Reconstruction of irradiated bone segmental defects with a biomaterial associating MBCP+®, microstructured collagen membrane and total bone marrow grafting: An experimental study in rabbits

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Résumé en anglais	The bone tissue engineering models used today are still a long way from any oncologic application as immediate postimplantation irradiation would decrease their osteoinductive potential. The aim of this study was to reconstruct a segmental critical size defect in a weight-bearing bone irradiated after implantation. Six white New Zealand rabbits were immediately implanted with a biomaterial associating resorbable collagen membrane EZ® filled and micro-macroporous biphasic calcium phosphate granules (MBCP+®). After a daily schedule of radiation delivery, and within 4 weeks, a total autologous bone marrow (BM) graft was injected percutaneously into the center of the implant. All the animals were sacrificed at 16 weeks. Successful osseous colonization was found to have bridged the entire length of the defects. Identical distribution of bone ingrowth and residual ceramics at the different levels of the implant suggests that the BM graft plays an osteoinductive role in the center of the defect. Periosteum-like formation was observed at the periphery, with the collagen membrane most likely playing a role. This model succeeded in bridging a large segmental defect in weight-bearing bone with immediate postimplantation fractionated radiation delivery. This has significant implications for the bone tissue engineering approach to patients with cancer-related bone defects.
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