Reduced Quantity and Impaired Functionality of Synovial Mesenchymal Stem Cells in Charcot Neuroarthropathy

Lew C. Schon, MD
Reed Mitchell, MS
Jeremy Molligan, MD
Sydney Rooney, BS
Zijun Zhang, PhD/MD

Orthobiologic Laboratory, MedStar Union Memorial Hospital, Baltimore, Maryland
Disclosure

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Jeremy Molligan, MD
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Charcot Neuroarthropathy (CNA)
Our previous study demonstrated that synovium is highly inflamed in CNA and fibroblast-like synoviocytes play an important role in the development of CNA (Molligan et al.).

Comparing with the normal synovium, the synovium in CNA has an expanded intimal layer and is infiltrated by leukocytes.
Synovial Mesenchymal Stem Cells (syn-MSCs)

- Syn-MSCs reside in the matrix of synovium.
- Syn-MSCs are multi-potent in differentiation.
- Syn-MSCs function in tissue repair and maintain tissue homeostasis.
- It is unknown whether the biological properties of syn-MSCs are changed in CNA.

Aim of the study: characterization of syn-MSCs in CNA.
Syn-MSCs in Charcot Neuroarthropathy

• Materials and Methods

CNA synovium
(n = 7)

Non-CNA synovium
(n = 7)

Isolation and culture syn-MSCs

Colony-forming unit-fibroblast

Surface markers

Proliferation

Tri-lineage differentiation
Syn-MSCs in Charcot Neuroarthropathy

Colony-forming unit-fibroblasts (CFU-F) represents the number of syn-MSCs.

- Fewer CFU-F formed by syn-MSCs in the CNA group than non-CNA group (A).
- The average size of the syn-MSC colonies in CNA group was smaller (B).
- The density of the colonies in the CNA group was reduced (C).
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- MSCs express cell surface marker CD73, CD90 and CD105, but not CD14

Syn-MSCs in the CNA group expressed all the regular MSC markers and the expression levels were comparable to syn-MSCs in non-CNA group.
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• Proliferation

Statistically, syn-MSCs in CNA and non-CNA groups proliferated at the same pace.
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- Tri-lineage differentiation

Syn-MSCs in CNA were capable of adipogenic, osteogenic and chondrogenic differentiation
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- Tri-lineage differentiation

Marker genes of adipogenic differentiation (PPAR-γ), osteogenic differentiation (RUNX2) and chondrogenic differentiation (Sox9 and Col2a) were down-regulated in the syn-MSCs in CNA group.
Conclusion

1. The number of MSCs was reduced in the synovium in CNA.
2. The differentiation potential of the syn-MSCs in CNA was compromised.

Future study will focus on the pathological role of syn-MSCs in the development of CNA.
Syn-MSCs in Charcot Neuroarthropathy

• References
