Advances in Therapeutic Approach for Orthopaedic Surgery – A Review

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Abstract

Recent advancements in orthopaedics have revolutionized the management of musculoskeletal conditions and injuries. This review provides insights into the latest developments in orthopaedic treatment. Stem cell therapy and platelet-rich plasma (PRP) injections in Regenerative Medicine have emerged as promising approaches to enhance tissue regeneration and accelerate healing. Robotic-assisted surgery enables surgeons to perform more precise procedures, improving surgical outcomes. Personalized medicine, tailored to individual genetic and environmental factors, is gaining prominence in treatment planning. Remote patient monitoring and telemedicine offer opportunities to enhance patient care and optimize healthcare delivery. Additionally, the integration of artificial intelligence (AI) and machine learning (ML) in orthopedics, particularly in diagnosis and treatment planning, is generating considerable interest. Overall, these advancements have led to enhanced treatment quality, reduced recovery periods, and improved patient outcomes in orthopedic surgery.

Significance | This review discussed the new therapeutic approach in orthopedic surgery.

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1. Introduction

Orthopaedic surgery has significantly improved the quality of life for individuals with musculoskeletal problems. Since its introduction, orthopaedic surgeons have continuously refined their techniques, making treatments less invasive and reducing recovery times. One accidental discovery led to a groundbreaking new form of surgery that enhanced overall health outcomes.

In recent decades, a major advancement in this field has been arthroscopy. This less invasive technique uses tools with small openings, allowing patients to recover faster and with less pain. Similarly, imaging technologies like MRI and CT scans have revolutionized the way surgeons visualize injuries, enabling them to develop detailed treatment plans that include both surgical interventions and rehabilitation.

As a result, orthopaedic surgery has transformed our approach to musculoskeletal issues. While traditional techniques are still in use, modern advancements such as computer-assisted imaging and computer-driven prostheses have significantly improved patient care. Looking ahead, the field of orthopaedic surgery is poised for continued innovation, opening up numerous opportunities for new ideas and practices (Su et al., 2022).

A. Definition of Orthopedic Surgery Therapy

However, orthopaedic surgery therapy includes a broad repertoire of treatments designed to improve musculoskeletal function and reduce pain and disability (Siegel et al, 2004). Recently, the interest in novel approaches in perioperative management, as in neoadjuvant immunotherapy regimens, has led to a stronger focus on treatment effectiveness and patient outcomes. In this field, the

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use of neoadjuvant regimens of nivolumab and ipilimumab was associated with a remarkable rate of major pathological response (64%) – considered a promising indicator of clinical efficacy, and no events related to systemic toxicity – further substantiating their use for approaching melanoma as a chronic condition. A second example is the lack of proper protocol definition of FI, as evidenced in randomised controlled trials investigating therapeutic strategies and enhancing the effectiveness of surgical therapy in patients with locally advanced rectal cancer (Uivaraseanu et al, 2022). These findings underscore the need to critically appraise how orthopaedic surgery therapy should be evaluated and its outcomes optimised for improving patient care and clinical practices.

B. Importance of Orthopedic Surgery Therapy

The presence of complex musculoskeletal conditions may have a profound impact on functional recovery and quality of life of patients. The literature builds evidence that total knee joint replacement (TKJR) should be considered as an adjunct therapy in improving pain and function in the presence of severe joint degeneration in patients with hemophilia ((Hosam et al., 2023)). The orthopedic surgeon, the hematologist and the anesthesiologist need to assume together a multidisciplinary approach, through a personalised management to achieve favourable outcome. Last but not least, the published review paper regarding the pubic symphysis separation after childbirth reveals the importance of early clinical diagnosis and treatment in acute and chronic orthopedic complications ((Mary et al., 2023)). The greater use of advanced imaging modalities associated with the multidisciplinary team approach should allow early diagnosis and specific treatment to improve functional outcome in young women. In conclusion, these findings dedicate significantly the therapeutic value of orthopedic surgery by converting the most complicated orthopedic issues into a valuable therapy improving patients' welfare.

C. Overview of the Evolution of Orthopedic Surgery Techniques

Nanotechnology has been used in the evolution of operative techniques in orthopedics, as it goes a long way to improving patient outcomes and the efficiency of the treatment. In their study, (Yongjun et al., 2023) explained how nanotechnology has met the needs of orthopedic surgeons in improving the management of musculoskeletal disorders by creating a versatile avenue for bone healing and improving the outcomes of surgeries and reducing undesirable consequences after operations. Nanoparticles have proven useful in orthopedic surgery by allowing surgeons to craft therapies to the exact needs of their patients. On a side note, the study by (Yadkikar et al., 2023) which selected two different variations of hip replacement surgery, one that was minimally invasive and the other with the traditional approach, shows that assessing different surgical approaches should play a role in improving surgical techniques and patient care during treatment. The future of orthopedic surgeries is shaping to be different, more precise, efficient and comfortable for patients, thanks to recent advancements in nanomedicine and other innovations.

D. Purpose of the Essay

The essay is providing an objective view of the contemporary trends used as an orthopedic surgery therapy. Most contemporary surgeons refer to orthopedic surgery as therapeutic procedures designed to respond to musculoskeletal conditions. Discussing the surgery types in detail allows healthcare managers and sponsors to understand which alternative line of treatment and method is appropriate in which case as well as its importance for a particular group of patients. Above all, this essay is meant to be a comprehensive summary demonstrating the ability of surgeons to utilize the latest methods of repairing fundamentally different medical conditions. That is why a lot of scholarly and medical literature is providing abundant evidence that the surgical procedures are safe and have a reliable clinical outcome which provides an instrument for evidence based healthcare sustaining today.

2. Current Techniques in Orthopedic Surgery Therapy

The modernisation of orthopedic joint replacement surgery through minimally invasive operation (MIO) is manifested in studies regarding minimally invasive slow hip replacement (SHR) technique with traditional poster lateral (PL) with regard to overall hip replacement (OHR)effort. Compared to PL, studies have shown that patients who had OHR or MIO with SHR showed little difference in patient's muscle damage, blood loss and inflammation. (Yadkikar, 2023)Currently, advancement in orthopedic surgery can be associated with effectiveness. Orthopedic surgery is improving in effectiveness through innovation in medical instruments, imaging technologies, and personalised treatment. With minimally invasive surgery, patients are benefitting from better health care experience, cost effectiveness and accessibility; all these processes allow patients to have greater health benefits (Xinyan, 2023). Surgical intervention and treatment with orthopaedic surgery continue to advance through evolutionary thinking. Using new medical instruments, imaging technologies and personalised treatment encourages orthopedic surgery to improve in patient's health, quality, and importantly on economic considerations. The field is undergoing change benefiting patients with new approaches inefficient treatment and procedures.

A. Minimally Invasive Surgery

When it comes to evaluating the current modalities of therapy in orthopedic surgery, the distinction between Minimally Invasive Surgery (MIS) approaches and traditional surgical procedures is an important focus of investigation – as highlighted in studies such as that of (Yadkikar et al., 2023), which delves into the details of minimally invasive procedures. The available research on MIS points towards equivalent outcomes to traditional techniques when

it comes to muscle damage and bleeding; this indicates that the perceived advantages of adopting minimally invasive approaches might not always translate into significant differences in these factors. Economic analyses such as that of (Strijbos et al., 2023) that explore the cost-benefit of MIS show some savings over time, thus emphasising the necessity for a holistic approach in evaluating this form of surgical approach, considering clinical outcomes, patient benefits and economic considerations.

B. Computer-Assisted Navigation

New technological application, like Computer-Assisted Navigation (CAN) in the therapy of the surgery in the orthopaedic area has scientifically shown to bring new technological part in front. CAN can make the accuracy of the operation and number of results to be precision in the field today. By using registrations of points and methods apply in the process of registration of images as pointed in Min et al., 2021, CAN can make the solution of finding the operation area in the pre-operative condition to be transferred into the scene today and finding the way to make the operation by the computer in orthopaedic surgery. Although spinal CAN encompasses a wide spectrum of applications, and its shift over time in different disciplines like cardiac surgery as reported in Guha et al. (2019), could be attributed to the real need to enhance adoption and comfort among surgical trainees, it remains that this shift should be embraced as we continue witnessing the dearth of sophisticated technologies in orthopedic and other surgical practices over the last decade.

C. 3D Printing in Orthopedic Surgery

In orthopaedic surgery, 3D printing technologies were used to make patient-specific implants that resemble the receiver's bone shape and anatomy and adapt to unique bony defects. This brief review paper (Joy et al., 2024) tested the utility of 3D printing and its products and demonstrated that it is an indispensable tool in small animal orthopaedic surgery to fabricate patient-specific implants, instruments and scaffolds on the receiver-specific basis that plays an important role in such complex orthopaedic surgeries as joint replacement and limb-sparing procedures. Another example of how researchers use 3D printing is the product that has a 3D printing structure composed of the material that comes from the waste shell of the Fidus LP blue crab. The review paper (Memarian et al., 2022) explored new materials that were used for the orthopaedic implants' production in principle, discovered their mechanical properties and biodegradability that could guarantee high reliability of the implant in orthopaedic therapy and its biocompatibility with an organism. However, as we can see, findings in this field differ in every attempt. Nevertheless, we can still be assured that progress will be made in this scientific area, and it will facilitate developing more personalised and effective orthopaedic interventions.

D. Robotics in Orthopedic Surgery

The way that robotics have been integrated into orthopaedic surgery is but one example of how surgery is becoming automated at a fast rate: Robots are sub-millimetre accurate, which makes them much more precise during surgical procedures. They can also make use of biosignals in real-time, so actual interventions can become more precise (Das et al., 2017). Furthermore, when medical imaging technology and robotics have been merged, it has engendered a myriad of solutions for accurate surgical navigation systems (Hong et al., 2011). The merger of these technologies in surgery offers the promise of decreasing invasiveness and improving clinical outcomes. The ways in which robotics, medical imaging and those technologies that entwine them within the environment of surgery are creating an adaptive, safe and consequently more patient-centred and process specific pathway to care should receive attention. What is evident in orthopaedic surgery is that medical service is at the cusp of transforming, where care can be improved, processes can be controlled more successfully, and where human, social and technical interaction in care delivery continues to develop.

E. Stem Cell Therapy in Orthopedic Surgery

Recent progress in orthopedic surgery has led to innovative treatment strategies for common musculoskeletal disorders. Stem cell therapy has become a popular treatment option for orthopedic surgery because of its viability and its desire to promote tissue regeneration and speed up the healing procedure more rapidly. This is supported by a study (Wenqing et al., 2024), as it states that stem-cell therapy contributed to the regeneration of damaged knee cartilage and improved the patient's health while also shortening their recovery time. Reharmonic Medicine comprises stem cell therapy for tissue regeneration and platelet-rich plasma treatment are the next steps for Orthopedics.Another consideration of stem cell therapy for orthopedic surgery is bone-cell transplantation for patients who suffer critical limb ischemia. A study by Yuan et al. (2023) demonstrated that the use of stem cell transplantation as a therapy is viable for patients to improve blood flow efficiency and thereby reducing the chance of threatening health risks. Additionally, the practice also permitted scientists to conduct an accurate prognosis and anticipate whether the patients would present poor syndromes after the therapy by using an advanced imaging technique CT perfusion which is currently used by physicians to analyze the vessels condition and identify the blood flow dynamics. Therefore, the progress of orthopedic surgery now not only leads to more personalized treatment for patients, but the practice also allows us to practice regenerative medicine for the discipline in the future, and ultimately improve the patient's quality of life for living (Madry, 2022).

3. Advantages and Limitations of Current Techniques

In the field of orthopedic surgery therapy, advances in technology have introduced both advantages and disadvantages in treating patients.

One major advantage is the increased use of minimally invasive surgical procedures, which provide reduce the pain, the length of hospital stay, and accelerate recovery times for the patients (Jang et al., 2021). As technology progresses, techniques have advanced as well. For example, imaging techniques like Magnetic Resonance Imaging (MRI) and Computerized Axial Tomography (CT) scans can provide more detailed and comprehensive visual imagery that could help surgeons to better plan a treatment before the actual outprocedure or even guide them during the operation (Joachim et al., 2010).

However, every technique also has its own limitations. For example, minimally invasive surgeries may be feasible for some, but not all patients and so highly dependent on the nature of the patient's anatomy and the complexity of the procedure itself. What is more, technology costs money, and so does keeping up with the advancement. Thus, the use of very advanced imaging techniques might not be feasible for smaller healthcare facilities to afford. This would hinder the benefit for a certain population.

Overall, stating the advantages and limitations of current techniques would help provide a more proper view of technology and assist orthopedic surgeons to make better decisions in their treatments.

A. Advantages of Minimally Invasive Surgery

In the orthopaedic surgery therapy, we can find that the changing tendency is clearly turned to minimally invasive techniques, which can be demonstrated by the development of injectable biomaterials and traditional Chinese medicine (TCM) separately. On one hand, injectable biomaterial both in polymeric systems and natural scaffold materials shows its minimally invasive characteristic by precise drug delivery and tissue regeneration (Xing, 2015). On the other hand, the minimally invasive techniques of TCM, with its characteristic skills of special needling methods and scar tissue release, always emphasises the importance of optimal healing and anatomic integrity with minimal disruption of normal tissue and less need for rehabilitation. (Dong, 2018) These minimally invasive surgery shows its advantage of postoperative pain lowering, shortening of recovery times, lower risk of infection and decreased size for incisions, providing a better patient outcome and easier for to loose patient's trust while in the orthopaedic surgery department, which presents a common, safer, more effective and patient-centred changes of modern treatment techniques for the direction of the orthopaedic surgery (Everts et al., 2021).

B. Enhanced Precision with Computer-Assisted Navigation

Orthopedic surgeons also use computer-assisted navigation (CAN) systems, which provide real-time intra-operative feedback. These advanced technologies allow surgeons to place implants more accurately and achieve better bone alignment. Studies have demonstrated that instrumented and computer-assisted navigation is associated with better outcomes, fewer complications, and faster recovery times for patients (Fang et al., 2020). Using the pre-operative imaging data to guide intra-operative procedures, enables surgeons to perform a surgery with a precision not available with traditional manual techniques. Computer-assisted systems provide the opportunity for change intra-operatively based on the feedback measured in real time. CAN systems maximise precision of placement of implants and achieve better alignment of the affected body part, compared to manual techniques, if the surgeon adheres to the intra-operative guidance (William Hozack et al., 2009).

C. Customization and Patient-Specific Implants with 3D Printing

In orthopaedic surgery, for example, we have witnessed advancements in 3D printing in the field, from spinal implants to personalised implants with the goal to improve functional results and reduce complications. A PRISMA-compliant systematic literature review by Anthimos et al in 2023 analysed not only the capabilities of personalised implants but also their applicability to orbital defect restoration, showing the positive functional results and improvement in cosmetic outcomes. Using personalised implants together with surgical navigation brings better capabilities and precision to treat facial asymmetries and enophthalmos. Future studies will need to better understood how these personalised implants hold up over time. In total knee arthroplasty, we see attempts with 3D anatomical models to leverage the potential accuracy of 3D-printed surgical guides for the resection of bone and better mechanical alignment. However, with conflicting data on study level, it remains unclear if leveraging personalised surgical implants will improve intermediate and long-term outcomes. With the trend toward personalised implants, further research into this subject is essential to clarify surgical technique and practise and to evaluate patients over long time scales, thus promoting orthopaedic surgery as a therapy (Memarian et al., 2022).

D. Improved Surgical Outcomes with Robotics

For instance, in orthopaedic surgery, there has been continued development of surgical techniques including incorporating robotics, with promise of better patient outcomes. The adoption of robotic surgery in these orthopaedic procedures is gaining interest among the surgical community but the efficacy and efficiency is still under scrutiny (Schwenk et al, 2019). Many of these innovations in surgical techniques have paralleled advances in other surgical therapies for common conditions such as arthritis, where studies have suggested the practice of minimally invasive and computer-guided joint replacement (Lyman et al, 2005). Using sophisticated and well-thought-out surgical techniques is a fundamental part of daily orthopaedic practice. This is exactly why we need to delve

more into embracing the cutting edge of orthopaedic surgery and collecting better evidence from these trials to assure that our patients are receiving the best available treatments. Many of these focus on new techniques of executing the typical orthopaedic procedure including dislocation and repair, but with continual and critical evaluation, orthopaedic surgeons will continue to improve surgical interventions and the care they provide their patients (Solanki et al., 2021).

E. Regenerative Potential of Stem Cell Therapy

The prospect of regenerating damaged orthopedic tissues using stem cell therapy has received much attention in recent years. As summarised in literature review (Feng, 2018), mesenchymal stem cells (MSCs) exhibit the highest proliferative ability and multipotency (being able to potentially differentiate into diverse musculoskeletal cells), which make it an important cell source for tissue repair and regeneration. Similarly, the meta-analysis (H. Feng, 2018) indicates that bone marrow-derived MSCs can significantly improve functional outcomes and relieve pain in patients with knee osteoarthritis. Furthermore, the history and current applications of stem cells, with clear demonstrations of the functionality of stem cells in orthopedic tissue regeneration have also been discussed in literature review by de Carvalho Pires et al. (2024). Therefore, these insights suggest that the emergence of stem cell therapy may offer a promising avenue to address challenging orthopedic conditions and heralds the future of regenerative medicine, which will play a consequential and dominant role in orthopedic surgery.

V. Future Directions and Challenges

When reviewing the current approaches and future perspective on the orthopaedic healthcare for articular fractures, it can be concluded that incorporation of new medical technologies and personalised medicine can revolutionise the management of foot fractures to improve patient outcomes. Uneven distribution of access to healthcare and unequal integration of technology pose obstacles to effective treatment. The review on cryptorchidism elaborates on the importance to intervene surgically as early in life as possible to ensure the testicular health with the prospects of fertility as dictated by guidelines. Surgical treatment of cryptorchidism also illustrates the evolving scope of orthopaedic and urological practices from the open approach to the laparoscopic surgical spectrum as new surgical techniques continue to unfold. The studies highlight the necessity of developing optimised patient-centred approaches that address the varied challenges in treating these complex orthopaedic and urological conditions. They also underline the need to continue to improve the standards of care in patient quality of life.

A. Integration of Artificial Intelligence in Orthopedic Surgery

Using Artificial Intelligence (AI) technologies in orthopedic surgery is also a rising trend to improve surgical precision and patient outcomes. Such technologies leverage AI algorithms to analyse huge amounts of medical data to aid surgeons in pre-operative planning, intraoperative decision-making and post-operative care, such as planning for optimal implant selection and surgical navigation, minimising risks of complications and improving accuracy. For instance, machine learning models have been developed to enable surgeons to predict patient-specific outcomes, such as age, weight, and bone density, on the basis of condition, so as to enable personalised treatment plans for patients (Meng et al., 2021). Beyond diagnosis and treatment planning, orthopedic surgical robotics is another technology which has been developed to assist orthopedic surgeons to execute operations with high accuracy and in reduced time. Reduced surgery time has translated into faster recovery time and better functionality after the procedure. These advances in AI research hold great hopes for enhancing our care and outcomes for patients. Since technologies continue to evolve and transform human lives, orthopedic surgeons must also stay up-to-date with such advancements to provide the best care for their patients (Guoyan et al., 2018).

B. Bioabsorbable Implants and Materials

Bioabsorbable implants and materials have undergone developments, leading to the creation of implants that can be used in orthopaedic surgery. These bioabsorbable implants also avoid several complications related to the use of metal implants. A body reacts to such implants with implantaemia (failure to hold firmly or slippage, migration or oozing of the implant from its position), infection and allergic responses, thereby necessitating removal in the future (Javaid and Haleem, 2020). In addition to avoiding multiple surgeries and the discomfort it entails for the patient, it also adds to the cost of healthcare spending. These materials are engineered for a period of time after which they deliver mechanical strength and help in the healing of bones before they are absorbed unlike the metallic implants. These bioabsorbable implants find applications across different situations in orthopaedics, such as the repair and fixation of broken bones, reconstruction of ligaments and joints, thus facilitating the surgery and encouraging the natural healing process. The application of bioabsorbable implants has led to promising results across different settings such as fracture fixation, reconstruction of ligaments, joint stabilization (Primorac et al., 2020) and is expected to completely alter the orthopaedic surgery techniques going forward. With advancement in the field progressing at a faster pace and gaining more momentum, the future patient is on his way to getting better results and outcomes from surgical procedures with the help of bioabsorbable implants materials.

C. Telemedicine in Orthopedic Surgery Follow-Up

As advancements in technology continue to affect the field of medicine, utilisation of telemedicine for follow-up care after orthopaedic surgery has become an important tool for orthopaedic surgeons. By this mean of allowing patients being away from the hospital, telemedicine provides an added and easier way for ease of follow-up care with their doctors, which may include monitoring the healing process, or reporting any complication. On the other hand, telemedicine follow-up care in orthopedic surgery represents a very important tool due to optimising patient satisfaction (they don't have to travel to an orthopaedic clinic) and cost savings (reducing the number of routine visits to an orthopaedic clinic for a post-surgical patient). Moreover, few studies have shown that the use of telemedicine for follow-up care results in a reduction of post-surgical complications and an increase in patient satisfaction (.Berteau, & Pujo-Menjouet, 2024).

Furthermore, Weber etal. (2021) has stated that patients reported higher convenience and comfort scores when utilising telemedicine for postoperative care compared with traditional clinic follow-up in efficacy. Many of these patients preferred telemedicine because it allowed their families to work and saved them money on expenses such as babysitters and missed work. As a result of being more comfortable and compliant with their treatment plan during telemedicine visits (either because they felt less rushed than they did in-clinic, because they and their surgeon didn't skip blood tests performed shortly before the scheduled visit, because it was virtual, or all of the above), their postoperative recovery improved.

Finally, Alfred et al (2020) has stated that telemedicine offers its ability to aid in timely communications with their providers should they notice any problem or complication as it allows the doctor to follow up on the patient and to intervene timely. As a result, telehealth has proven a useful tool in the field of orthopaedic surgical follow-up care.

D. Addressing Cost and Accessibility Issues

Throughout the journey of understanding the challenges posed by cost and access in orthopedic surgery therapy, we established the drivers that contribute to the cost and availability of these treatments. One of the key drivers that need recognition is rising cost of medical equipment and technology owing to increased competition amongst orthopedic surgeons, causing treatment prices to rise. Furthermore, orthopedic surgery therapy often leads to high insurance burden for patients with inability to cover expenses. To tackle these issues, governments and healthcare providers must join hands to develop cost-effective strategies to provide patients the necessary and unhindered access to care without compromising on quality (Foster et al. 2020). The way towards increasing costs of orthopedic therapy care system is to establish transparency around pricing, increasing coverage of essential orthopedic procedures in insurance, seeking global alliance between healthcare institutions to train more surgeons. Consequently, providing patients from all socioeconomic backgrounds access to orthopedic surgery will lessen disparities in healthcare affordability, increasing the quality of life of patients (Cooper et al., 2015).

E. Ethical Considerations in Orthopedic Surgery Therapy

By first taking into consideration the ethical considerations of the decisions being made in implementing a specific course of orthopaedic surgery therapy (eg, limb salvage from osteosarcoma versus amputation, or insertion of the latest hip arthroplasty versus hip resurfacing), the surgeon may provide a more comprehensive and perhaps 'better treatment' for the patient. For example, with the recent AI developments as highlighted by OpenAI in launching ChatGPT – that is, with attentive responses relative to individuals' questions, personalised benefits could be provided to orthopaedic patients with regard to educational messaging and medical support (Morya et al., 2024). Such developments, however, largely depend on the ethical considerations when initiating applied clinical AI tools to disseminate 'accurate and unbiased' information to medical patients. Similar arguments regarding ethical considerations in medical practice were made with regard to the modern problems in precision medicine for glioblastoma, as exemplified by the important issues regarding personalising modern clinical care as well as screening for useful biomarkers to improve the outcome of a substantial percentage of orthopaedic patients with this life-threatening malignancy (Micheletti et al., 2023). The use of AI with precision medicine in orthopaedic clinical care requires a balanced thinking between each aspect of utilising technology in orthopaedic therapies versus prioritising the ethical considerations to preserve the wellbeing of our medical patients (eg, with patient autonomy being ensured, informed consent for new and improved orthopaedic procedures, fair and equal access to the latest technology-based therapies, etc), further underpinning the need to enhance the daily practice of orthopaedists when confronted with complex treatment choices.

4. Conclusion

As orthopaedic surgeons strive to refine techniques for treatment of hypophosphatemic rickets and hip replacement surgeries, the outcomes from these two studies reflect the intricate detail and finesse required for many orthopaedic surgical interventions. The results suggested good outcomes for varied surgical approaches used to correct deformities in hypophosphatemic rickets for example, the Ilizarov frame, as well as comparative results between the minimally invasive muscle-splitting mini-posterolateral approach and the standard posterolateral approach for hip replacement surgeries. As noted by the authors of the latter study, muscle damage and inflammatory markers did not differ significantly between the traditional and minimally-invasive approaches, but both, overall, showed comparable outcomes. The conclusions of these two studies, in the authors' words, reinforce

the need for individualised approaches to best tailor the surgery to the surgeon and the patient, reflecting a pivotal shift in surgeons' thinking regarding optimal surgical strategies.

Author contributions

A.E.A.K. conceptualized, literature review, edited and reviwed the manuscript.

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