12. Jahreskongress der Deutschen Kniegesellschaft

Abstract-Nr.: DKG23-2029

Erstellt:	25. Mai 2023 10:08:36 MESZ
Bearbeitet:	26. Mai 2023 05:34:13 MESZ
Status:	Eingereicht
Beitragsart:	Vortrag
Abstractsprache:	Englisch
Präsentationssprache:	Deutsch
AV-Ausstattung:	Laptop, Beamer, Mikrofon

Erstautor:	Jannik Frings
Präsentierender Autor:	Jannik Frings
Einreichender Autor:	Jannik Frings
Autorenliste:	Jannik Frings[1], Anke Baranowsky[2], Alexander Korthaus[1], Karl-Heinz Frosch[1], Hendrik Fahlbusch[1], Milad Fal[1], Matthias Buhs[3], Johannes Keller[2], Matthias Krause[1]
Institut/e:	[1] Universitätsklinikum Hamburg-Eppendorf, Klinik und Poliklinik für Unfallchirurgie und Orthopädie, Hamburg, Deutschland [2] Universitätsklinikum Hamburg-Eppendorf, Klinik und Poliklinik für Unfallchirurgie und Orthopädie, Experimentelle Unfallchirurgie, Hamburg, Deutschland [3] Norddeutsches Knorpelcentrum, Quickborn, Deutschland

Thema:	Knorpel und Meniskus

Inhalt Englisch

Titel:	Arthroscopic harvest of minced cartilage results in reduced cell viability and lower quality repair tissue compared to conventional fragmentation

interrogation:	The minced cartilage (MC) procedure is one of the most popular innovations in the modern treatment of cartilage defects in the knee. Based on the promising results of in-vitro and animal studies, investigating conventional MC procedures, novel arthroscopic techniques are increasingly being promoted. However, there is a lack of clinical and biological evidence to support this specific technique. The aim of this study was to investigate the cell viability of arthroscopically harvested chondrocytes intended for autologous transplantation and the quality of the resulting repair tissue.
methodology:	A two-arm study was conducted to evaluate the results of human and porcine samples. Chondral tissue was harvested from 9 human and 8 porcine knees. Human specimens were <40 years old with intact, native cartilage surfaces and deceased <48 hours prior to harvest. Porcine specimens were euthanized one day before harvest. Arthroscopic harvest was performed with two shaver blades (groups 1 and 2) in 2 operating modes (oscillating vs. forward) and compared to a scalpel-fragmented control. Samples were digested (Collagenase II) to optimize cell differentiation, while undigested tissue samples were included to improve comparability. Tissue samples were stained (Typan) and analyzed histologically. A subset of porcine samples was analyzed for cell viability, gene expression of the cartilage-specific markers Aggrecan (ACAN), collagen-II, alpha1 (COL2A1), collagen-I, alpha1 (COL1A1), fibronectin 1 (FN), and cartilage matrix formation (alcian blue staining) after 21 days of 2D culture.
results and conclusion:	In both human and porcine specimens, arthroscopically harvested chondral tissue had significantly fewer viable chondrocytes (465-773/g^3 vs. 2271-2564/g^3, p=0.02) and a significantly lower live-dead ratio (41-54% vs. 90-91%, p<0.01) compared to the control, regardless of shaver blade or operating mode. After 21 days, the digested control showed high expressions of ACAN (29 virtual copy numbers (VCN)/GAPDH) and COL2A1 (30 VCN/GAPDH), which were significantly lower in the digested groups 1 and 2 (ACAN 2-9 VCN/GAPDH, COL2A1 2-7 VCN/GAPDH, p=0.001), regardless of shaver blade or operating mode. COL1A1 (9-20 VCN/GAPDH) and FN (12-19 VCN/GAPDH) expressions were significantly higher in groups 1 and 2 compared to the controls (1 and 5 VCN/GAPDH, p=0.001). Similar observations were made for the undigested samples, showing an overall decrease in ACAN and COL2A1, but an increase in COL1A1 and FN. The cartilage matrix formed in the digested control showed a strong signal intensity (85/mm^2) but was significantly less intense in groups 1 and 2 (7-11mm^2, p<0.01). In conclusion, arthroscopic harvesting of healthy cartilage tissue significantly impaired chondrocyte quantity and viability compared to conventional fragmentation. Furthermore, the high chondrogenic potential of MC to form hyaline-like repair tissue could not be confirmed for arthroscopic techniques, which showed a high expression of fibroblast markers.

Stichwörter:	minced cartilage, cell viability, arthroscopy, chondral lesion, hyaline