INTRODUCTION: Osteochondral lesions of the talus are frequent occurrences, mostly following inversion or eversion ankle sprains in young active patients. Different surgical options have been proposed over time in order to repair cartilage tissue damages. Among them only mosaicplasty and Autologous Chondrocyte Implantation (ACI) were capable up to now to regenerate hyaline cartilage at the lesion site, although major disadvantages of these techniques have been widely described. Looking for new methods for cartilage repair able to avoid the harvest of a healthy biopsy and cell expansion, the use of Bone-Marrow-Derived Cells (BMDCs) were recently hypothesized as a possible alternative for the treatment of articular cartilage defects. The aim of this study was to verify the ability of an original technique based upon BMDCs to regenerate hyaline articular cartilage, and to compare the clinical and histological results with those obtained after ACI.

METHODS: 48 patients affected by osteochondral lesion of the talus >1.5 cm² underwent an original arthroscopic procedure of BMDCs Transplantation by using bone marrow blood harvested from the posterior iliac crest, concentrated directly in operating room and charged on a collagen scaffold with the addition of Platelet Rich Fibrin (PRF). Patients evaluation included clinical AOFAS score, X-Rays, MRI preoperatively and at different established follow-up. A series of 46 patients operated arthroscopically by ACI procedure and comparable for age and lesion type were used as control group.

RESULTS: Before surgery the mean AOFAS score was 64.4±14.5 in BMDCs Transplantation group and 57.2 ±14.3 in the ACI one, while it was 83.3±8.7 at 12 months follow-up in BMDCs Transplantation group and 86.8 ± 13.4 in the ACI one. Both groups improved after surgery with similar patterns (p<0.005) and no significant differences were found between the two groups. Second-look arthroscopies were performed, when the implant site was inspected, biopsies were performed and evaluated according to ICRS scoring system. In 3 patients treated with ACI the second-look revealed a continuous and intact cartilage layer. In 2 samples a complete integration of the new tissue was observed, while in 1 case a slight cartilage softening at the site of implantation was noticed. A good tissue integration and no demarcated border were observed in the BMDCs Transplantation group. Samples obtained from the biopsies of both groups highlighted the presence of all the components of hyaline cartilage, with various degrees of tissue-remodelling. Safranin-O staining of the specimens showed in general a high expression of proteoglycans, while immunohistological evaluation of collagen type II showed the presence of some positive zones. An initial columnarization of chondrocytes was observed in the deep layers of the samples. Fibrous and fibrocartilaginous features were more evident in ACI specimens compared to BMDCs’.

DISCUSSION: ACI have proved to be able to provide a repair tissue which closely approximates the physical and histological characteristics of hyaline cartilage in the majority of cases and may make it more durable in long term compared to fibrocartilage. Nevertheless, the need of two surgeries and the high costs due to cell expansion are to be considered major drawbacks of the technique which may never be overcome. On the contrary, BMDCs Transplantation technique have proven to be capable to regenerate a cartilagineous tissue with histological characteristics which closely resemble the repair tissue obtained with ACI and similar clinical results. Furthermore, this technique demonstrated to be able to overcome all the previous drawbacks described for ACI since only one step surgery is required saving costs, time and patient’s morbidity. A longer follow up is necessary in order to confirm the results and to evaluate the evolution of the cartilage maturation processes, but BMDCs Transplantation may represent a dramatic advancement in the state or the art of cartilage regeneration.