

Bone Formation

Skeletal Disease/Injury | Umbilical Cord Blood, Adipose



Breaks in bone can result in an inability to repair normally after 3-6 months, particularly if complex, repeated or as a result of disease. This inability to repair normally occurs in 1% of all fractures, but is disproportionate in lower leg fractures (19%) or where there is movement at the fracture site. 343,536 people in the UK are admitted to hospital with fractures every year, with £2 billion alone spent annually on approximately 70,000 to 75,000 hip fracture cases.

Mesenchymal stem cells (MSC) are found in cord blood, bone marrow and peripheral blood, and it has been widely demonstrated that such cells exhibit the same cell surface markers as those found on bone cells. Therefore, they can be induced to create cells with the same characteristics as bone cells.

Clinical Trials

The NCT01206179 clinical trial looked at the use of bone marrow-derived MSCs to promote bone formation in non-union fractures. A further study (NCT01435434) looks to use autologous bone marrow cells with a bioscaffold to repair non-union fractures. This is scheduled to start patient recruitment in 2014.

Animal Studies

In mice it has been shown that the addition of bone morphogenetic protein 2 (BMP-2) to human cord blood improves the formation of bone in such injuries. It is thought that this may form part of a clinical trial in the near future. A comparison of embryonic-derived stem cells to cord blood stem cells shows that the latter produces better bone formation in rats when seeded to a bone matrix.

Patient Studies

A small-scale study with children suffering from osteogenesis imperfecta in 1999 demonstrated the safety and efficacy of bone marrow-derived MSC.

Summary

Further work has been done in the repair of non-union bone fractures using stem cells and bioscaffolds, as well as using donor material such as bone grafts.

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