

Morphological characteristics of progenitor and non-progenitor cells derived from human cartilage using time-lapse phase contrast microscopy**Sarinna Vasavada**¹, George F. Muschler, MD², Venkata P Mantripragada²¹Hathaway Brown School²Department of Biomedical Engineering, Lerner Research Institute, Cleveland Clinic

Stem and progenitor cells have the capacity to differentiate and play a vital role in tissue and cartilage regeneration. It is essential to be able to distinguish connective tissue progenitors from non-connective tissue progenitor cells in order to use them therapeutically. Accordingly, the goal of this study was to use time-lapse phase contrast microscopy to examine the morphological characteristics of progenitor and non-progenitor cells in order to differentiate them for use in cellular therapies. Tissue samples from five patients with knee osteoarthritis were used for analysis. Phase contrast video of cultured progenitor cells was gathered and sequentially analyzed over a time period of ten days. Using ImageJ software, images were background corrected and analyzed with metrics for area, perimeter, circularity, and diameter being collected for each progenitor and non-progenitor. Cell samples demonstrated that on day 1 the area of progenitors (mean of 60.8 μm^2) was significantly greater than that of the non-progenitors (mean of 28.3 μm^2 , p-value 8.01×10^{-13}), however the circularity was equal with a mean of 0.56. Comparing day 1 and day 10 non-progenitors, the area of day 10 non-progenitors (mean of 70.7 μm^2) was greater than day 1 non-progenitors (mean of 28.3 μm^2). However, the circularity of day 10 non-progenitors was less with a mean of 0.16 compared to a mean of 0.29 from the non-progenitor cells. Accordingly, the area metric of stem cells could provide a useful method for identifying progenitor cells to be used for cellular based therapies because of the significant increase in size over time.