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SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Stem Cell and Regenerative Injections

Overview

- There is insufficient evidence to recommend stem cell injections in clinical practice for osteoarthritis of the knee at this time [1].
- Stem cell injections for osteoarthritis of the knee should continue to be studied in rigorous trials [1].
- Mesenchymal stem cell injections represent a growing area of research in traumatology and orthopaedics [2].
- There is a significant risk of reporting bias in randomized controlled trials and clinical trials of mesenchymal stromal cells for the treatment of knee osteoarthritis, with abstracts showing a significantly higher proportion of significant P values compared to main texts [9].
- The superiority of bone marrow aspirate concentrate over other orthobiologic treatments for knee osteoarthritis cannot be assessed given the conflicting results presently available [6].
- Mesenchymal stem cells have been used in clinical practice in orthopaedics and traumatology in accordance with government health regulations [5].
- The application of mesenchymal stem cells in clinical practice should be guided by the pathophysiology of the target disease [5].
- The application of mesenchymal stem cells in clinical practice should follow regulatory frameworks to ensure safe and effective use [5].
- The intervention schedule is significantly correlated with the therapeutic efficacy of stem cells for posttraumatic osteoarthritis, with the best effects observed on days 7 and 14 after anterior cruciate ligament transection in a rat model [3].
- The combination of adipose-derived mesenchymal stem cells and platelet-rich plasma demonstrated enhanced therapeutic efficacy for the treatment of osteoarthritis [4].
- Intra-articular injection of umbilical cord-derived mesenchymal stem cells is safe and effective for moderate to severe knee osteoarthritis with synovitis [7].
- Treatment with umbilical cord-derived mesenchymal stem cells showed clinical improvement at the end of follow-up, especially in patients with moderate to severe pain [7].

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- Endogenous mesenchymal stromal cells can be pharmacologically mobilized into peripheral blood and recruited to the site of rotator cuff repair via local delivery of MCP-1 [8].
- Mesenchymal stem cell-derived miR-125b-1-3p-abundant exosomes alleviate osteoarthritis by modulating the KDM6B-H3K27me3-FOXM1 axis [10].
- Findings regarding mesenchymal stem cell-derived miR-125b-1-3p-abundant exosomes provide a theoretical rationale for the development of exosome-based therapeutic strategies against osteoarthritis [10].
- These findings identify promising therapeutic targets for the development of exosome-based therapeutic strategies against osteoarthritis [10].

How It Works

- There is insufficient evidence to recommend stem cell injections in clinical practice at this time [1].
- Stem cell injections should continue to be studied in rigorous trials [1].
- Mesenchymal stem cell (MSC) injections represent a growing area of research in traumatology and orthopaedics [2].
- MSC application in clinical practice should be guided by the pathophysiology of the target disease [5].
- MSC application in clinical practice should follow regulatory frameworks to ensure safe and effective use [5].
- The superiority of bone marrow aspirate concentrate (BMAC) over other orthobiologic treatments cannot be assessed given conflicting results [6].
- Treatment with umbilical cord-derived mesenchymal stem cells (UC-MSCs) is a viable therapeutic option for knee osteoarthritis (KOA) combined with synovitis [7].
- UC-MSC treatment shows clinical improvement at the end of follow-up, especially in patients with moderate to severe pain [7].
- The combination of platelet-rich plasma (PRP) and adipose-derived stem cells (ADSCs) demonstrates enhanced therapeutic efficacy for osteoarthritis [4].
- Endogenous MSCs can be pharmacologically mobilized into peripheral blood [8].
- Endogenous MSCs can be recruited to the site of rotator cuff repair via local delivery of MCP-1 [8].
- MSC-derived miR-125b-1-3p-abundant exosomes alleviate osteoarthritis by modulating the KDM6B-H3K27me3-FOXM1 axis [10].
- Local delivery of MSC-derived extracellular vesicles (MSC-EVs) embedded within an injectable collagen scaffold enhances tendon regeneration in a rat model of collagenase-induced tendinopathy [11].
- Local application of BMAC without appropriate carriers could not enhance bone-tendon interface healing in a rabbit model of chronic rotator cuff tear [12].
- Adipose-derived stem cell (ASC) interactions with the immune system are complex [13].

- ASC secretome may be a well-tolerated treatment for osteoarthritis, though further studies are needed to determine its potential therapeutic benefits [13].
- Hypoxic MSCs might exert therapeutic effects mediated by stimulating TGF-β [16].
- Hypoxic MSCs promote the expression of COL II [16].
- Hypoxic MSCs inhibit the expression of COL X [16].

What the Evidence Shows

- There is insufficient evidence to recommend stem cell injections in clinical practice for osteoarthritis of the knee at this time [1].
- Stem cell injections for osteoarthritis of the knee should continue to be studied in rigorous trials [1].
- Mesenchymal stem cell injections represent a growing area of research in traumatology and orthopaedics [2].
- There is a significant risk of reporting bias in randomized controlled trials and clinical trials of mesenchymal stromal cells for the treatment of knee osteoarthritis, with abstracts showing a significantly higher proportion of significant P values compared to main texts [9].
- Spin bias was present in most mesenchymal stromal cell-related trials for knee osteoarthritis, with a higher frequency among trials that utilized adipose-derived mesenchymal stem cells [14].
- The superiority of bone marrow aspirate concentrate over other orthobiologic treatments for knee osteoarthritis cannot be assessed given the conflicting results presently available [6].
- Mesenchymal stem cells have been used in clinical practice in orthopaedics and traumatology in accordance with government health regulations, but their application should be guided by the pathophysiology of the target disease and follow regulatory frameworks to ensure safe and effective use [5].
- The intervention schedule is significantly correlated with the therapeutic efficacy of stem cells for posttraumatic osteoarthritis, with the best effects observed on days 7 and 14 after anterior cruciate ligament transection in a rat model [3].
- The combination of platelet-rich plasma and adipose-derived stem cells demonstrated enhanced therapeutic efficacy for the treatment of osteoarthritis [4].
- Treatment with umbilical cord-derived mesenchymal stem cells was shown to be a viable therapeutic option for knee osteoarthritis combined with synovitis, showing clinical improvement at the end of follow-up, especially in those with moderate to severe pain [7].
- Endogenous mesenchymal stromal cells can be pharmacologically mobilized into peripheral blood and recruited to the site of rotator cuff repair via local delivery of MCP-1 [8].
- Local delivery of mesenchymal stem cell-derived extracellular vesicles embedded within an injectable collagen scaffold enhanced tendon regeneration in a rat model of collagenase-induced tendinopathy [11].
- Local application of bone marrow aspirate concentrate without appropriate carriers could not enhance bone-tendon interface healing in a rabbit model of chronic rotator cuff tear [12].

- Augmenting hamstring allograft anterior cruciate ligament reconstruction with an amnion collagen matrix and injecting bone marrow aspirate concentrate appeared to be safe, and clinical outcomes were favorable up to 2 years postoperation despite having no quantifiable effect on graft maturation [15].
- Arthroscopic surgical repair combined with mesenchymal stem cell augmentation reported better structural outcomes compared to isolated surgical repair for rotator cuff tears [17].

Practical Considerations

- There is insufficient evidence to recommend stem cell injections in clinical practice at this time [1].
- Stem cell injections should continue to be studied in rigorous trials [1].
- Mesenchymal stem cell injections represent a growing area of research in traumatology and orthopaedics [2].
- The intervention schedule is significantly correlated with the therapeutic efficacy of stem cells for posttraumatic osteoarthritis [3].
- The best effects of stem cell treatment for posttraumatic osteoarthritis are observed on days 7 and 14 after anterior cruciate ligament transection [3].
- The combination of platelet-rich plasma and adipose-derived mesenchymal stem cells demonstrated enhanced therapeutic efficacy for osteoarthritis [4].
- Mesenchymal stem cells have been used in clinical practice in orthopaedics and traumatology in accordance with government health regulations [5].
- The application of mesenchymal stem cells should be guided by the pathophysiology of the target disease [5].
- The application of mesenchymal stem cells should follow regulatory frameworks to ensure safe and effective use [5].
- The superiority of bone marrow aspirate concentrate over other orthobiologic treatments cannot be assessed given the conflicting results presently available [6].
- Treatment with umbilical cord-derived mesenchymal stem cells is a viable therapeutic option for knee osteoarthritis combined with synovitis [7].
- Umbilical cord-derived mesenchymal stem cell treatment showed clinical improvement at the end of follow-up, especially in patients with moderate to severe pain [7].
- There is a significant risk of reporting bias in randomized controlled trials and clinical trials of mesenchymal stromal cells for the treatment of knee osteoarthritis [9].
- Abstracts of mesenchymal stromal cell trials for knee osteoarthritis show a significantly higher proportion of significant P values compared to main texts [9].
- Spin bias was present in most mesenchymal stromal cell-related trials for knee osteoarthritis [14].
- Spin bias had a higher frequency among trials that utilized adipose-derived mesenchymal stem cells [14].

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- Augmenting hamstring allograft anterior cruciate ligament reconstruction with an amnion collagen matrix and injecting bone marrow aspirate concentrate appeared to be safe [15].
- Augmenting hamstring allograft anterior cruciate ligament reconstruction with an amnion collagen matrix and injecting bone marrow aspirate concentrate produced favorable clinical outcomes up to 2 years postoperation [15].
- Augmenting hamstring allograft anterior cruciate ligament reconstruction with an amnion collagen matrix and injecting bone marrow aspirate concentrate had no quantifiable effect on graft maturation [15].
- Adipose-derived stem cell interactions with the immune system are complex [13].
- The secretome of adipose-derived stem cells may be a well-tolerated treatment for osteoarthritis [13].
- Further studies are needed to determine the potential therapeutic benefits of adipose-derived stem cell secretome [13].

Key Evidence

- [L1] There is insufficient evidence to recommend stem cell injections in clinical practice at this time, but they should continue to be studied in rigorous trials. [1] (10.1097/corr.0000000000003593)
- [L2] MSC injections represent a growing area of research in traumatology and orthopaedics. [2] (10.1186/s12891-025-09123-8)
- [L5] The intervention schedule is significantly correlated with the therapeutic efficacy of stem cells for PTOA, with the best effects observed on days 7 and 14 after ACLT. [3] (10.1177/03635465251326499)
- [L5] The combination of PRP and ADSCs demonstrated enhanced therapeutic efficacy, suggesting its potential as a treatment option for OA. [4] (10.1186/s13018-024-05396-2)
- [L5] Mesenchymal stem cells (MSCs) have been used in clinical practice in orthopaedics and traumatology in accordance with government health regulations, but their application should be guided by the pathophysiology of the target disease and follow regulatory frameworks to ensure safe and effective use. [5] (10.1530/eor-2026-0056)
- [L2] However, the superiority of BMAC over other orthobiologic treatments cannot be assessed given the conflicting results presently available. [6] (10.1186/s13018-025-06509-1)
- [L1] Treatment with UC-MSCs was shown to be a viable therapeutic option for KOA combined with synovitis, showing clinical improvement at the end of follow-up, especially in those with moderate to severe pain. [7] (10.1186/s12891-025-09440-y)
- [L5] Endogenous MSCs can be pharmacologically mobilized into peripheral blood and recruited to the site of rotator cuff repair via local delivery of MCP-1. [8] (10.1177/03635465251341439)
- [L2] The study highlights a significant risk of reporting bias in RCTs and CTs of MSCs for the treatment of knee OA, with abstracts showing a significantly higher proportion of significant P values compared to main texts. [9] (10.1177/23259671251374306)
- [L5] These findings provide a theoretical rationale and identify promising therapeutic targets for the development of exosome-based therapeutic strategies against OA. [10] (10.1186/s13018-026-06765-9)

- [L5] Local delivery of MSC-EVs embedded within an injectable collagen scaffold enhanced tendon regeneration in a rat model of collagenase-induced tendinopathy. [11] (10.1177/03635465261421555)
- [L5] Local application of BMAC without appropriate carriers could not enhance bone-tendon interface healing. [12] (10.1177/03635465241313124)
- [L5] This study highlights the complexity of ASC interactions with the immune system, while secretome may be a well-tolerated treatment, further studies are needed to determine its potential therapeutic benefits. [13] (10.1186/s12891-025-08642-8)
- [L2] Spin bias was present in most MSC-related trials for knee osteoarthritis, with a higher frequency among those that utilized adipose-derived MSCs. [14] (10.1177/03635465241274155)
- [L4] This case series demonstrated that augmenting hamstring allograft ACL reconstruction with an amnion collagen matrix and injecting BMAC appeared to be safe, and clinical outcomes were favorable up to 2 years postoperation despite having no quantifiable effect on graft maturation. [15] (10.1016/j.asmr.2025.101209)
- [L5] Hypoxic MSCs might exert therapeutic effects mediated by stimulating TGF-β and subsequently promote and inhibit the expressions of COL II and COL X respectively. [16] (10.1186/s13018-025-06184-2)
- [L1] Arthroscopic surgical repair combined with MSC augmentation reported better structural outcomes compared to isolated surgical repair for RCT. [17] (10.1016/j.jseint.2025.03.017)

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