

Is the *In Vitro* Generated Autologous Bone Graft is Round the Corner?

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Bone has a vigorous potential to regenerate itself after damage; however, the efficacious repair of large defects resulting from resection, trauma, extended fractures or inadequately vascularized bone gaps will not achieve a satisfactory healing and will be considered as nonunion [1]. Up-to 10% of patients will experience a nonunion bone gap and will require implantation of bone grafts. Cumulatively, 500,000 surgical cases of bone grafting procedures are taking place annually in the US alone [2]. Importantly, the demand for bone grafts is expected to be even greater over the next decade as the population ages and life expectancy increases [1].

Autologous bone grafts are considered as gold standard for reconstruction of bony defects [1]. However, autologous grafts are inherently accompanied with significant disadvantages such as donor site morbidity and limited availability. Widespread utilization of either allografts or xenografts is limited due to risk of rejection. Ongoing scientific progress in bone tissue engineering is envisioned to provide a robust unlimited source for grafting material while incorporating personalized approach. Recently the process to generate autologous bone grafts as a live autologous bone tissue originating from patient-specific osteoblast-like cells grown from bone marrow on β -tricalcium phosphate supporting 3-dimensional matrix has been presented [3]. The generated live bone material will be advantageous on existing inorganic fillers, with low ability of bone generation, and on cell therapy products which has uncertain ability to proceed for bone generation after implantation.

Because the theoretical and methodical basis for *in vitro* live human bone generation is evident, we should anticipate that clinically available source for autologous bone grafting, without the need for additional harvesting surgery, is around the corner. The only gap that should be filled in order to allow clinical use of the tissue engineered bone is the fulfilling of the regulatory requirements, including clinical studies, and this might take several years more. The musculoskeletal surgeons community should 'be expected to take part in this exciting pathway.

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