

Clinical effect of intraarticular treatment with allogeneic mesenchymal stem cells derived from umbilical cord Wharton's jelly (WJ-MSC) in adults with Knee Osteoarthritis (KOA). BioXcellerator, Medellín, Colombia.

FA Barrios-Arroyave¹, KJ Rendon-Morales¹, LA Palacio¹, N Zapata-Franco¹, A Aguilar¹, A Ramirez¹, K Halpert-Correa^{1,2}, HF Ortega-Arellano², C Quintero-Gil², L Lopez-Quiceno^{1*}
¹ BioXcellerator, Medellín, 050021, Colombia. ² BioXtech, Medellín, 050021, Colombia.

Introduction

Knee osteoarthritis (KOA) is a degenerative joint disease that progresses over time, resulting in pain and limited functionality. Ortho-biological regenerative therapies, such as mesenchymal stromal cells (MSC), have been shown to be beneficial for treating KOA. These therapies are safe and can effectively promote cartilage biological repairment, which helps to relieve pain and recover knee functionality. The mechanisms of action of MSC on the knee cartilage are shown in Figure 1.

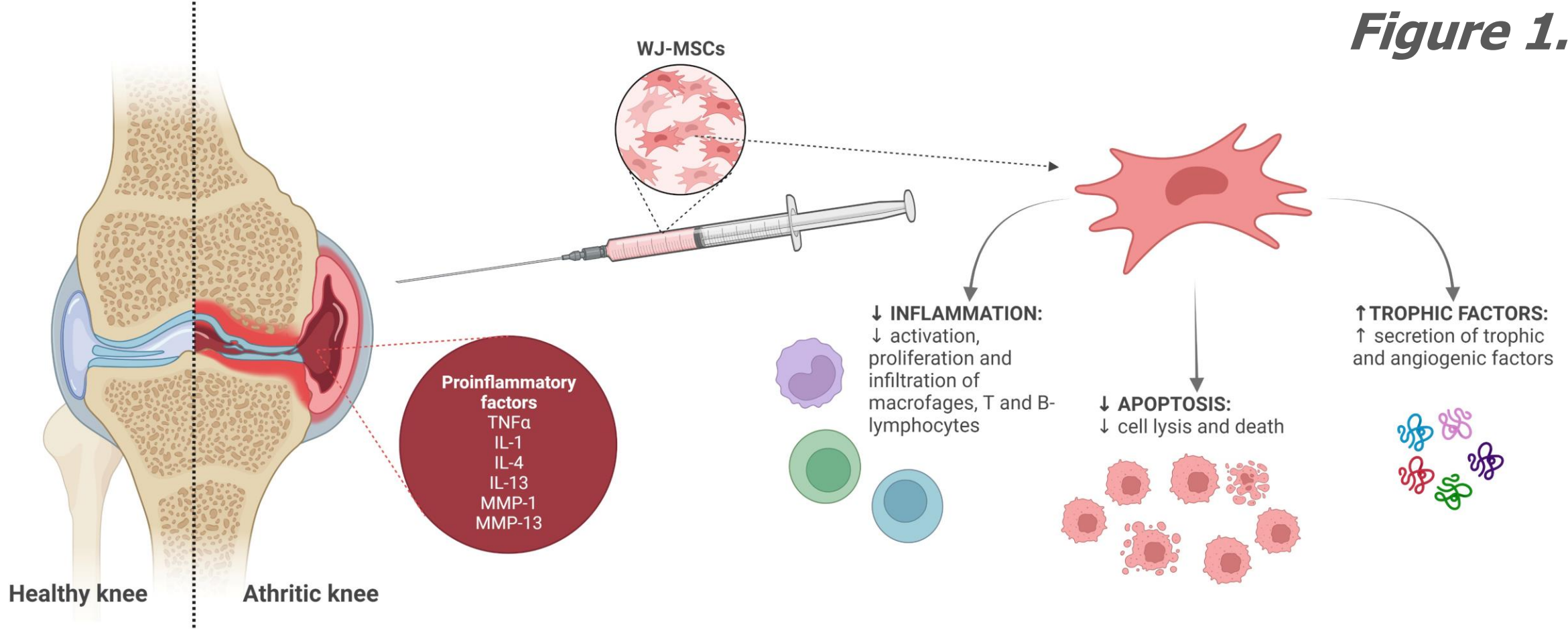


Figure 1.

Objective

To describe the clinical progression in KOA patients after intra-articular cell therapy with allogeneic Wharton's jelly, stem cells from the umbilical cord (WJ-MSC).

Materials and methods

A retrospective cohort observational study analyzed the effects following MSC therapy based on WJ-MSC in KOA patients. Ethical approval was obtained by an independent ethics committee (CEI-0435-11-2022).

Clinical outcomes were measured by the Short-Form12 questionnaire, Visual-Analog-Scale (VAS), and Western-Ontario-McMaster-Index (WOMAC). Clinical assessments were performed at baseline and six months after intra-articular delivery of a single dose of 40x10⁶ WJ-MSC per target knee. The application procedure is shown in Figure 2.

Figure 2.



WJ-MSCs were obtained from a clinical-grade GMP-compliant laboratory. Flow cytometry analysis of P7 cells demonstrated >84% expression of CD105, CD73, and CD90, with <2% expression of CD45, CD34, CD11b, CD19, and HLA-DR. The cells also displayed in vitro differentiation into osteoblasts, adipocytes, and chondrocytes.

Results – Sociodemographic data

- 35 knees (19 patients) were included (Feb/2020-Apr/2023).
- All subjects completed 6 months of follow-up.
- Male 18 (94.7%), Female 1 (5,3%).
- The median age was 59 (IQR=18).
- Country of origin: United States (n=16, 84,2%).

Results – Clinical data

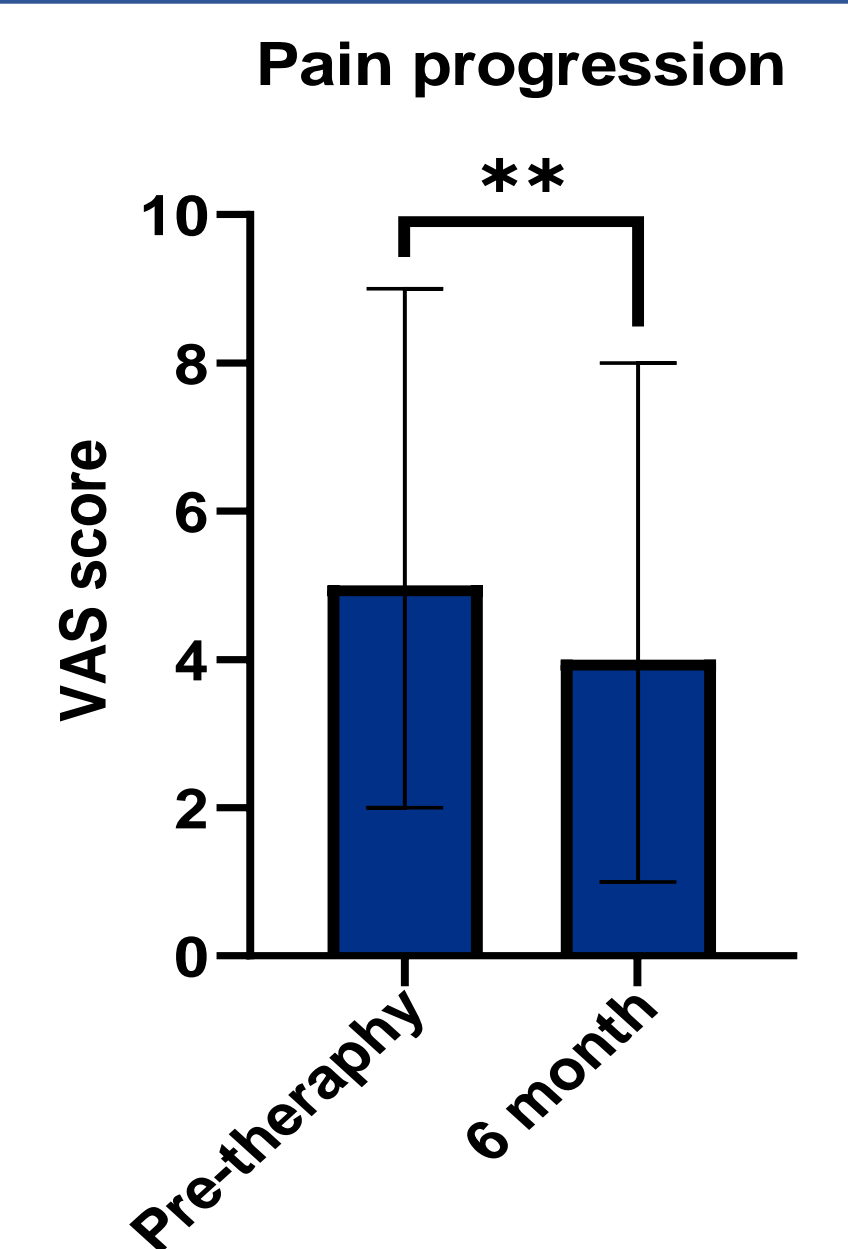
- The median time between probable KOA diagnosis or symptoms onset and WJ-MSC therapy was 184.4 months (IQR=127.02) (15.4 years).
- The mean BMI was 29.5 kg/m² (SD=4.5).
- Kellgren-Lawrence: mild (n=16/46%), moderate (n=14/40%), severe (n=5/14%).
- KOA location: patellofemoral (n=2, 6%), tibiofemoral (n=2, 6%), tricompartmental (n=26, 74%), medial (n=4, 11%), lateral (n=1, 3%).

- History of chondromalacia (n=20, 57%), meniscopathy (n=28, 80%), cruciate ligament injury (n=14, 40%).
- History of surgeries n= 13 (37%).
- Physical therapy pre-MSC treatment (n=1, 3%).

Results – Pain assessment

- The median pre-therapy VAS score was 5 (IQR=2), and the 6-month was 4 (IQR=2.5) ($p<0.001$).
- In 31 target knees (89%) the VAS improved compared to baseline ($p<0.001$).

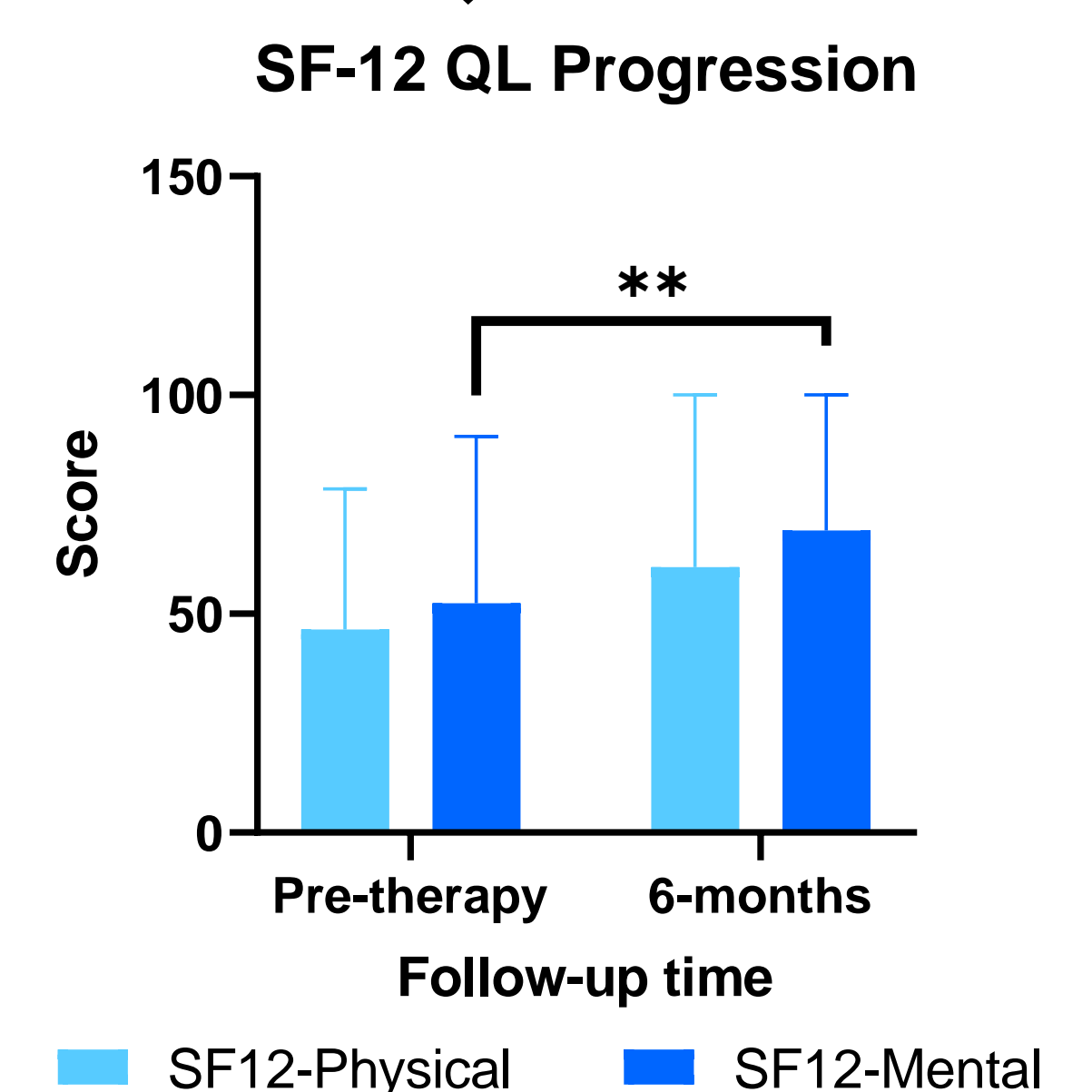
Figure 3.



Results – Health-related quality of life (HRQL)

- Median baseline SF12-mental score: 52.38 (IQR=57.14). 6-month 64.28 (IQR=42.85) ($p=0.003$).
- Changes in SF12-physical score were not significant statistically ($p=0.971$).
- After six months, the global SF12 improved compared with the baseline measurement in 14 patients (78%) ($p=0.009$).

Figure 4.



Results – Response to therapy

- WOMAC-general score: pretherapy 37 (IQR=26.5) → 6-month 27 (IQR=18.5) ($p=0.022$).
- WOMAC-pain score: pretherapy 7 (IQR=5) → 6-month 4 (IQR=5) ($p<0.001$).
- WOMAC-functionality score: pretherapy 24 (IQR=20.5) → 6-month 21 (IQR=13) ($p=0.045$).
- Outcome: Target knee achieved ≥20% WOMAC-general score difference between baseline and post-treatment. 16 knees responded to the therapy (46%).
- Variables associated with treatment response: Age ($p=0.009$), BMI ($p=0.018$), patellofemoral-KOA ($p=0.041$), partial-arthroplasty ($p=0.012$), total-arthroplasty ($p=0.001$), previous cartilage repair ($p=0.043$), physical therapy ($p=0.003$), reduction in 6-month VAS (same or improved vs worsened) ($p=0.039$).
- Cox regression analysis ($p=0.005$, AIC=71.6, R²=82.17%): patellofemoral-KOA ($p=0.004$, HRa=58.49, 95%CI=4.49-162.00).

WOMAC Progression

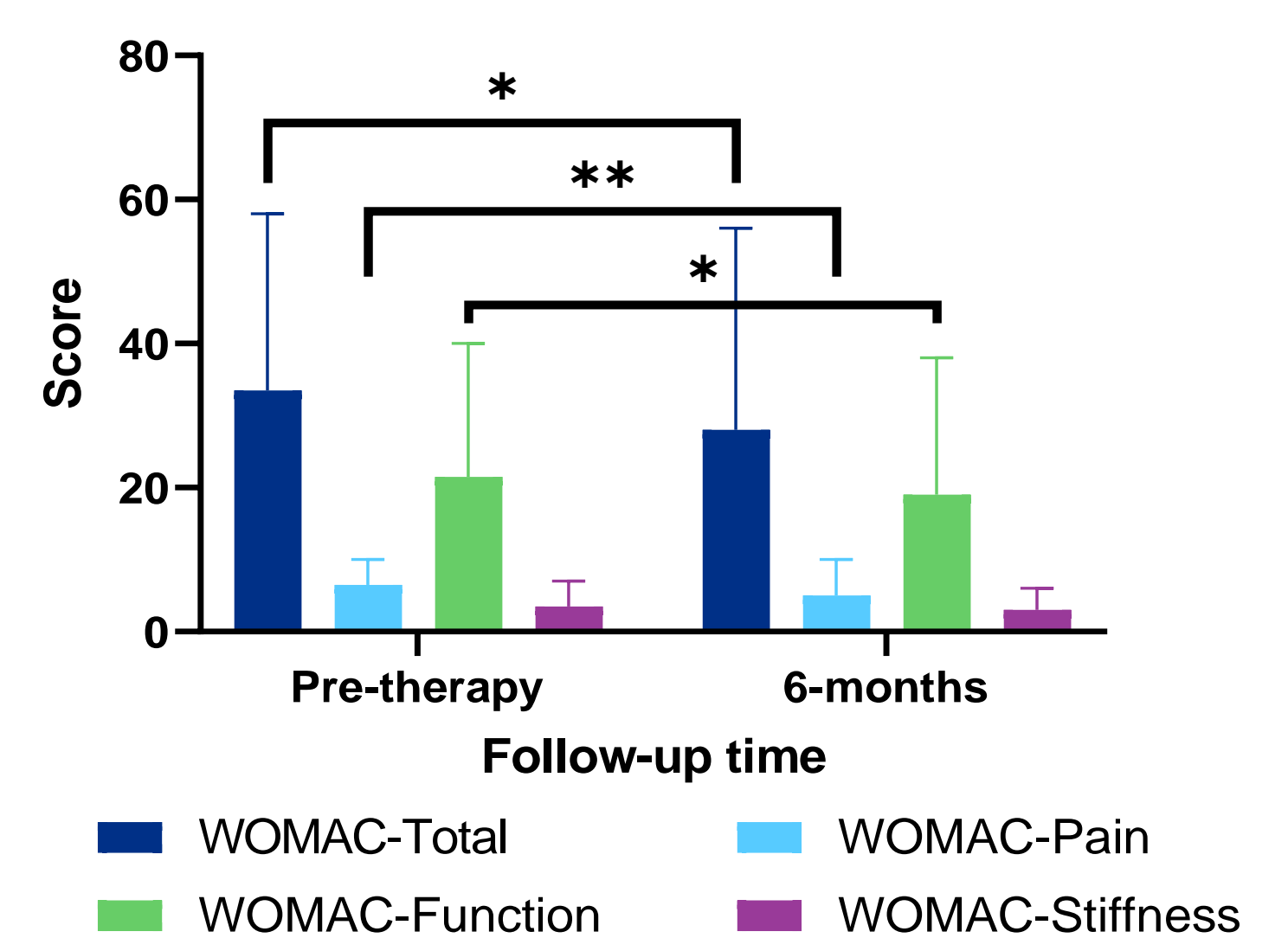


Figure 5.

Conclusion

Intra-articular delivery of WJ-MSCs was safe and effective in treating KOA with no reported serious adverse events..

References

Liao CD, Chen HC, Huang MH, Liou TH, Lin CL, Huang SW. Comparative Efficacy of Intra-Articular Injection, Physical Therapy, and Combined Treatments on Pain, Function, and Sarcopenia Indices in Knee Osteoarthritis: A Network Meta-Analysis of Randomized Controlled Trials. Int J Mol Sci. 2023 Mar 23;24(7):6078. doi: 10.3390/ijms24076078