proliferation and differentiation and bone formation are observed simultaneously with resorbtion of ceramic material. At later stages dense bone-ceramics connection is formed in implantation zone. Osteogenesis stimulation is achieved due to the usage of hybrid materials where osteoconduction characteristics of ceramics are combined with osteoinduction ones of skeletogenic cells saturating porous HA samples. Addition of silver ions to HA composition (one weight percent) does not break osteoreparation process but makes bactericidal effect. Corundum, HA and TCP ceramic grafts developed in the institute are broadly used during stabilizing reconstruction surgeries on various skeleton parts to treat inflammation, destruction or tumor defects. Good results were achieved in 82% of cases, satisfactory ones - in 10% and unsatisfactory - in 8% of cases.

Conclusions: The usage of grafts made of ceramic materials proves to be one the promising directions of spine surgery.

References
Author Information

V. Radchenko, M.D.
Malyshkina S. Sytenko Institute of Spine and Joint Pathology, Academy of Medical Science of Ukraine

G. Gruntovsky, M.D.
Malyshkina S. Sytenko Institute of Spine and Joint Pathology, Academy of Medical Science of Ukraine

N. Dedukh
Malyshkina S. Sytenko Institute of Spine and Joint Pathology, Academy of Medical Science of Ukraine