Arthroscopic management of glenohumeral osteoarthritis: A systematic review of clinical outcomes and treatment durability

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Background: Glenohumeral osteoarthritis (GHOA) is a degenerative condition causing pain and functional impairment. While total shoulder arthroplasty (TSA) is the standard treatment for end-stage disease, younger and active patients often seek joint-preserving alternatives. Various arthroscopic techniques, including comprehensive arthroscopic management (CAM), debridement, and interposition arthroplasty, have been explored, but their efficacy and durability remain unclear.

Purpose: To systematically review the clinical outcomes, pain relief, functional improvement, and conversion rates to TSA following arthroscopic treatment for GHOA.

Methods: A systematic search in Medline® and Embase identified studies published in the last 20 years on arthroscopic treatment for GHOA. Data on demographics, surgical techniques, outcome measures (ASES scores, VAS pain scores), and conversion rates to TSA were extracted. Study quality was assessed using the Joanna Briggs Institute checklist, and heterogeneity was evaluated using the I^2 statistic.

Results: Seventeen studies (727 patients, aged 32–59) were included, covering debridement (7 studies), CAM (5), interposition arthroplasty (4), and capsulotomy (1). Pooling of the data revealed a postoperative ASES following CAM of 81.9, and debridement of 64.1, although the differences were not statistically significant. The postoperative pain on VAS ranged between 2 and 7.4 following debridement, 1.3 and 3.3 following CAM, and 2 following interposition arthroplasty. Conversion rates to TSA were lowest for CAM (22%) compared to debridement (25%) and interposition arthroplasty (34%), though statistical significance was not achieved due to study heterogeneity.

Conclusion: Arthroscopic management of glenohumeral osteoarthritis can provides meaningful pain relief and functional improvement and may delay TSA. However, durability remains uncertain. Standardized protocols and prospective studies are needed to optimize patient selection and treatment strategies.

What this study adds: This review identifies CAM as an effective arthroscopic approach for GHOA.

Potential impacts on research, practice, or policy: Findings support CAM as a viable joint-preserving option, emphasizing the need for standardized evaluation, longer follow-up, and improved patient selection criteria.

Study design: Systematic review

Level of Evidence: Level IV

Keywords: Glenohumeral osteoarthritis; Arthroscopy; Comprehensive arthroscopic management; Interposition arthroplasty; Debridement; Joint preservation.

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Introduction

Glenohumeral osteoarthritis (GHOA) is a progressive degenerative condition. It leads to pain, stiffness, and physical limitations, which significantly impacts patients' quality of life. Nonoperative management is the first-line treatment of choice. It consists of physical therapy, nonsteroidal anti-inflammatory medications, corticosteroid

injections, and activity restrictions and modifications [1][2]. If conservative treatment fails, there are a variety of surgical procedures described in the literature. Total shoulder arthroplasty (TSA) remains the definitive treatment for end-stage GHOA. However, younger and more active patients often seek joint-preserving alternatives to delay or avoid arthroplasty like arthroscopic debridement and biological interposition arthroplasty [3][4][5][6][7][8]. Several arthroscopic procedures were proposed in the literature including capsular release, joint debridement, synovectomy, chondroplasty, subacromial decompression, biceps tenodesis, microfractures, loose bodies removal, humeral osteoplasty, osteophyte excision, acromioplasty and release of the axillary nerve. A combination of previously described procedures otherwise entitled as a comprehensive arthroscopic management (CAM) has been described by Millet et al [9].

There is a great variability in the description of different arthroscopic techniques, their outcomes and durability. Most of the data we have is based on retrospective case studies [4][5][8][9][10][11][12][13][14][15][16][17][18][19][20]. Considering the heterogeneity in the existing literature, a better understanding of the effectiveness of different arthroscopic techniques for the management of GHOA is needed.

This systematic review aims to critically evaluate the available evidence on arthroscopic treatments for GHOA. We will analyse their clinical effectiveness, pain reduction, functional outcomes, and conversion rates to arthroplasty.

Methods

The protocol for this systematic review was submitted to PROSPERO prior to commencement (registration number CRD42024618749) and conforms to the principles outlined in the handbook of the Cochrane Collaboration [21], along with the guidelines established by the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) [22].

Search strategy

The authors conducted a structured electronic literature search on 10 December 2024 using the Medline® and Embase databases, applying the search terms (arthroscopy OR "arthroscopic management" OR "arthroscopic treatment") and ("glenohumeral OA" OR "gleno-humeral OA" OR "shoulder OA" OR "glenohumeral osteoarthritis" OR "gleno-humeral osteoarthritis" OR "shoulder osteoarthritis" OR "glenohumeral arthritis" OR "gleno-humeral arthritis" OR "shoulder arthritis " OR GHOA OR GH-OA). The search was limited to articles published in the last 20 years. After removal of duplicate records, each of the two researchers (MN and FVR) screened the titles and abstracts to determine the suitability for the review using the following predefined eligibility criteria: This review included studies if they reported on any arthroscopic treatment for glenohumeral osteoarthritis, including but not limited to, comprehensive arthroscopic management, debridement, resurfacing, interposition arthroplasty, etc., with no limit for sample size or prevalence. Studies were excluded if they were published in a language other than English, published before the year 2004, or were narrative or systematic reviews, expert opinions, editorials, letters to the editor or conference proceedings. Studies reporting on animal, in-vitro or in-silico studies were also not considered for this review

Study selection

Studies that met the eligibility criteria during title and abstract screening underwent full-text screening by two researchers (MN and FVR) and any disagreement was first discussed between the researchers, and if required, a third researcher resolved any disagreement. The reference lists of studies for full text review were searched, and an expert was consulted to identify further relevant studies that may not have been captured by the database searches.

Data extraction and quality assessment

Data extraction was performed by two researchers (MN and FVR) independently and their results were compared to ensure accuracy. Where there was disagreement in the documented value, the true value was ascertained by simultaneous review of the data in question by both researchers. The following data was extracted from the included studies; author(s), journal, year of publication, level of evidence, country where study was performed, conflicts of interest and funding declaration. Patient characteristics were retrieved, including number of patients in each group, sex, age, stage of osteoarthritis, Walch classification, spur size, critical shoulder angle, and acromio-humeral distance. Furthermore, clinical outcomes such as American Shoulder and Elbow Surgeon (ASES) scores, Constant score, pain on VAS, and rates of conversions to arthroplasty were extracted. Methodological quality and risk of bias of the eligible studies was assessed by two researchers (MN and FVR) according to the Joanna Briggs Institute (JBI) checklist, to appraise the reporting quality (10 items). Where there was disagreement between the researchers, consensus was achieved by discussion and review.

Statistical analysis

When available in the original articles, outcomes were tabulated: continuous outcomes were reported as means, standard deviations, and ranges, while categorical outcomes were reported as proportions. Heterogeneity was evaluated

by visual inspection of the forest plots and quantified using the I2 statistic to provide a measure of the degree of inconsistency across the studies [21]. In case of ≤3 studies for an outcome, no pooling was performed. If domains of studies were not sufficiently comparable to pool, the summary estimate was withheld [23].

Results

The systematic search returned 415 records, of which 9 were duplicates, leaving 406 for screening. A total of 386 studies were excluded by examining their titles and/or abstracts, and a further 2 studies were excluded after full-text review. This left 17 eligible studies [4][5][8][9][10][11][12][13][14][15][16][17][18][19][20][24][25] (**Table 1**, **Figure 1**), on a total of 727 patients (**Table 2**), aged between 32 and 59. Of the 17 studies, 7 were on debridement, 5 on CAM, 4 on interposition arthroplasty, and 1 on capsulotomy.

Risk of bias

The JBI quality assessment revealed that, of the 17 eligible studies, there was 1 randomized controlled trial, 1 prospective non-randomized study and 15 retrospective case series. There was no consecutive inclusion in 11 of the 17 studies (**Table 3**), and statistical analyses were insufficient in 4 of the 17 studies (**Table 3**). Of the 17 studies, 2 scored high for risk of bias of 50%.

Clinical outcomes

The 17 included studies had a follow-up ranging from 1 to 10 years (**Table 4**). The postoperative ASES was reported in 13 studies, and ranged between 50.8 and 75.3 following debridement, 70.9 and 84.5 following CAM, 64.1 and 78 following interposition arthroplasty, and 79.1 following capsulotomy. Pooling of the data revealed a postoperative ASES following CAM of 81.9 (I2, 52%; CI, 75.2-88.5; p=0.10), and debridement of 64.1 (I2, 91%; CI, 45.4-82.6; p<0.01), although the differences were not statistically significant (**Figure 2**).

The postoperative pain on VAS was reported in 10 studies, and ranged between 2 and 7.4 following debridement, 1.3 and 3.3 following CAM, and 2 following interposition arthroplasty. Pooling of the data revealed postoperative pain on VAS following CAM of 1.7 (I2, 0%; CI, 1.2-2.3; p=0.96) (**Figure 3**).

Of the 17 studies, conversion to arthroplasty was reported in 16, and ranged between 8% and 44% following debridement, 11% and 39% following CAM, and between 23% and 70% following interposition arthroplasty. Pooling of the data revealed a 22% conversion to arthroplasty rate following CAM (I2, 80%; CI, 0.11-0.36; p<0.01), 25% following debridement (I2, 79%; CI, 0.22-0.31; p<0.01), and 34% following interposition arthroplasty (I2, 62%; CI, 0.19-0.52; p<0.01), although the differences were not statistically significant (**Figure 4**).

Author, Year	Journal	Study design		COI	Country	Type of arthroscopic surgery
Kany, 2021	OTSR	Retrospective	case series	NA	France	Debridement
Henry, 2015	BMC Musculoskeletal Disorders	Retrospective	case series	NA	Canada	Debridement
Skelley, 2015	Arthroscopy	Retrospective	case series	Zimmer and Tornier	USA	Debridement
Godinho, 2013	Revista Brasileira de Ortopedia	Retrospective	case series	None	Brazil	Debridement
de Beer, 2010	KSSTA	Retrospective	case series	Wright Medical Techr	South Africa	Debridement
van Thiel, 2010	Arthroscopy	Retrospective	case series	None	USA	Debridement
Kerr, 2008	CORR	Retrospective	case series	None	USA	Debridement
Lopez-Fernandez, 2023	KSSTA	Retrospective	cohort	None	Spain	CAM
Arner, 2021	AJSM	Retrospective	case series	Steadman Philippon R	USA	CAM
Mitchell, 2016a	AJSM	Retrospective	case series	Steadman Philippon R	USA	CAM
Millett, 2013	Arthroscopy	Retrospective	case series	None	USA	CAM
Mitchell, 2016b	AJSM	Retrospective	case series	Steadman Philippon R	USA	CAM
Cable, 2021	Arthroscopy	Retrospective	case series	Arthroscopy board, A	USA	Interposition arthroplasty
Hartzler, 2017	Arthroscopy	Retrospective	case series	Arthrex	USA	Interposition arthroplasty
Karelse, 2016	Acta Orthopaedica Belgica	Prospective	RCT	None	Belgium	Interposition arthroplasty
Savoie, 2009	Arthroscopy	Prospective	case series	None	USA	Interposition arthroplasty
Porcellini, 2013	Journal of Orthopaedics and Traumat	Retrospective	case series	None	Italy	Capsulotomy with adjuvant procedure

Abbreviations: COI, Conflict Of Interest; CAM, comprehensive arthroscopic management

Table 1. Characteristics of the studies included in the systematic review

Author, Year	Type of arthroscopic surgery	Cohort	Male	Age	Kellgren-Lawrence	Walch classification	Spur size (mm)	Critical shoulder angle	Acromiohumeral distance
Kany, 2021	Debridement	73	52	42		A, B, or C			
Henry, 2015	Debridement	56	32	59					
Skelley, 2015	Debridement	33	24	55					
Godinho, 2013	Debridement	38	23	58					
de Beer, 2010	Debridement	32	22	58	3 and 4	A or B			
van Thiel, 2010	Debridement	81	47	47					
Kerr, 2008	Debridement	20	12	38					
Lopez-Fernandez, 2023	CAM	25	NA	42					
Arner, 2021	CAM	38	27	53	3 and 4	B2 or C	9.5	31.4	9.7 to 12.6
Mitchell, 2016a	CAM	107	72	52		A, B, or C	9.6	29.2	10.8
Millett, 2013	CAM	30	23	52			14.7		4.23 to 4.97
Mitchell, 2016b	CAM	49	29	52	3 and 4	A, B, or C	9.6	29.9	10.6
Cable, 2021	Interposition arthroplasty	25	17	56					
Hartzler, 2017	Interposition arthroplasty	43	34	57					
Karelse, 2016	Interposition arthroplasty	10	6	44		A1, B1, or C			
Savoie, 2009	Interposition arthroplasty	20	NA	32					
Porcellini, 2013	Capsulotomy with adjuvant proce	47	45	42					

Table 2. Patient characteristics

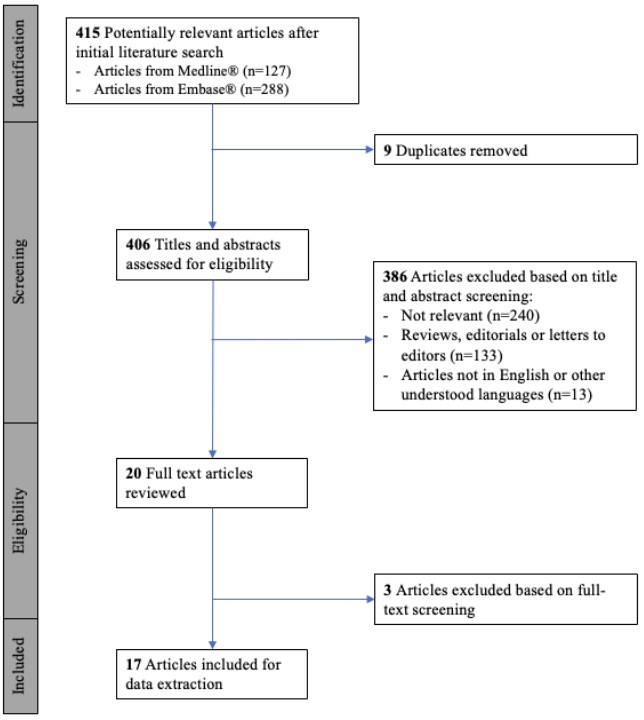


Figure 1. Flowchart

Case series		Lopez-Fernandez, 2023	Arner, 2021	Cable, 2021	Kany, 2021	Hartzler, 2017	Mitchell, 2016a	Karelse, 2016	Mitchell, 2016b	Henry, 2015	Skelley, 2015	Godinho, 2013	Millett, 2013	Porcellini, 2013	de Beer, 2010	van Thiel, 2010	Savoie, 2009	Kerr, 2008
1	Were there clear criteria for inclusion in the case series?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
2	Was the condition measured in a standard, reliable way for all participants included in the case series?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	Y	Y
3	Were valid methods used for identification of the condition for all participants included in the case series?	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	U	Y	Y	U	Y	Y	Y
4	Did the case series have consecutive inclusion of participants?	U	U	U	N	Y	Y	N	Y	N	Y	N	N	Y	Y	N	U	N
5	Did the case series have complete inclusion of participants?	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
6	Was there clear reporting of the demographics of the participants in the study?	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	Was there clear reporting of clinical information of the participants?	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N
8	Were the outcomes or follow up results of cases clearly reported?	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	Was there clear reporting of the presenting site(s)/clinic(s) demographic information?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
10	Was statistical analysis appropriate?	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	N

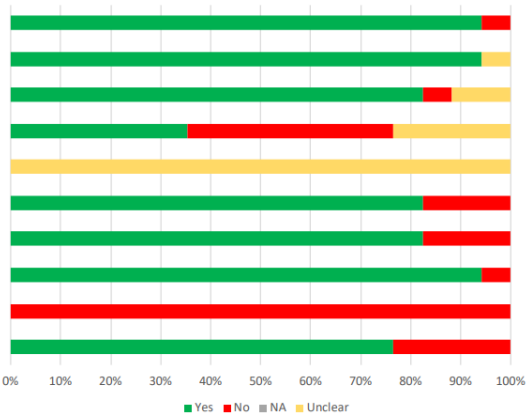
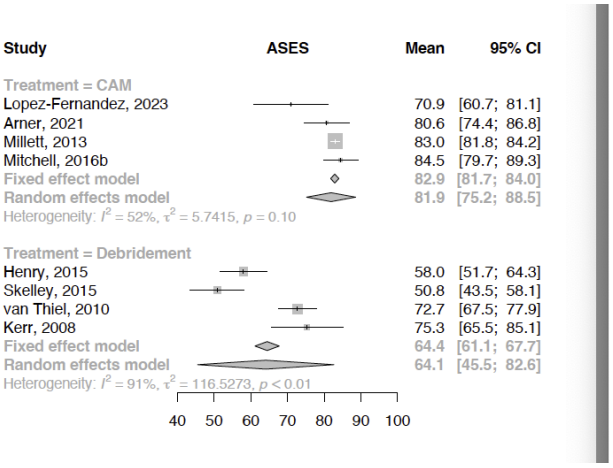


Table 3. JBI checklist for case series and randomised controlled trials

Author, Year	Type of arthroscopic surgery	Follow-up (years)	Preoperative ASES	Postoperative ASES	Preoperative Constant score	Postoperative Constant score	Preoperative pain on VAS	Postoperative pain on VAS	Conversions to arthroplasty	
Kany, 2021	Debridement	5.2			51.0	64.0			32	44%
Henry, 2015	Debridement	1 to 2 years	41.0 ±18.0	58.0 ±24.0					18	32%
Skelley, 2015	Debridement	3.6	42.2	50.8			7.8	7.4	14	42%
Godinho, 2013	Debridement	5.1				71.8			3	8%
de Beer, 2010	Debridement	2.8			40.0	64.5	8.0	2.0	5	16%
van Thiel, 2010	Debridement	2.3	51.8 ±18.6	72.7 ±23.9		72.0	4.8 ±2.0	2.7 ±2.6	16	20%
Kerr, 2008	Debridement	2.8		75.3					3	15%
Lopez-Fernandez, 2023	CAM	3.5	23.4 ±16.8	70.9 ±26.1			7.8 ±2.3	2.4 ±2.7	3	12%
Arner, 2021	CAM	10.0	63.3 ±14.2	80.6 ±19.4			3 (0-3 scale)	1 (0-3 scale)	15	39%
Mitchell, 2016a	CAM	5.7	59.4 ±17.5						12	11%
Millett, 2013	CAM	2.6	58.0 ±2.4	83.0 ±3.3			3.5 ±0.5	1.7 ±0.5	6	20%
Mitchell, 2016b	CAM	3.9	61.3	84.5 ±17.0			3.0	1.3	17	35%
Cable, 2021	Interposition arthroplasty	3.4		64.1					9	36%
Hartzler, 2017	Interposition arthroplasty	4.4	47.0	76.0			7.0	2.0	10	23%
Karelse, 2016	Interposition arthroplasty	2.0			34.0				7	70%
Savoie, 2009	Interposition arthroplasty	1.6	22.0	78.0	26.0	79.0	8.0	2.0	5	25%
Porcellini, 2013	Capsulotomy with adjuvant proce	2.0		79.1 ±14.9	43.8 ±12.9	79.1 ±14.9				0%

Abbreviations: ASES, American Shoulder and Elbow Surgeons; VAS, visual analogue scale

Table 4. Clinical outcomes



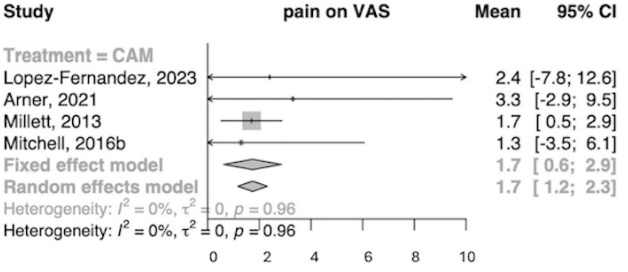


Figure 2. Forest plot on postoperative ASES (left) ; Figure 3. Forest plot on postoperative pain on VAS (right)

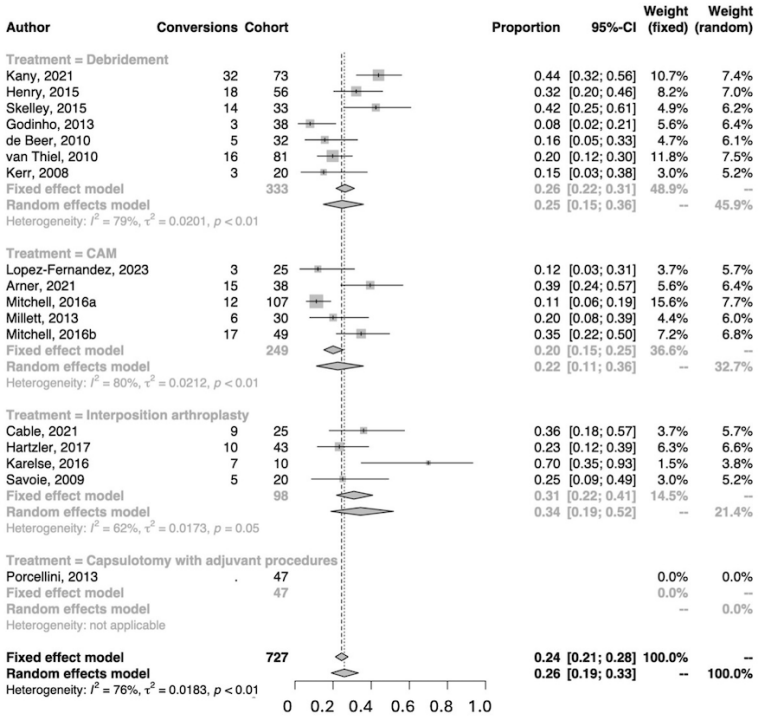


Figure 4. Forest plot on rates of conversion to arthroplasty

Discussion

The findings of this review highlight the effectiveness of arthroscopic treatments in reducing pain, improving function, and potentially delaying the need for TSA. However, variability in outcomes and conversion rates raises important questions regarding patient selection and long-term efficacy [4][5][8][9][10][11][12][13][14][15][16][17][18][19][20][24][25].

The analysis of clinical outcomes suggests that arthroscopic management provides significant pain relief and functional improvement. Among the different techniques reviewed, CAM tended to have better scores, with the highest postoperative ASES scores (81.9) [9][10][16][18] compared to debridement (64.1) [5][8][14][20], although the differences were not statistically significant. This could be explained by a systematic CAM's approach as it addresses multiple intra-articular pathologies simultaneously and thus offers a more comprehensive solution for symptom relief [9][10][16][17][18].

However, despite these improvements, the differences in outcomes across procedures were not always statistically significant. Additionally, the extent of symptom relief varied between studies, likely influenced by differences in patient selection, surgical technique, and postoperative rehabilitation protocols. The inconsistency in reported outcomes emphasizes the need for standardized assessment measures and longer follow-up studies to better understand the true benefits of each procedure.

The studies included in this review reported significant reductions in pain, with CAM showing the lowest postoperative VAS scores (1.7) [9][10][16][18], followed by interposition arthroplasty (2.0) [13][25] and debridement (ranging from 2.0 to 7.4) [4][8][20]. These findings show that CAM may grant lower postoperative pain compared to other arthroscopic procedures, likely because of its multimodal approach affecting different pain generators within the joint.

A primary concern with arthroscopic management is its durability and the risk of eventual conversion to TSA. The review found conversion rates ranging between 8% and 44% for debridement [4][5][8][12][14][15][20], 11% and 39% for CAM [9][10][16][17][18], and 23% and 70% for interposition arthroplasty [11][13][24][25]. Interposition arthroplasty has been associated with relatively high conversion rates. This could suggest that while it may provide temporary symptom relief, it may not significantly alter the disease progression in the long term.

Interestingly, CAM exhibited a lower conversion rate (22%) compared to other arthroscopic techniques. This suggests that it may serve as a more durable joint-preserving option for selected patients. However, the variability in reported conversion rates underscores the need for careful patient selection - patients with advanced cartilage loss or extensive joint degeneration may still be at high risk for progression to TSA, regardless of arthroscopic intervention.

The findings of this review have important clinical implications. Arthroscopic interventions, particularly CAM,

appear to offer meaningful symptom relief and functional improvement, making them viable options for patients seeking to delay arthroplasty.

Future research should focus on prospective, high-quality comparative studies with standardized outcome measures, longer follow-up periods to assess the true durability of arthroscopic procedures and better-defined patient selection criteria to optimize treatment outcomes.

Limitations

Despite the valuable insights gained from this review, several limitations must be acknowledged. First, the majority of included studies were retrospective case series (15 out of 17) [4][5][8][9][10][11][12][13][14][15][16][17][18][19][20], with only one randomized controlled trial [24], limiting the ability to establish definitive causal relationships. The inherent risk of selection bias and variability in study methodologies further complicates direct comparisons between different arthroscopic techniques. Second, significant heterogeneity in patient demographics, surgical techniques, and postoperative rehabilitation protocols exists across studies. The high statistical heterogeneity observed (I^2 values ranging from 52% to 91%) reflects this inconsistency, making it difficult to draw universal conclusions. Future research should prioritize standardized surgical protocols and outcome reporting to enhance the comparability of results. Thirdly, in the discussion we compared means to ranges, which could lead to false interpretations. Lastly, the follow-up duration varied significantly among studies, ranging from 1 to 10 years [4][5][8][9][10][11][12][13][14][15][16][17][18][19][20][24][25]. Longer-term follow-up is essential to determine the true durability and efficacy of different arthroscopic treatments, particularly regarding their ability to delay or prevent conversion to TSA.

Conclusion

Arthroscopic management of GHOA represents a promising joint-preserving procedure for selected patients. Between the different arthroscopic techniques, CAM seems to provide the most favourable clinical outcomes, with superior pain relief, functional improvements, and lower conversion rates compared to debridement and interposition arthroplasty. However, concerns regarding long-term durability remain, and further prospective randomized studies are needed to improve on patient selection criteria and optimize surgical procedures.

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Conflict of interest and disclosure statement

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Author contributions

AL had the idea for the article. The literature search and data analysis were performed by FV and MN. The first draft of the manuscript was written by AL, MN, and FV, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Supplementary Material

1) Full size Tables and Figures

2) PROSPERO International prospective register of systematic reviews

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