Kongress: 93. Jahrestagung der Vereinigung der Bayerischen Chirurgen e.V.
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Abstract Nr.: 144
Kategorie: 1 Grundlagen- und translationale Forschung
Vortragssprache: D
Vortragsart: P
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Abstracttitel: Evaluation of proliferative and osteogenic differentiation capacity of hMSC:
Influence of donor site and donor age (K)

a.) Bone grafting is regularly carried out for arthrodesis and for treating complex
fractures or nonunions in patients of all age groups. The bone graft contains high
numbers of human mesenchymal stem cells (hMSC) which are the cellular source
of bony healing. Most commonly the bone graft is harvested from the iliac crest
even though the donor site morbidity is as high as 20%. Frequency, proliferation
and osteogenic differentiation capacity of hMSC from the iliac crest are known to
decline with age. Alternative donor sites such as the intramedullary canal of the
femur and the proximal tibia feature a significantly lower complication rate, but
there is no study available evaluating the effect of donor age on the cells
harvested from these donor sites. Due to this lack of evidence these alternative
donor sites are not routinely used in the elderly. Consequently, we analyzed the
influence of the donor age on the osteogenic potency of hMSC harvested from
the iliac crest and the proximal tibia. b.) We included patients undergoing
autologous bone transplantation for any medical reason from one of these donor
sites. Grouping was carried out in young (18-49 years) and elderly (≥ 50 years)
with 10 patients per group. HMSC were isolated with collagenase type II,
characterized and quantified. The proliferation capacity was assessed by
determining the cumulative population doubling and colony forming potential,
while the metabolic activity was quantified by a WST-1 assay. Additionally,
osteogenic differentiation capacity was assessed by quantifying extracellular
calcium deposition after inducing differentiation. c.) No differences were found
when comparing proliferation and metabolic activity of hMSC from the iliac crest
and the proximal tibia within the same age group. However, determination of the
CFU revealed an age-independent significant lower clonogenic potential of hMSC
from the iliac crest when compared to cells of the tibia. Additionally, iliac crest-
derived hMSCs of young and old patients showed noticeable lower osteogenic
differentiation capacity than hMSCs derived from the tibia. d.) By proving a
maintained osteogenic differentiation capacity of hMSC harvested from tibia
plateau in young and elderly patients, the patient comfort could be improved by
increasing the utilization of these alternative donor sites.