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Magnetic Resonance Imaging Parameters in the Evaluation of Non-traumatic Painful Hip Joint

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ABSTRACT

Background: Non-traumatic hip pain encompasses a wide range of musculoskeletal pathologies, with MRI serving as a valuable diagnostic tool due to its detailed visualization of bone and soft tissue structures. This study aimed to evaluate the MRI findings in patients presenting with non-traumatic hip pain at a tertiary care center in Nepal.

Methods: A prospective observational study was conducted at NAMS, Bir Hospital from September 2024 to September 2025. One hundred patients with acute or chronic non-traumatic hip pain underwent MRI evaluation using a 1.5 Tesla scanner. Patients with traumatic hip pain or prior hip surgery were excluded. MRI parameters including joint space narrowing, subchondral edema, osteophytes, bone destruction, and soft tissue changes were analyzed.

Results: The study included 55 males and 45 females, with a mean age of 60 years (range 20–70). Osteoarthritis was the most common diagnosis (50%), characterized by marginal osteophytes, joint space narrowing, subchondral sclerosis, and labral tears. Avascular necrosis accounted for 10% of cases, showing femoral head destruction and flattening. Infectious pathologies including tubercular and septic arthritis were found in 8% of patients each, with distinct MRI features such as joint effusion, bony erosion, and soft tissue inflammation. Less common diagnoses included transient synovitis (8%), transient osteoporosis (5%), femoral osteomyelitis (5%), Perthes disease (2%), slipped capital femoral epiphysis (2%), and osteosarcoma (2%).

Conclusion: MRI is an essential imaging modality for diagnosing diverse causes of non-traumatic hip pain, facilitating early detection and management. Osteoarthritis remains the predominant pathology, but MRI also effectively identifies infective, inflammatory, and rare malignant conditions, underscoring its critical role in patient care.

Keywords: Non-Traumatic; Painful Hip Joint; Osteoarthritis; Avascular Necrosis; MRI Findings; Soft Tissue Changes; Bone Marrow Edema; Joint Space Reduction; Femoro-Acetabular Impingement; Infective Arthritis; Perthes' Disease; Nepal.

1. Introduction

The hip joint is a major weight-bearing joint with significant mobility, and non-traumatic hip pain is a common yet non-specific symptom, affecting approximately 14% of individuals [1]. The etiology of hip pain can be articular or extra-articular, making accurate diagnosis challenging, especially when radiographic findings are nonspecific or normal [2]. Intra-articular causes include labral tears, loose bodies, and femoro-acetabular impingement, while extra-articular sources encompass iliopsoas tendonitis, snapping hip, and bursitis [2]. Hip pain may also originate from surrounding structures such as the pelvis, sacroiliac joint, or lumbar spine [3].

Magnetic Resonance Imaging (MRI) has emerged as a critical diagnostic tool for evaluating non-traumatic hip pain due to its superior soft tissue contrast and ability to detect subtle abnormalities in bones, cartilage, and soft tissues that are often missed on X-rays [4]. MRI provides detailed, multiplanar images that enable accurate diagnosis of various conditions, including avascular necrosis (AVN), osteoarthritis, tendinopathies and infections like tuberculosis [5]. The technique is particularly valuable for early detection of AVN, outperforming plain radiography in sensitivity and accuracy [6]. It is particularly effective in identifying early-stage pathologies, including bone marrow edema, joint effusion, subchondral cysts, and cartilage thinning, which are critical for timely intervention and preventing joint collapse. Non- traumatic painful hip conditions are prevalent across all ages in Nepal, often leading to significant disability if untreated. Early diagnosis and intervention can halt disease

progression, preventing chronic pain and improving quality of life. Without timely management, these conditions impact economic productivity, social well-being, and national growth. Identifying varied MRI imaging appearances can support early detection and address health issues at an early stage. This study aims to assess the role of MRI in the early evaluation of non-traumatic painful hip conditions.

1.1. Objectives of this Study

1.1.1. General objective

This study aims to find the key MRI parameters used in the assessment of non-traumatic painful hip joint conditions in order to improve diagnostic accuracy.

1.1.2. Specific Objectives

a. To identify the imaging findings like joint space narrowing, subchondral edema, marginal osteophytes, acetabular involvement, joint effusion, adjacent soft tissue inflammatory changes, and bone destruction.

b. To describe the imaging findings in diagnosing specific hip disorders like avascular necrosis, osteoarthritis, labral tears, inflammatory or infectious pathologies.

2. Research Methods

This prospective observational study was conducted at the Radiology Department of NAMS, Bir Hospital—Nepal's largest and oldest tertiary care center—from September 1st, 2024, to September 1st, 2025. A total of 100 patients presenting with acute or chronic non-traumatic hip pain were included for MRI evaluation using a 1.5 Tesla MRI scanner. The hospital performs approximately 10 to 12 musculoskeletal MRIs daily, of which 1 to 2 are related to the hip. Patients were selected through random sampling based on the inclusion criteria of undergoing MRI for non-traumatic hip pain; those with a history of traumatic hip injury or prior hip surgery were excluded. MRI scans were interpreted using standard musculoskeletal protocols, and relevant clinical and demographic data were collected. The data were analyzed using descriptive statistical methods, and ethical approval was obtained from the Institutional Review Board of NAMS, with informed consent secured from all participants.

3. Result

A total of 100 patients with non-traumatic hip pain underwent MRI evaluation during the study period. The study population included 55 males and 45 females, with a mean age of 60 years (range: 20 to 70 years). MRI findings revealed that the most common diagnosis was osteoarthritis, observed in 50% of cases. Other notable findings included avascular necrosis (10%), tubercular arthritis (8%), septic arthritis (8%), and transient synovitis (8%). Less frequent diagnoses included transient osteoporosis (5%), femoral osteomyelitis (5%), tumors (2%), Perthes disease (2%), and slipped capital femoral epiphysis (SCFE) (2%). These results demonstrate that osteoarthritis remains the predominant cause of non-traumatic hip pain in this setting, with MRI also playing a critical role in identifying a diverse range of less common but clinically significant pathologies.

In this study, various MRI parameters were evaluated to characterize the manifestations of non-traumatic hip pain. These included joint space narrowing, subchondral edema, marginal osteophytes, subchondral sclerosis, subchondral cysts, acetabular involvement, joint effusion, soft tissue changes, bone destruction, synovial involvement, labral tears, femoral head development, and femoral head position.

Among the 100 patients evaluated, the most common diagnosis was osteoarthritis, accounting for 50% of cases. The hallmark MRI features in osteoarthritis included marginal osteophytes, subchondral edema, joint space narrowing, subchondral sclerosis, and labral tears in a few cases. The second most frequent diagnosis was avascular necrosis (AVN) of the femoral head (10%), with MRI findings such as femoral head destruction, flattening, and in some cases, associated degenerative changes consistent with secondary osteoarthritis. Acetabular involvement in AVN was rare.

Infective pathologies were also prevalent, with tubercular arthritis (n=8) and septic arthritis (n=8) comprising a significant portion of cases. Both showed subchondral edema, joint space narrowing, bony erosion, soft tissue inflammatory changes, and joint effusion. Tubercular cases showed large, thin-walled collections (seen in 2 patients), while septic arthritis cases had smaller, thick-walled collections (4 patients). Bone destruction was generally more severe in bacterial infections than in tubercular cases. Transient synovitis was seen in 8 patients, with joint effusion as the predominant feature. No bony involvement was noted, though mild joint space widening was present in a few cases.

Femoral osteomyelitis was diagnosed in 5 patients, all of pyogenic origin. MRI findings included aggressive bone destruction, soft tissue inflammatory changes, and associated collections. Importantly, there was no obvious joint involvement in these cases. Transient osteoporosis was found in 5 cases and typically showed subchondral edema in the femoral head without joint effusion or soft tissue inflammation. Acetabular involvement was uncommon in these cases.

Rare pathologies included Perthes disease, slipped capital femoral epiphysis (SCFE), and tumor-like osteosarcoma, each seen in 2 patients. Perthes disease showed femoral head flattening, with associated degenerative changes in one case. In SCFE, there was medial displacement of the femoral head. MRI features of osteosarcoma included aggressive bone destruction, periosteal elevation of the Codman's triangle type, and a permeative or moth-eaten pattern of bone loss, most commonly in the proximal femur.

4. Discussion

This prospective study provides valuable insight into the spectrum of MRI findings in patients presenting with non-traumatic hip pain at a major tertiary care center in Nepal. The predominance of osteoarthritis (50%) among the study population aligns with global trends, where degenerative joint disease remains the leading cause of chronic hip pain, especially in older adults with a mean age of 60 years. The MRI features observed—marginal osteophytes, joint space narrowing, subchondral sclerosis, and labral tears—are consistent with the classic radiological presentation of osteoarthritis described in the literature.

Avascular necrosis (AVN), accounting for 10% of cases, also reflects a significant cause of non-traumatic hip pathology. The femoral head destruction and flattening noted on MRI support early diagnosis and potential

intervention before secondary osteoarthritis advances. Our finding of rare acetabular involvement in AVN matches previous studies that emphasize the localized nature of this disease in its initial stages.

The identification of infective arthritides—both tubercular and septic arthritis—in 16% of patients highlights the ongoing burden of infectious diseases in this population. The distinct MRI patterns, such as larger, thin-walled collections in tuberculosis compared to smaller, thick-walled abscesses in bacterial infections, provide important diagnostic clues. Moreover, the relatively greater bone destruction seen in bacterial infections underscores the aggressive nature of septic arthritis, reinforcing the need for prompt diagnosis and management.

Transient synovitis and transient osteoporosis represent reversible causes of hip pain predominantly affecting younger individuals and middle-aged adults, respectively. Their MRI features, primarily joint effusion and subchondral edema without destructive changes, facilitate differentiation from more severe pathologies, thus guiding conservative management.

Rare conditions such as Perthes disease, slipped capital femoral epiphysis (SCFE), and tumor like osteosarcoma were also identified, emphasizing the importance of MRI in diagnosing diverse pathologies with overlapping clinical presentations. Notably, the aggressive bone destruction and periosteal reactions observed in osteosarcoma highlight the role of imaging in early detection of malignancy.

Overall, this study underscores the utility of MRI as a comprehensive imaging modality that not only identifies common degenerative and infective causes of hip pain but also detects rare and potentially serious conditions. Early and accurate diagnosis through MRI can significantly impact patient management, prognosis, and quality of life.

Limitations of this study include its single-center design and the lack of longitudinal follow-up data to assess outcomes post-diagnosis. Future multicenter studies with larger sample sizes and clinical correlation would strengthen the evidence base and further refine MRI diagnostic criteria for non-traumatic hip pain.

5. Conclusion

This study highlights that osteoarthritis is the most common cause of non-traumatic hip pain in the studied population, with MRI playing a critical role in its diagnosis and in identifying other diverse pathologies such as avascular necrosis, infectious arthritis, and rare conditions like Perthes disease and osteosarcoma. MRI provides detailed visualization of joint and soft tissue changes, enabling accurate differentiation of various hip disorders. Early and precise diagnosis through MRI can guide appropriate management strategies, ultimately improving patient outcomes. Further research with larger cohorts and long-term follow-up is recommended to validate these findings and enhance diagnostic protocols.

6. Future Suggestions

1) MRI is crucial for accurately diagnosing a wide range of non-traumatic hip pathologies, with osteoarthritis being the most common, followed by avascular necrosis and infectious arthritis.

2) Early detection through MRI enables timely management, preventing disease progression and improving patient outcomes.

3) Standardized MRI protocols and larger multicenter studies are needed to improve diagnostic consistency and tailor approaches to local populations.

4) Future research should focus on integrating AI, longitudinal outcome tracking, and comparative imaging studies to enhance diagnostic accuracy and cost-effectiveness.

5) Expanding MRI accessibility and clinician training in Nepal is essential for early detection of both common and rare hip conditions, ultimately improving healthcare delivery.

Declarations

Source of Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing Interests Statement

The authors declare that they have no competing interests related to this work.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

All the authors took part in literature review, analysis, and manuscript writing equally.

Availability of data and materials

The corresponding author is the custodian of the materials presented in this paper; the data are available upon reasonable request.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of NAMS.

Informed Consent

All participants in this study voluntarily gave their informed consent prior to their involvement in the research.

References

[1] Christmas, C., Crespo, C.J., Franckowiak, S.C., Bathon, J.M., Bartlett, S.J., & Andersen, R.E. (2002). How common is hip pain among older adults? Results from the Third National Health and Nutrition Examination Survey. Journal of Family Practice, 51(4): 345–348.

[2] Tibor, L.M., & Sekiya, J.K. (2008). Differential diagnosis of pain around the hip joint. Arthroscopy, 24(12): 1407–1421.

[3] Mengiardi, B., Pfirrmann, C.W.A., & Hodler, J. (2007). Hip pain in adults: MR imaging appearance of common causes. European Radiology, 17(7): 1746–1762.

[4] Omar, I.M., & Blount, K.J. (2015). Magnetic resonance imaging of the hip. Topics in Magnetic Resonance Imaging, 24(4): 165–181.

[5] Vaghamashi, A., Bhatt, J., Doshi, J., & Patel, V. (2017). MRI in evaluation of painful hip joint. IOSR Journal of Dental and Medical Sciences, 16(5): 85–96. https://www.iosrjournals.org/iosr-jdms/papers/vol16-issue5/version-7/t1605078596.pdf.

[6] Tushar, K., Kushal, B., & Purnachandra, L. (2024). The application of magnetic resonance imaging in the early and accurate diagnosis of hip joint avascular necrosis. PubMed. https://pubmed.ncbi.nlm.nih.gov/39376854/.

[7] Osman, N.M., Hemeda, T.W., & Thabit, M.T. (2019). Role of magnetic resonance imaging in the evaluation of adult non-traumatic painful hip. Sohag Medical Journal, 23(2): 150–157.

[8] Chhabra, S., Kaur, N., Bhatnagar, S., Chhabra, P., & Puri, S. (2020). MRI evaluation of painful hip joint. Asian Journal of Medical Radiological Research, 8(1): 122–127.

[9] Chougule, S.R. (2022). The role of magnetic resonance imaging in non-traumatic chronic hip joint pain in adult rural population. International Journal of Research in Medical Sciences, 10(12): 2821–2825.

[10] Nvp, D.V., Sudha, D.K.J., Vineela, D.M.L., & Chandra, D.T.J. (2020). A study to find the utility of MRI in the evaluation of painful hip joints. International Journal of Medical Research and Review, 8(4): 315–319.

[11] Ranabhat, N., Bhattarai, R., Basnet, P., Banjade, U.R., Pande, S., & Sapkota, S., et al. (2023). MRI evaluation of degenerative lumbar spine in population of Eastern Nepal. Nepalese Journal of Radiology, 13(1): 9–14.

[12] Sharma, B.R., Singh, S., & Timilsina, M.M. (2022). Evaluation of the diagnostic utility of spinal magnetic resonance imaging in low back pain patients. Nepalese Journal of Radiology, 12(1): 30–38.

[13] Macías-Hernández, S.I., Zepeda-Borbón, E.R., Lara-Vázquez, B.I., Cuevas-Quintero, N.M., Morones-Alba, J. D., Cruz-Medina, E., et al. (2020). Prevalence of clinical and radiological osteoarthritis in knee, hip, and hand in an urban adult population of Mexico City. Reumatología Clínica (English Edition), 16(2): 156–160.

[14] Xu, H., Xiao, W., Ding, C., Zou, J., Zhou, D., Wang, J., et al. (2025). Global burden of osteoarthritis among postmenopausal women in 204 countries and territories: A systematic analysis for the Global Burden of Disease Study 2021. BMJ Global Health, 10(3): e017198.

[15] Momodu, I.I., & Savaliya, V. (2025). Septic arthritis. In StatPearls, StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/nbk538176/.