Proceedings of German Society for Stem Cell Research (PGSSCR)

Adult multilineage mesenchymal progenitor cells isolated from the bursa subacromialis

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Published online on 16 May 2007

Introduction:

The subacromial bursa plays key roles in the gliding mechanism of the shoulder and can be efficiently used to augment repair procedures after rotator cuff tears. In this work, we specifically wished to characterize the cells that can be isolated from subacromial bursa tissue and to evaluate their potential to differentiate into the various mesenchymal lineages compared adult marrow-derived mesenchymal stem cells (MSCs).

Materials and Methods:

Bursa cells were isolated from 5 bursae subacromiales by collagenase digestion and marrow-derived MSCs were recovered by adherent culture of bone marrow aspirate from 5 different donors. Tissues and aspirates were retrieved from patients undergoing rotator cuff repair surgery and total hip arthroplasty after informed consent and local IRB approval. Monolayer cultures were analyzed by flow cytometry (CD34, CD53, CD73, CD90, CD105, CD106, CD133, CD144, CD166, and Stro-1). Osteogenesis was induced by supplementation with dexamethasone, insulin, indomethacin and IBMX in monolayer culture. Chondrogenesis was induced by pellet cultures in serum-free medium containing dexamethasone, ascorbate, proline, sodium pyruvate, and recombinant TGF-s1 (10 ng/mL). Negative control cultures were also maintained in the respective media without supplements, and all cultures were maintained for three weeks. The lineage differentiation was analyzed by RT-PCR (COL I, II, IX, X, SOX-9, ALP, OC, Cbfal, LPL, PPARg2), histology and immunohistochemistry (H&E, Alcian Blue, Alizarin red, ALP, Oil Red O, COL I, II and X).

Results:

Light microscopy and flow cytometry revealed a mainly fibroblastic appearance and similar positive stainings for the markers CD 73, 90, 105, 106, 133, 144, 166 for both cell types. Following three weeks of differentiation culture, the bursa cells and MSCs revealed a strong chondrogenic, adipogenic and osteogenic differentiation potential, as shown by the respective histological, immunohistochemical and RT-PCR analyses. In contrast, the respective negative control cultures for the bursa cells and MSCs, which were maintained without any media
supplements, were negative for the tissue specific markers.

**Conclusion:**

Cells retrieved from subacromial bursa tissue reveal an almost similar surface antigen expression profile compared to marrow derived-MSCs and an almost equivalent multilineage mesenchymal differentiation potential for all lineages observed. Therefore bursa cells have to be considered adult multilineage progenitor cells. This knowledge might be used in order use these cells to augment of rotator cuff repairs. Global gene expression analyses (Affymetrix HG-U133_Plus) are underway to further characterize the stemness of the bursa-derived cells.