

Diagnostic Performance of Oblique Coronal MRI Sequences Obtained for Anterior Cruciate Ligament Assessment in the Evaluation of Meniscal Pathology: A Retrospective Study

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Abstract: ***Background:** Magnetic resonance imaging (MRI) plays a pivotal role in the evaluation of anterior cruciate ligament (ACL) injuries and associated internal derangements of the knee. Oblique coronal MRI sequences, routinely acquired for ACL assessment, provide excellent visualization of the ligament and may simultaneously improve the detection of meniscal pathology. Early and accurate diagnosis of meniscal tears is essential for appropriate treatment planning and prevention of long-term joint dysfunction. This study aimed to evaluate the diagnostic performance of oblique coronal MRI sequences in identifying meniscal abnormalities compared with routine MRI sequences. **Aim:** To evaluate the effectiveness of oblique coronal MRI sequences obtained primarily for ACL assessment in detecting meniscal pathology and to determine their diagnostic accuracy in comparison with routine MRI sequences. **Conclusion:** Oblique coronal MRI sequences obtained primarily for ACL assessment demonstrated excellent diagnostic performance for the evaluation of meniscal pathology, with a sensitivity of 100%, specificity of 95%, positive predictive value of 95.2%, negative predictive value of 100%, and an overall diagnostic accuracy of 97.5%. These findings suggest that oblique coronal sequences can reliably identify clinically significant meniscal tears and serve as a valuable adjunct to routine MRI protocols. However, dedicated meniscal sequences remain important for the evaluation of subtle or complex tears.*

Keywords: Anterior cruciate ligament; Magnetic resonance imaging; Oblique coronal sequence; Meniscal tear; Knee MRI; Diagnostic accuracy

1. Introduction

Meniscal injuries are among the most common internal derangements of the knee and frequently coexist with anterior cruciate ligament (ACL) injuries, significantly affecting knee stability and long-term joint function. Accurate diagnosis is essential for appropriate treatment planning and prevention of progressive cartilage degeneration.¹ Magnetic resonance imaging (MRI) is the imaging modality of choice for evaluating meniscal and ligamentous injuries because of its excellent soft-tissue contrast and multiplanar capability.^{2,3}

Routine knee MRI includes sagittal, coronal, and axial sequences for comprehensive assessment of intra-articular structures. Oblique coronal MRI sequences, acquired primarily for ACL evaluation, are aligned parallel to the ligament fibres, providing superior visualization of the ACL. Recent studies have suggested that these sequences may also improve visualization of the meniscal body, posterior horn, and root attachments by reducing partial-volume artefacts, thereby enhancing the detection of associated meniscal pathology.⁴⁻⁶

Despite the established role of MRI in diagnosing meniscal tears, evidence regarding the diagnostic utility of oblique coronal sequences obtained primarily for ACL assessment remains limited.^{7,8} Therefore, the present retrospective study was undertaken to evaluate the diagnostic performance of oblique coronal MRI sequences in detecting meniscal

pathology and to compare their findings with routine MRI sequences.⁹

2. Aim and Objectives

To evaluate the effectiveness of oblique coronal MRI sequences obtained primarily for anterior cruciate ligament (ACL) assessment in detecting meniscal pathology and to determine their diagnostic accuracy in comparison with routine MRI sequences.

To assess the ability of oblique coronal MRI sequences to detect meniscal pathology and compare their diagnostic performance with routine MRI sequences using sensitivity, specificity, positive predictive value, negative predictive value, and overall diagnostic accuracy.

3. Research Methodology

This retrospective study was conducted over a period of one year at a tertiary care hospital. A total of 40 MRI examinations performed for clinically suspected anterior cruciate ligament (ACL) injury were retrospectively reviewed. MRI examinations were selected based on predefined inclusion and exclusion criteria.

MRI examinations of patients undergoing knee MRI for suspected ACL injury with a complete routine MRI protocol, including oblique coronal sequences, were included in the

study. MRI examinations with a history of previous knee surgery, incomplete MRI protocol, poor image quality, or significant motion artefacts precluding accurate assessment of the menisci were excluded from the study.

All MRI examinations were performed using a 1.5 Tesla MRI scanner. Standard imaging sequences were acquired in sagittal, coronal, axial, and oblique coronal planes using the routine knee MRI protocol. Meniscal findings on oblique coronal MRI sequences were independently evaluated and compared with routine MRI sequences for the detection of meniscal tears and degenerative changes. The diagnostic performance of oblique coronal MRI sequences was assessed by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy.

4. Result

A total of 40 MRI examinations were included in the study. Meniscal abnormalities were detected in 26 (65%) cases on oblique coronal MRI sequences. Of the 40 examinations, 21 demonstrated meniscal tears, while 19 had a normal meniscus on comparison with routine MRI sequences.

Oblique coronal MRI sequences demonstrated 20 true-

positive, 19 true-negative, 1 false-positive, and no false-negative cases (Table 1). The diagnostic performance of oblique coronal MRI sequences showed a sensitivity of 100%, specificity of 95%, positive predictive value (PPV) of 95.2%, negative predictive value (NPV) of 100%, and an overall diagnostic accuracy of 97.5% (Figure 2).

Representative MRI images comparing conventional sagittal and oblique coronal sequences are shown in Figure 1. While conventional sagittal images demonstrated limited visualization of the ACL fibres, oblique coronal images provided improved delineation of the ligament and facilitated better visualization of associated meniscal pathology (Figure 1). Overall, oblique coronal MRI sequences reliably identified clinically significant meniscal tears and may serve as a valuable adjunct to routine knee MRI sequences.

Table 1: Comparison of Oblique Coronal MRI Findings with Routine MRI Sequences

Oblique Coronal MRI	Meniscal Tear	Normal Meniscus	Total
Meniscal Tear	20	1	21
Normal Meniscus	0	19	19
Total	20	20	40

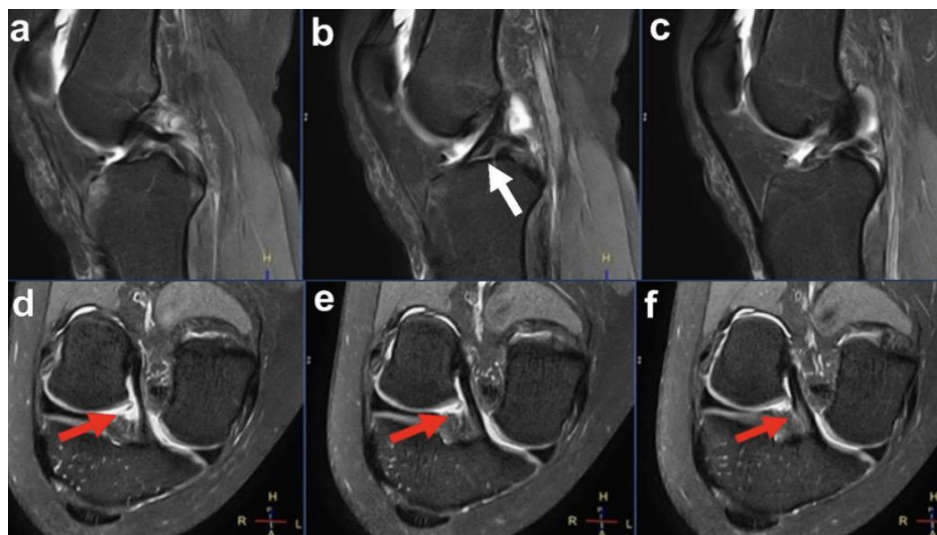


Figure Legend

Figure 1: Comparison of conventional sagittal MRI and oblique coronal MRI sequences in anterior cruciate ligament (ACL) assessment. (A–C) Consecutive sagittal MRI images demonstrate limited visualization of the ACL fibres, making it difficult to determine the integrity of the ligament. (D–F) Corresponding oblique coronal MRI images provide improved visualization of the ACL and clearly demonstrate a complete tear of the anteromedial bundle (arrows), while also allowing better assessment of the adjacent meniscal structures.

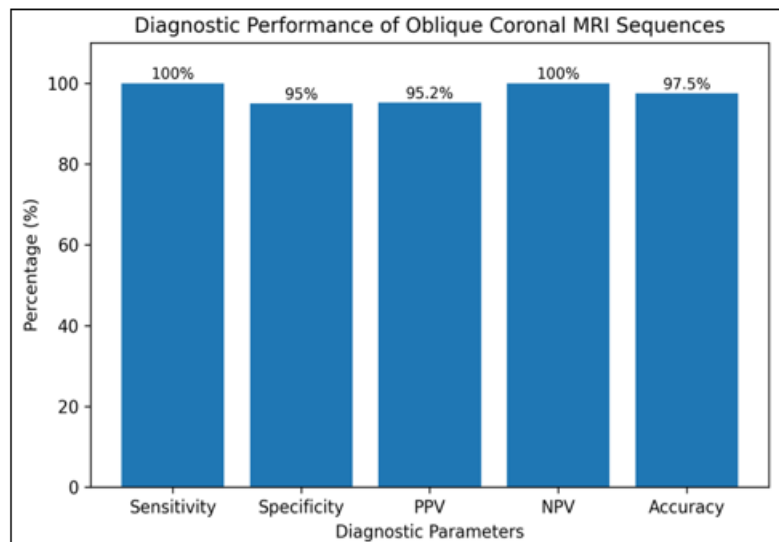


Figure 2: Graph depicting diagnostic Performance of Oblique Coronal MRI Sequences

5. Conclusion

Oblique coronal MRI sequences acquired primarily for anterior cruciate ligament (ACL) assessment provide reliable evaluation of associated meniscal pathology and complement routine knee MRI protocols. By improving visualization of the ACL and adjacent meniscal structures, these sequences enhance diagnostic confidence and facilitate comprehensive assessment of internal knee derangements.

The incorporation of oblique coronal imaging into routine knee MRI protocols may improve the detection of clinically significant meniscal injuries without increasing examination complexity. Further prospective studies with larger sample sizes are warranted to validate these findings and establish the role of oblique coronal MRI as a standard component of knee MRI protocols.

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