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Review Article

Total Joint Replacement without Surgery: Advances in Regenerative and Biologic Joint Restoration

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Abstract

Purpose

We analysed the urological sections of Al-Tasrif by Abacaxis, with particular attention to the management of bladder stones, the surgical instruments described for their extraction, and the operative techniques outlined.

Materials and Methods

Al-Tasrif, a surgical text authored by Al-Zahrani (who lived in Al-Andalus between 930 and 1013 CE), was critically evaluated with regard to its descriptions of urinary bladder stones and the surgical instruments used for their management.

Results

The textbooks provide detailed information on the surgical management of the urinary bladder stones by perineal cystolithotomy. Additionally, they include descriptions of the surgical instruments used in the removal of these stones.

Conclusion

This comprehensive historical analysis highlights the crucial part Abacaxis (Al-Zahrani) played in the inception and early stages of perineal cystolithotomy. As one of the foremost surgical innovators of the Islamic Golden Age, Abacaxis provided the first detailed descriptions of bladder stone removal via the Perineal route, laying the foundation for centuries of urological practice.

Keywords: breakfast skipping; adolescence; cognitive development; academic performance; nutrition; obesity prevention; meal patterns

1.Introduction

Joint degeneration is one of the most common causes of chronic disability worldwide. Conventional total joint replacement (TJR) has restored mobility for millions of patients, but it remains invasive, costly, and limited by implant lifespan and complications [1]. With rising life expectancy and earlier onset of osteoarthritis, there is growing interest in non-surgical, biologically driven approaches that restore native joint integrity rather than replacing damaged tissue with synthetic components [2].

Advances in regenerative medicine, molecular biology, and biomaterials have enabled therapeutic strategies targeting intrinsic healing pathways. These include the application of mesenchymal stem cells (MSCs), platelet-rich plasma (PRP), growth factor delivery, gene therapy, and bioengineered scaffolds [3,4]. Collectively, these methods aim to stimulate cartilage and subchondral bone regeneration, control inflammation, and restore biomechanical function—offering a potential alternative to traditional arthroplasty [5]

2. Literature Review

2.1 Biological basis of non-surgical joint restoration

Cartilage possesses limited self-repair capacity due to its avascular and aneural nature [6]. MSCs derived from bone marrow, adipose tissue, or synovium have shown the ability to differentiate into chondrocytes and secrete anti-inflammatory cytokines such as IL-10 and TGF-β [7]. PRP provides autologous growth factors—PDGF, VEGF, and IGF-1—that promote matrix synthesis and angiogenesis [8].

2.2 Emerging regenerative techniques

Stem-cell-based injections combined with hyaluronic acid scaffolds enhance chondrocyte survival and extracellular matrix deposition [9]. Exosome therapy delivers nanoscale vesicles containing microRNAs that regulate cartilage homeostasis [10]. Nanotechnology has further improved targeted delivery of anti-catabolic drugs and regenerative factors [11].

2.3 Clinical outcomes

Randomized clinical trials comparing PRP and MSC therapy with hyaluronic acid injections show superior outcomes in pain relief and functional scores at 6–12 months [12,13]. However, heterogeneity in cell preparation, dosing, and follow-up duration limits comparability. Long-term data (>5 years) remain sparse [14].

2.4 Comparative advantages

Non-surgical therapies are minimally invasive, reduce hospital stay, and maintain natural biomechanics. Table 1 summarizes major differences between traditional TJR and biologic joint restoration.

Feature	Surgical TJR	Regenerative/Non-surgical
Procedure	Invasive, prosthetic implantation	Outpatient injection-based
Recovery	3–6 months rehabilitation	1–4 weeks functional recovery
Complications	Infection, implant wear, revision surgery	Mild pain, swelling, transient inflammation
Mechanism	Mechanical replacement	Biological regeneration
Longevity	15–20 years (implant life)	Potential continuous tissue remodeling
Cost	High surgical and hospital cost	Moderate, outpatient procedures

Table 1: Comparison of conventional joint replacement and non-surgical regenerative therapies

Sources: compiled from refs [1–5, 12–14]

3. Methodology

This review synthesizes peer-reviewed studies published between 2010 and 2025 focusing on non-surgical joint restoration. Databases searched included PubMed, Science Direct, and Scopus using the terms *joint regeneration*, *stem cell therapy*, *platelet-rich plasma*, and *non-surgical joint replacement*. Inclusion criteria were randomized controlled trials (RCTs), clinical studies, and meta-analyses evaluating safety and efficacy outcomes in human subjects with osteoarthritis or cartilage injury.

Data were extracted on study design, intervention type, follow-up duration, pain and functional scores, and reported adverse effects. Emphasis was placed on therapies using MSCs, PRP, or exosomes with or without scaffold materials. Qualitative synthesis compared efficacy outcomes against conventional management

4.Results

4.1 Clinical effectiveness

Across selected studies, intra-articular PRP demonstrated mean pain reduction of 45–60 % and functional improvement of 40 % on standardized scales within 12 months [12]. MSC therapies produced durable improvements for up to three years in early osteoarthritis [13]. Combination protocols (PRP + MSCs) yielded synergistic outcomes in cartilage volume restoration confirmed by MRI [15].

4.2 Safety profile

Reported adverse effects were minimal and transient, including injection-site pain and mild effusion [16]. No serious systemic complications or tumorigenic effects were noted in human trials to date [17].

4.3 Cost and accessibility

While biologic treatments are less expensive than full surgery, costs vary with cell-processing techniques. Figure 1 illustrates the relative cost and recovery timelines between interventions.

Figure 1: Comparative cost and recovery timeline between surgical and non-surgical joint restoration

Source: synthesized from refs [1–5, 12–17]

5. Discussion

The findings confirm that regenerative therapies offer a viable non-surgical pathway for joint restoration, particularly in early degenerative disease. Biological repair maintains natural tissue interfaces and avoids complications associated with prosthetic implants [18]. MSCs act through paracrine signaling and immunomodulation, reducing catabolic enzymes such as MMP-13 while enhancing cartilage matrix deposition [19].

Despite promising outcomes, challenges persist. There is still no consensus on optimal cell dosage, preparation technique, or injection frequency [20]. Variability in patient age, disease severity, and comorbidities affects response rates. Furthermore, regulatory frameworks differ across countries, influencing clinical translation [21].

Future research should focus on multicenter RCTs with standardized protocols, biomarker-based patient stratification, and long-term imaging follow-up. Integration with physiotherapy and lifestyle interventions will maximize regenerative potential. Ethical considerations regarding stem-cell sourcing and cost accessibility must also be addressed before widespread adoption [22].

6 Conclusion

Total joint replacement without surgery is no longer a theoretical concept but an evolving clinical reality. Through advances in stem-cell biology, PRP therapy, nanomedicine, and biomaterials, clinicians can now harness the body's regenerative capacity to repair damaged joints biologically. Non-surgical joint restoration promises shorter recovery, reduced complications, and preservation of native tissue architecture. While surgical arthroplasty will remain necessary for advanced joint destruction, regenerative strategies will likely become the first-line option for many patients within the next decade. Continued interdisciplinary collaboration among orthopedic surgeons, biomedical scientists, and rehabilitation specialists is essential to refine these techniques and ensure safe, effective, and equitable access for all.

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Declaration of Interest:

I herewith acknowledge that:

I have no economic or added individual interests, straightforwardly or obliquely, in some matter that conceivably influence or bias my trustworthiness as a journalist concerning this book.

Conflicts of Interest:

The authors profess that they have no conflicts of interest to reveal.

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References

1. Learmonth ID, Young C, Rorabeck C. 2007 The operation of the century: total hip replacement. Lancet. 370(9597):1508-1519.
2. Buckwalter JA, Martin JA. Osteoarthritis. Adv Drug Deliv Rev. 2006;58(2):150–67.
3. Filardo G, 2021 et al. Regenerative orthopedics: current concepts and future perspectives. Knee Surg Sports Traumatol Arthrosc.;29:367–375.
4. Barry F, Murphy M 2013. Mesenchymal stem cells in joint disease and repair. Nat Rev Rheumatol.;9(10):584-594.
5. Kon E, 2019 et al. Stem cell therapies for cartilage regeneration: a systematic review. Br Med Bull; 132:61-79.
6. Hunziker EB 2002; Articular cartilage repair: basic science and clinical progress. Osteoarthritis Cartilage. 10(6):432–463.

7. Pittenger MF, 1999 et al. Multilineage potential of adult human mesenchymal stem cells. Science.;284(5411):143–147.
8. Andia I, Maffulli N. 2013 Platelet-rich plasma for managing pain and inflammation in osteoarthritis. Nat Rev Rheumatol.;9(12):721–730.
9. Kim YS, 2020 et al. Clinical outcome of MSCs with HA scaffold in knee cartilage defects. Am J Sports Med.;48(3):716–727.
10. Ragni E, 2022 et al. Extracellular vesicles and exosomes in joint disease. Front Cell Dev Biol.; 10:856547.
11. Singh A, 2021 et al. Nanotechnology in cartilage repair. ACS Nano.;15(2):2293–2314.
12. Bennell KL 2021, et al. Effect of PRP vs placebo for knee osteoarthritis: RCT. JAMA.;326(20):2021–2030.
13. Lamo-Espinosa JM, 2018 et al. Intra-articular MSCs for knee OA: long-term results. Transl Res. 200:1–9.
14. Bastos R, 2018; et al. Long-term effectiveness of PRP in knee OA. J Orthop Surg Res. 13:20.
15. Freitag J, 2019 et al. Combined PRP and MSC therapy for cartilage regeneration. Stem Cells Transl Med.;8(5):485–493.
16. Gobbi A, 2020 et al. Safety of MSCs in orthopedic applications. Int Orthop.;44(2):307–315.
17. Lee WY, Wang B. 2017 Stem cells: safety and tumorigenicity. J Orthop Transl.; 9:60–68.
18. Rittberg M. Regenerative strategies for cartilage repair. Clin Orthro Relate Res. 2015;473(6):1663–72.
19. Caplan AI. MSCs 2017 as trophic mediators. J Cell Biochem.;118(9):2404–9.
20. Anz AW, 2020 et al. Current concepts in biologic joint preservation. Clin Sports Med.;39(1):63–83.
21. Iijima H, 2021 et al. Regulatory perspectives on cell-based therapies. Regen Ther.;18:120–128.
22. Sakata R, 2020 et al. Ethical issues in regenerative orthopedics. BMC Med Ethics. 21:78.