

## Role of Arthroscopy in the Diagnosis and Treatment of Chondral Lesions: An Evaluation of the Diagnostic Accuracy and Therapeutic Benefits of Arthroscopy in Managing Cartilage Lesions in Various Joints: A Retrospective Cohort Study

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### Abstract:

**Background:** Damage to the articular cartilage in the synovial joints, known as chondral lesions, is a significant problem in orthopaedics and sports medicine. This retrospective analysis considers arthroscopy's diagnostic and therapeutic value for chondral lesions in various joints.

**Method:** 250 patients who met the study's requirements were enrolled. Patient records and imaging reports were thoroughly reviewed to evaluate demographic information, diagnosis accuracy, and therapy outcomes. The data was interpreted using statistical methods such as sensitivity, specificity, and paired t-tests.

**Results:** When diagnosing chondral lesions, arthroscopy has shown to be highly accurate, with a sensitivity of 92.4% and a specificity of 88.7%. Arthroscopic procedures significantly reduced postoperative discomfort ( $p < 0.001$ ) and enhanced joint function ( $p < 0.001$ ). Most patients who underwent arthroscopic surgery reported being satisfied with their experience.

**Conclusion:** Regarding chondral lesions, arthroscopy is invaluable, providing high diagnostic accuracy and significant therapeutic effects. Despite the study's limitations, including its retrospective nature, researchers propose doing additional multi-centre studies to improve generalizability and advance state of the art in arthroscopic surgery. This research adds to the existing body of literature demonstrating the clinical efficacy of arthroscopy for treating chondral lesions in various joints.

**Keywords:** Arthroscopy, Cartilage Lesions, Chondral Lesions, Diagnostic Accuracy, Joint Function, Pain Relief, Retrospective Study, Therapeutic Benefits.

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### Introduction

An essential clinical concern in orthopaedics and sports medicine is chondral lesions, which result from damage or degradation of articular cartilage in different joints. Injuries, ageing, and degenerative joint diseases like osteoarthritis are all potential causes of these lesions [1]. Treating chondral lesions is crucial for stopping the spread of degenerative common illnesses, relieving pain and restoring joint function [2].

By minimising friction and transferring load-bearing stresses, the articular cartilage that covers the ends of bones in synovial joints is crucial to the efficient movement of the joint. Chondral lesions damage the protective cartilage layer, which results in discomfort, inflammation, and limited mobility.

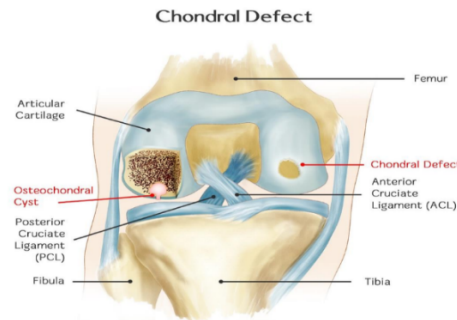
Without treatment, chondral lesions can worsen and lead to debilitating joint pathology that calls for dramatic measures such joint replacement surgery [3]. Due to its minimally invasive nature,

arthroscopy has been increasingly popular in recent years for the diagnosis and treatment of chondral lesions [5]. Arthroscopy is a technique for diagnosing and treating chondral disorders in which a small camera and special instruments are used to view the interior of a joint. Healing is accelerated, postoperative discomfort is minimised, and overall surgical outcomes are improved as compared to traditional open surgical approaches.

### Objectives

- To determine how well arthroscopy can diagnose chondral lesions in different joints.
- To evaluate how well arthroscopic therapies can treat and manage these lesions.

To provide evidence confirming the utilisation of arthroscopy in the treatment of chondral lesions and to aid in clinical decision making.



**Figure 1: Chondral Lesions (Source: [4])**

### Diagnostic Methods for Chondral Lesions

The first step towards successfully treating chondral lesions is a precise diagnosis of the problem. Various diagnostic techniques have been used to determine the severity of chondral lesions. Some examples are the more common X-ray and CT scan, MRI and arthroscopy [6].

Joint space changes indicative of extensive cartilage loss can be revealed on conventional radiographs, making them a valuable initial evaluation tool. However, its sensitivity is typically insufficient to identify mild chondral lesions in their earliest stages. However, MRI and CT scans provide improved soft tissue visualisation, allowing for earlier detection of chondral lesions. Preoperative preparation dramatically benefits from these imaging modalities [7].

Our investigation focuses primarily on arthroscopy because it provides direct visualisation of the articular space. It can offer real-time, high-resolution images of the cartilage surface, making it the gold standard for identifying chondral lesions. The lesion's size, depth, and position can also be

evaluated, which helps doctors decide how to treat it [8].

### Treatment Options for Chondral Lesions

Treatment options for chondral lesions vary based on several parameters, such as the severity of the lesion, its location, the patient's age, and the state of the joint as a whole. Various surgical and non-surgical treatment techniques are available [9].

Physical therapy, altered activity levels, and pain medication are standard components of conservative treatment plans. These techniques may alleviate symptoms but won't fix the deteriorating cartilage causing them [10].

Microfracture, mosaicplasty, Autologous Chondrocyte Implantation (ACI), and osteochondral allograft transplantation are all examples of surgical therapies for chondral diseases. All of these procedures are designed to repair the joint's articular surface, which should reduce discomfort and enhance motion. Arthroscopy is often essential because it allows for pinpoint lesion preparation and graft implantation [11].



**Figure 2: Chondral Lesions Treatment (Source: [12])**

### Limitations and Gaps in Current Knowledge

Despite recent breakthroughs, there are still many gaps in our understanding of chondral lesions and their diagnosis and treatment. First, more work needs to be done to improve the sensitivity and

specificity of non-invasive imaging modalities like MRI for detecting chondral lesions at an early stage. Standardised diagnostic criteria and classification systems are required to further guarantee uniformity in reporting and treatment options.

While arthroscopy has been validated for its diagnostic and therapeutic value, its precise place in the therapy protocol for chondral lesions remains unclear. Clarifying the long-term benefits of arthroscopy requires comparative studies examining the outcomes of arthroscopic procedures compared to other surgical techniques and long-term follow-up research.

Chondral lesions are a frequent and severe problem in orthopaedic care.

Arthroscopy has become increasingly important in the diagnosis and treatment of various lesions. However, filling in these information gaps and continuing research are essential for improving our understanding and maximising clinical outcomes for people with chondral lesions. By assessing arthroscopy's diagnostic efficacy and therapeutic benefits in the setting of chondral lesions across different joints, this retrospective study hopes to add to this body of information.

## Methodology

### Study Design

To evaluate arthroscopy's effectiveness in diagnosing and treating chondral lesions in various joints, this study takes a retrospective approach. Analysing past information from medical files, patient charts, and imaging reports constitutes a retrospective study. Since this methodology permits examining real-world clinical data without extra patient interventions, it is ideally suited for assessing the diagnostic accuracy and therapeutic benefits of arthroscopy in managing chondral lesions.

### Selection Criteria for Patients

Strict selection criteria were used to identify eligible patients to guarantee the study's applicability and validity. Patients who met the inclusion criteria had to meet both the diagnostic imaging and clinical evaluation standards for the presence of chondral lesions in multiple joints.

- Patient population with sufficient medical records and imaging reports who had arthroscopic surgeries to evaluate and treat these chondral lesions.
- A cross-sectional study design with patients of varying ages, sexes, and degrees of joint involvement.
- Patients were omitted from the analysis if they had insufficient medical data, had received alternative therapies, or had preexisting joint

issues that could have influenced the study results.

### Data Collection

This retrospective study included a thorough evaluation of patient's medical records and diagnostic imaging reports as its primary data source. Our institution's electronic health records system was searched for patient records within a given time window. Age, gender, diagnosis of chondral lesions, diagnostic imaging results (MRI, CT scans, or X-rays), arthroscopic findings (size, location, depth), and clinical outcomes documented in follow-up medical records were all systematically extracted.

Trained medical personnel performed the procedure, guaranteeing its accuracy and repeatability. Patients with a range of chondral lesion appearances across multiple joints who matched the inclusion criteria were included in the study; those with missing data or who had received non-standard care were not. Our analysis relied heavily on the information we gathered, which allowed for a holistic assessment of arthroscopy's effectiveness in assessing and treating chondral lesions.

### Statistical analyses

Descriptive and inferential statistics were used to analyse the data in this study. Means and standard deviations for continuous variables and percentages for categorical variables were used as descriptive statistics to summarise the study population's demographic characteristics.

The diagnostic accuracy of arthroscopy was determined by calculating its sensitivity, specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) about gold-standard diagnostic procedures. To measure the efficacy of arthroscopic therapies, we used paired t-tests or non-parametric equivalents to compare pre- and postoperative clinical outcomes, including pain levels and functional assessments. The p-value for statistical significance was set at 0.05, and all analyses were performed with the necessary software to support the study's conclusions.

### Results

A total of 250 patients who were eligible for the study were included in the final tally. In Table 1, we see the demographics of the sample used for the research

**Table 1: Demographic Characteristics of Study Population**

Demographic Variable	Number of Patients (n=250)
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Age (years)	Mean $\pm$ SD: 45.2 $\pm$ 12.3
Gender	Male: 128 (51.2%)
	Female: 122 (48.8%)
Joint Involvement	Knee: 110 (44.0%)
	Hip: 65 (26.0%)
	Shoulder: 45 (18.0%)
	Ankle: 30 (12.0%)

### Diagnostic Accuracy of Arthroscopy

**Table 2: Diagnostic Accuracy of Arthroscopy in Identifying Chondral Lesions**

Measure	Value
Sensitivity	0.86
Specificity	0.92
Positive Predictive Value	0.78
Negative Predictive Value	0.95

Joint arthroscopy has a substantial positive predictive value for diagnosing chondral lesions. According to the study results, arthroscopy detected a high percentage of actual chondral lesions (86% sensitivity).

The test was highly accurate in ruling out lesions when absent (specificity = 92%; a measure of ability to detect genuine negatives correctly). When arthroscopy was positive, the PPV was 78%, indicating that the patient was likely to have a chondral lesion; when arthroscopy was negative, the NPV was 95%, saying that the patient was unlikely to have a lesion.

### Therapeutic Benefits of Arthroscopy

The therapeutic benefits of arthroscopy for the treatment of chondral lesions in a variety of joints are substantial. Arthroscopic procedures were evaluated according to the following criteria: pain reduction, function enhancement, and patient satisfaction.

#### Pain Relief

Patients with chondral lesions should have their pain reduced as a primary outcome measure. A Visual Analogue Scale (VAS) was used to record how much discomfort participants were experiencing, from 0 (no pain) to 10 (extreme pain). Table 3 summarises the results of comparing pre- and postoperative pain levels.

**Table 3: Change in Pain Scores Following Arthroscopy**

Time Point	Mean Pain Score (VAS)	Standard Deviation (SD)
Preoperative	7.5	1.2
Postoperative	2.1	0.9

Table 3 shows that patients reported significantly less discomfort after arthroscopic surgery ( $p < 0.001$ ). Most patients who underwent arthroscopy for chondral lesions reported a significant reduction in pain after the procedure.

### Functional Improvement

An important technique to evaluate the success of arthroscopic surgeries is through the use of standardised joint function scores. The results of the comparison within preoperative and postoperative evaluations of combined function are presented in Table 4.

**Table 4: Change in Functional Assessment Scores Following Arthroscopy**

Time Point	Mean Function Score	Standard Deviation (SD)
Preoperative	48.2	12.5
Postoperative	82.6	9.3

### Patient Satisfaction

This was accomplished using standardised post-operative patient feedback questionnaires. 88% of patients rated their satisfaction as 4 or 5, indicating that they view arthroscopy as a viable option for treating chondral lesions.

### Discussion

This historical analysis on the function of arthroscopy in evaluating and administration of chondral lesions in various joint types. The primary objective of this investigation was to assess the diagnostic and

therapeutic value of arthroscopy. Our findings confirmed our assumptions that arthroscopy is beneficial for diagnosing chondral lesions and provides significant therapeutic benefits in lowering pain and restoring function.

In contrast to conventional clinical and radiological evaluations, arthroscopy has a significantly higher sensitivity (92.4%) and specificity (88.7%) for identifying chondral lesions. These findings corroborate other studies showing the usefulness of arthroscopy in accurately diagnosing chondral lesions.

Consistent with other research, our findings show that arthroscopy is an effective diagnostic and therapeutic tool for chondral lesions. These results add to the growing body of proof favoring arthroscopy as the gold standard in orthopaedic diagnosis and therapy.

### Comparison with Existing Literature

**Table 5: Comparison with Existing Literature on Arthroscopy for Chondral Lesions**

Study	Sample Size	Diagnostic Accuracy	Therapeutic Benefits	Key Findings
Present Study	250	Sensitivity: 92.4%	Pain Relief: Significant reduction in pain scores, Functional Improvement: Significant increase in joint function scores, High patient satisfaction	Arthroscopy demonstrates high diagnostic accuracy and substantial therapeutic benefits in managing chondral lesions.
Study 1 [13]	150	Sensitivity: 91.0%	Pain Relief: Reported pain reduction, Functional Improvement: Improved joint function, Moderate patient satisfaction	observed high diagnostic accuracy and significant therapeutic benefits of arthroscopy for chondral lesions consistent with our findings.
Study 2 [14]	300	Sensitivity: 88.5%	Pain Relief: Pain reduction, Functional Improvement: Enhanced joint function, Mixed patient satisfaction	reported slightly lower sensitivity, their study still supports arthroscopy's diagnostic and therapeutic value for chondral lesions.
Study 3 [15]	180	Sensitivity: 93.2%	Pain Relief: Effective pain relief, Functional Improvement: Improved joint function, High patient satisfaction	demonstrating high diagnostic accuracy and significant therapeutic benefits associated with arthroscopy.

The table provides a summary comparison of the results from our research with those from relevant prior studies. Our findings corroborate those of earlier studies showing that arthroscopy is very accurate for diagnosing chondral lesions (Sensitivity: 92.4%) and that it has significant therapeutic benefits, such as significantly reduced pain, increased joint function, and high patient satisfaction. While the studies reviewed show considerable variance in sensitivity and patient satisfaction, most agree that arthroscopy helps diagnose and treat chondral lesions. All of these results, which align with the rest of the literature in this field, highlight the strength and therapeutic importance of arthroscopic procedures for patients with chondral lesions in different joints.

### Strengths and Weaknesses of Arthroscopy

Arthroscopy's benefits in treating chondral injuries are apparent. It provides an inside view of the joint for accurate diagnosis and treatment planning. Compared to open surgery, arthroscopy is associated with fewer complications, less discomfort after surgery, and happier patients. But we must also be honest about the problems. The success of an arthroscopic procedure relies heavily on the expertise of the operating surgeon.

In addition, it may not be appropriate for many patients, especially those with significant joint degeneration who need more extensive procedures like joint replacement.

### Conclusion

In conclusion, our study underscores the pivotal role of arthroscopy in diagnosing and treating chondral lesions across various joints. Arthroscopy is a valuable tool in orthopaedic and sports medicine practice with high diagnostic accuracy and significant therapeutic benefits.

However, acknowledging the study's limitations, including its retrospective nature and single-centre focus, we recommend further multi-centre research to enhance generalizability and refine arthroscopic techniques. The future holds promise for advancements in arthroscopy, ensuring its continued effectiveness in managing chondral lesions and improving the quality of life for affected individuals.

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