11:35 – 11:40 am
Cartilage Matrix for Talus OCD
H. Thomas Temple, MD
Miami, Florida

Introduction
Cartilage defects are common in young athletes. To date, many surgical techniques have produced unsatisfactory results. A novel preparation of micronized and lyophilized cartilage has been prepared from human cadaveric tissue utilizing a cold desiccation technique.

Methods and Results
This material has been tested in the laboratory with periosteal stem cells on micro perforated laminar bone producing a material that is reminiscent of hyaline cartilage clinically. On further testing, this engineered tissue is found to express SOX-6, Type II collagen and aggregan by rt PCR. In vivo, this material has been used in mature non-human primates and on post-mortem observation produced complete healing with mature appearing hyaline-like cartilage. On histologic sections, the hyaline nature of the reconstituted tissue was confirmed.

The in vitro portion of the experiment combined periosteal explants cells with cartilage microparticulate that was prepared by a cold desiccation technique. The cartilage was obtained from cadaveric joints, desiccated at 4°C and placed in a cryomill (Retsch, Düsseldorf, Germany). The cartilage was then milled at -150°C. The cells were explanted from human cadaveric periosteum. These cells expressed CD40, CD90 and CD 105. They also expressed Oct4a and HTeRT by rt PCR. The cortical bone was prepared from human cadaveric femur and cut at 14µm then perforated. The bone, cells and cartilage were then incubated at 37°C under conditions that induced the periosteal stem cells to differentiate into cartilage. After 30 days in media, the gross appearance of this composite is shown in figure 1.

Hyaline type cartilage (white circle) on laminar perforated bone
Histologically, this is demonstrated in figure 2

Laminar bone (yellow), disorganized cartilage (brown)
The second part of the experiment involved creating a micro fracture in mature non-human primates (baboons). The defects were then filled with micronized cartilage prepared in a similar fashion. The baboons were sacrificed at one week (A), 4 weeks (B) and 9 weeks (C,D). The gross appearance is demonstrated in figure 3:

The defect is completely filled with hyaline-type cartilage in 9 weeks. Control animals (micro fracture resulted in an uneven cartilage surface and had a fibrous appearance. (Not shown)

Conclusions
Micronized cartilage prepared by cold desiccation is a promising material in the treatment of focal cartilage defects. The combination of cells and matrix produced a hyaline-like composite with disorganized layers of cells.