Inflammatory Profile and Osteogenic Potential of Fracture Hematoma in Humans
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Purpose: Fracture hematoma forms immediately after fracture and is considered the initial part of the bone healing process. Its molecular composition has been briefly investigated with our current understanding being based on animal studies. This study aims to analyze the inflammatory cytokine content of fracture hematoma in humans and determine its effect on osteoprogenitor cells.

Methods: 23 patients were recruited following informed consent. Peripheral blood, fracture hematoma, and bone were collected. Osteoprogenitor cells (mesenchymal stem cells [MSCs]) were isolated following collagenase digestion and functional assays were performed. Gene expression analysis of 84 key osteogenic molecules was performed. A Luminex assay on the levels of 34 cytokines was performed and peripheral serum was used as control.

Results: 33 inflammatory cytokines were found to be significantly raised in fracture hematoma when compared to peripheral serum (P <0.05). Among the most raised molecules were interleukin (IL)-11, IL-8, and matrix metalloproteinase (MMP)-1, -2, and -3. Fracture hematoma did not significantly affect MSC proliferation, but alkaline phosphatase activity and calcium deposition were significantly increased in the MSCs undergoing osteogenic differentiation. The gene expression analysis reinforced these results.

Conclusion: Fracture hematoma is not the consequence of trauma, but a rich medium in which inflammatory and osteogenic molecules capable to upregulate the osteogenic potential of MSCs.