Original Article
Clinics in Orthopedic Surgery Published Online • https://doi.org/10.4055/cios25171

Does Preoperative Arthritis Affect the Outcomes of Superior Capsular Reconstruction? A Systematic Review

Tae-Hoon Park, MD*,#, Hyungsuk Kim, MD†, Sukil Kim, MD‡, Jongin Lee, MD§,||, Gerald R. Williams Jr, MD¶, Hyun Seok Song, MD*,†

*Department of Medicine, Graduate School, The Catholic University of Korea, Seoul,
†Department of Orthopedic Surgery, Eunpyeong St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul,
‡Department of Preventive Medicine and Public Health, College of Medicine, The Catholic University of Korea, Seoul,
§Department of Occupational and Environmental Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea
||Centre for Occupational and Environmental Health, School of Health Sciences,
Faculty of Biology, Medicine and Health, University of Manchester, Manchester, UK
¶Department of Orthopedic Surgery, Rothman Institute, Thomas Jefferson University, Philadelphia, PA, USA

Background: The optimal indications for superior capsular reconstruction (SCR) in cases of massive irreparable rotator cuff tears (RCTs) accompanied by degenerative arthritis remain controversial.

Methods: A systematic review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, searching PubMed, Embase (Elsevier), and Google Scholar. Studies were included if they documented Hamada grade and reported clinical and radiographic outcomes after SCR for irreparable RCTs. American Shoulder and Elbow Surgeons (ASES) score, visual analog scale for pain (pVAS), active range of motion, and acromiohumeral distance (AHD) were analyzed.

Results: In all 7 studies, there was no consistent trend observed regarding the influence of arthritis on the improvement of ASES scores, and none of the studies showed statistically significant correlations ($p > 0.05$). All 5 studies regarding pVAS showed a trend that the pVAS improvement after surgery decreased as the severity of arthritis increased (beta coefficient < 0). Out of the 7 studies regarding forward flexion (FF), 6 demonstrated a trend where the improvement after surgery decreased as the severity of arthritis increased (beta coefficient < 0). There was a tendency for the improvement in AHD to increase as the Hamada grade progressed.

Conclusions: There was no consistent trend observed regarding the impact of the severity of arthritis on the improvement of ASES score. However, there was a trend of decreasing improvement in pVAS and FF after surgery as arthritis progressed. SCR could be a viable option even in cases of Hamada grades 3 and 4.

Keywords: *Rotator cuff tear, Superior capsular reconstruction, Hamada grade, Arthritis*

Received May 13, 2025; Revised September 11, 2025;
Accepted September 11, 2025
Correspondence to: Hyun Seok Song, MD
Department of Orthopedic Surgery, Eunpyeong St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 1021 Tongil-ro, Eunpyeong-gu, Seoul 03312, Korea
Tel: +82-2-2030-4628, Fax: +82-2-2030-4629
E-mail: hssongmd@hanmail.net
#Current affiliation: Department of Medicine, Graduate School, The Catholic University of Korea and Department of Orthopedics, Seoul Central Hospital, Seoul, Korea

A massive rotator cuff tear (RCT) refers to a tear exceeding 5 cm or involving 2 or more rotator cuff tendons.[1] In cases of extensive damage, traditional repair to the native attachment site is often not feasible due to tendon retraction, muscle atrophy, and fatty infiltration.[2] Even if repair is attempted, the re-tear rate is very high, ranging from 25% to 41%.[3-6] If the tear cannot be repaired, it is classified as an irreparable RCT.

Reverse total shoulder arthroplasty is a suitable approach for treating irreparable RCTs in elderly patients.[7]

However, this method is generally discouraged for younger, more active individuals due to concerns about complications and long-term survival.[8)] In younger patients with preserved glenohumeral joint cartilage and irreparable lesions, various strategies have been explored, such as arthroscopic debridement[9)] with or without biceps tenotomy or tenodesis,[10,11)] partial rotator cuff repair,[12)] patch augmentation,[13-15)] supraspinatus advancement,[16)] biodegradable spacer interposition (subacromial balloon),[17,18)] and tendon transfer.[19)] However, these treatments exhibit variable outcomes, lacking a definitive gold standard due to challenges in achieving effective results, functional restoration, and pain relief.[4,20)]

An irreparable RCT may ultimately lead to subacromial contact of the humeral head, resulting in cuff tear arthropathy.[21)] The stages of cuff tear arthropathy are primarily defined by the Hamada classification (grades 1–5),[22)] based on the acromiohumeral distance (AHD).[23)] Grade 3 is characterized by a concave deformity at the acromial undersurface or "acetabulization." Grade 4 additionally involves narrowing of the glenohumeral joint, while grade 5 is characterized by humeral head collapse.

Mihata et al.[24,25)] introduced superior capsular reconstruction (SCR), a technique involving attaching an autogenous tensor fascia lata (TFL) graft to the glenoid and greater tuberosity. SCR stabilizes the glenohumeral joint, prevents superior migration of the humeral head, and reverses pseudoparesis.[26)] This provides a passive biological constraint to superior humeral head migration, thus restoration of a stable fulcrum.[27)] Although early SCR studies have reported improved pain and function with minimal complications,[28)] subsequent research has indicated varying rates of graft re-tear and revision surgeries.[29,30)] Factors contributing to these different outcomes include graft type (autograft or allograft), surgical expertise, and indications.

Several studies have identified poor prognostic factors for SCR. In a study of 35 patients, Ohta et al.[31)] identified that Hamada grade ≥ 4, age ≥ 80 years, and male sex as risk factors for re-tear after SCR using autogenous TFL or iliotibial band graft. Gilat et al.[32)] found that female sex and accompanying subscapularis tears were linked to clinical failure with decellularized dermal allograft in a study of 54 shoulders. In a case-control study of 46 shoulders, Lee et al.[33)] reported that preoperative subscapularis atrophy or humeral side re-tear of the graft negatively affected clinical outcome for arthroscopic SCR using autogenous TFL or dermal allograft.

However, there is a lack of consensus regarding SCR indications based on preoperative arthritis severity or Hamada grade. This study assessed the clinical and radiological outcomes following SCR, stratified by preoperative arthritis severity. The hypothesis was that the severity of preoperative arthritis would affect the clinical and radiological outcomes of SCR.

METHODS

The approval of institutional review board and informed consent was waived due to retrospective systematic review.

Literature Search

Two independent reviewers (THP and JL) comprehensively searched online databases, including PubMed, Embase (Elsevier), and Google Scholar. In PubMed, the search employed the terms "superior capsular reconstruction," "superior capsule reconstruction," and "ASCR." In Embase, the abstracts and titles were explored using the combination "(superior capsular reconstruction) OR (superior capsule reconstruction)." For Google Scholar, the search involved the combinations "(superior capsule reconstruction OR superior capsular reconstruction) AND osteoarthritis." The search was limited to studies published between 2008 and 2022.

Inclusion and Exclusion Criteria

The inclusion criteria were (1) clinical studies of levels 1 to 4 investigating irreparable RCT with a size ≥ 5 cm or involving ≥ 2 tendons, (2) clearly defined SCR procedures, (3) documented Hamada grade, (4) use of autograft or allograft, (5) use of arthroscopic and/or open surgical techniques, (6) postoperative assessment of functional outcomes using the American Shoulder and Elbow Surgeons (ASES) score, visual analog scale for pain (pVAS), or active range of motion (ROM), (7) postoperative radiographic assessment at least 1 year after surgery, and (8) publication in English from 2008 to 2022.

The exclusion criteria were (1) non-clinical studies, such as technical notes, cadaver, animal, and biomechanical studies, as well as reviews or meta-analyses, (2) case reports (evidence level V) with fewer than 5 patients, (3) abstracts, commentaries, and editorial letters, (4) use of biceps long head graft, xenograft, or synthetic graft, (5) studies lacking ASES score or pVAS, and (6) postoperative radiographic follow-up of less than 1 year.

Study Identification and Data Extraction

Two authors (THP and HK) independently assessed the retrieved studies by title and abstract. Subsequently, a full-text review was conducted based on the inclusion criteria. In case of disagreement, a senior author (HSS) reviewed the article and made the final decision.

Risk of Bias Assessment

Two authors (THP and JL) independently assessed the methodological quality of each study using the Methodological Index for Nonrandomized Studies (MINORS).[34] The questionnaire items were scored as follows: 0 for unreported information, 1 for inadequately reported information, and 2 for adequately reported information, with a maximum possible score of 16 for non-comparative studies. Studies with MINORS scores of 13–16 for non-comparative studies and 21–23 for comparative studies were considered to have a low risk of bias, whereas studies with MINORS scores ≤ 12 for non-comparative studies and ≤ 20 for comparative studies were considered to have a high risk of bias.[34] Any discrepancies in scoring were resolved through consensus between the 2 authors.

Outcome Measures

Patients' demographic data included age and sex, while radiological data were Hamada grade and AHD. Clinical data consisted of ASES score, pVAS, and active ROM. ROM measurements included forward flexion (FF), abduction (Abd), external rotation (ER) in the neutral position, and internal rotation (IR). The vertebral-level method (lesser tuberosity: 0, greater tuberosity: 1, buttock: 2, sacrum: 3, L5: 4 to T1: 20) was used to measure internal rotation.[35]

Statistical Analysis

Statistical analyses were performed using R version 4.3.2 (R Foundation for Statistical Computing). In each study, changes in the dependent variable according to the preoperative Hamada grade were calculated through linear regression analysis. The dependent variables in the regression model were the differences in ASES score, pVAS, ROM (FF, Abd, ER, IR) and AHD between pre- and postoperative stages. The beta coefficients and their confidence intervals were calculated from the linear regression analysis. The calculated beta coefficient represents the change in the dependent variable for each 1-grade increase in Hamada grade.

RESULTS

Study Identification

After eliminating duplicate papers, 700 studies were screened. The titles and abstracts were meticulously reviewed to exclude irrelevant studies. Following a comprehensive evaluation of the full-text versions of pertinent studies, 21 studies that satisfied the inclusion criteria were included (Fig. 1). Among these studies, we were able to directly extract Hamada grade from the tables of 4 studies.[25,36-38] In addition, we obtained raw data including Hamada data from the corresponding authors of 3 other studies.[33,39,40] Consequently, a systematic review was conducted on data from 136 shoulders derived from a total of 7 studies.[25,33,36-40] Further details of the risk of bias assessment are provided in Table 1.

Demographics and Grafts

To provide an overview of the included studies, Table 2 summarizes the 7 studies. The study group consisted of 80 males and 56 females, with a mean age (± standard deviation) of 64.2 ± 6.6 years. Hamada grade ranged from grade 1 to 4, with 45 patients having grade 1, 65 patients with

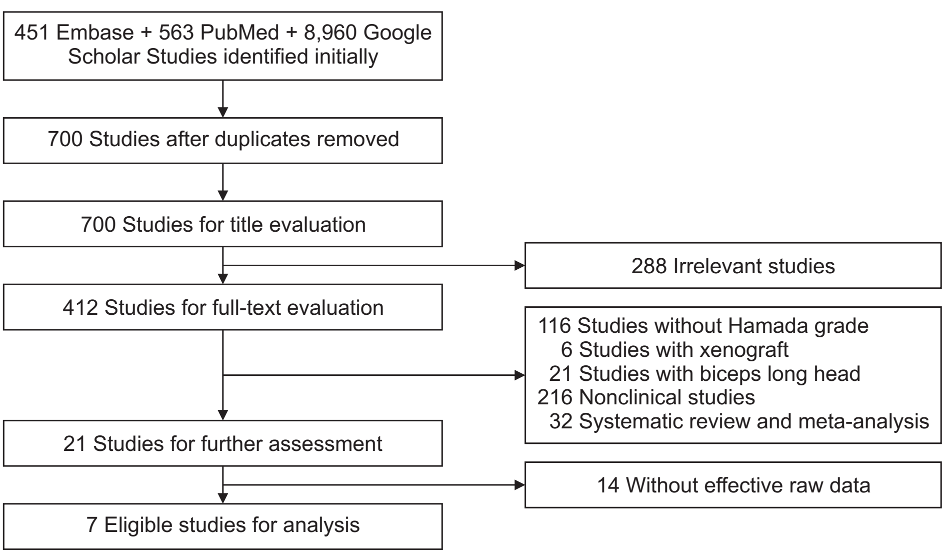

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

Table 1. MINORS Scores

Study	Clearly stated aim	Consecutive patients	Prospective design	Appropriate endpoints	Blinded assessment	Appropriate follow-up	Follow-up loss < 5%	Power calculation	Total score
de Campos Azevedo et al. (2018)[37]	2	2	2	2	0	2	2	2	14 / 16
Kholinne et al. (2021)[38]	2	2	2	2	0	2	2	0	12 / 16
Mihata et al. (2013)[25]	2	2	2	2	0	2	2	0	12 / 16
Yoon et al. (2018)[36]	2	2	2	2	0	2	2	0	12 / 16
Lee et al. (2021)[39]	2	2	2	2	1	2	2	0	13 / 16
Shin et al. (2022)[40]	2	2	2	2	2	2	2	2	16 / 16
Lee et al. (2020)[33]	2	2	2	2	0	2	2	0	12 / 16

Each item is scored as 0 = not reported, 1 = reported but inadequate, and 2 = reported and adequate. The maximum possible score for noncomparative studies is 16.
MINORS: methodological index for non-randomized studies.

Table 2. Summary of Included Studies

Study/ journal	LOE	No. of shoulders	Graft type (thickness, mm)	Mean patient age (yr)	Hamada grade preoperative	Hamada grade postoperative	Follow-up (mo)	Mean FF (pre–post, ° △)	Mean ER (pre–post, ° △)	Mean Abduction (pre–post, ° △)	Mean AHD (pre–post, mm△)	Mean ASES score (pre–post, △)	Mean VAS (pre–post, △)	Graft retear rate (%)	MINORS score*
de Campos Azevedo et al. (2018)[37]/ OJSM	IV	22	Auto TFL (5–8)	64.8	1.4 (1–2)	NR	23 (6–24)	74.8–143.8 (69)	13.2–35.6 (22.4)	53.2–120.7 (67.5)	6.4–7.1 (0.7)	NR	NR	2 (9.1)	14 / 16
Kholinne et al. (2021)[38]/ OJSM	IV	6	Allo-Achilles w bone (minimum 6)	62.3	2.2 (2–3)	2.2 (2–3)	14.5 (12–17)	98.3–123.3 (25)	58.3–39.2 (–19.1)	NR	3.9–6.4 (2.5)	42.8–62.2 (19.4)	4–2.8 (1.2)	At MRI, 1 (16.7); at 2nd look A/S, 5 (83.3)	12 / 16
Mihata et al. (2013)[25]/ Arthroscopy	IV	24	Auto TFL (6–8)	65.1	1.7 (1–4b)	NR	34.1 (24–51)	84–148 (64)	26–40 (14)	NR	4.6–8.7 (4.1)	23.5–92.9 (69.4)	NR	4 (17)	12 / 16

Table 2. Continued

Study/ journal	LOE	No. of shoulders	Graft type (thickness, mm)	Mean patient age (yr)	Hamada grade preoperative	Hamada grade postoperative	Follow-up (mo)	Mean FF (pre–post, °△)	Mean ER (pre–post, °△)	Mean Abduction (pre–post, °△)	Mean AHD (pre–post, mm△)	Mean ASES score (pre–post, △)	Mean VAS (pre–post, △)	Graft retear rate (%)	MINORS score*
Yoon et al. (2018)[36]/ CiSE	IV	6 (5 Auto TFL, 1 dermal allo)	Auto TFL (NR) dermal allo (2)	59.5	1.5 (1–2)	2.5 (1–5)	27.4 (18–36)	151.7–160 (9.2)	30–34.2 (4.2)	148.3–165.8 (17.5)	4.8–3.8 (–1)	60.4–81.6 (21.2)	3.7–1.6 (2.1)	1 (16,7)	12 / 16
Lee et al. (2021)[39]/ CiOS	IV	11	Allo-Achilles w/o bone (average, 7.4; range, 6.5–8.6)	66.3	2.4 (2–3)	NR	27.6 (24–32)	93.0–137.3 (44.3)	24.0–41.0 (17)	94.5–143.5 (49)	3.9–6.4 (2.5)	51.6–76.4 (24.8)	4.1–1.1 (3)	2 (18.2)	13 / 16
Shin et al. (2022)[40]/ Arthroscopy	IV	21	dermal allo (4–5)	63.4	2.0 (1–3)	1.8 (1–3)	14.7 (12–20)	136.0–150.0 (14)	36.4–40.7 (4.3)	NR	4.5–7.1 (2.6)	55.5–87.0 (31.5)	4.0–2.2 (1.8)	7 (33.3)	16 / 16
Lee et al. (2020)[33]/ OJSM	III	46 (30 Auto TFL, 16 dermal allo)	Auto TFL (5.7 ± 1.5) Dermal allo (5.6 ± 1.5)	61	2.1 (1–4)	NR	31.2 (25–60)	107.2–141.3 (34.1)	40.7–53.7 (13)	NR	4.7–8.1 (3.4)	52.5–81.1 (28.6)	5.7–1.9 (3.8)	16 (34.8)	12 / 16

Values are presented as mean (range) or mean ± standard deviation. Summary statistics reported as weighted mean ± standard deviation or frequency.
LOE: level of evidence, FF: forward flexion, ER: external rotation, AHD: acromiohumeral distance, ASES: American Shoulder and Elbow Surgeons, VAS: visual analog scale, MINORS: methodological index for non-randomized studies, OJSM: *Orthopaedic Journal of Sports Medicine*, TFL: tensor fascia lata, NR: not reported, MRI: magnetic resonance imaging, A/S: arthroscopy, w/o: without, CiSE: *Clinics in Shoulder and Elbow,* CiOS: *Clinics in Orthopedic Surgery*.

grade 2, 22 patients with grade 3, and 4 patients with grade 4. The preoperative AHD measured 4.8 ± 2.3 mm. The average anterior-to-posterior tear size was 39.6 ± 9.8 mm, and the average medio-lateral size was 42.7 ± 5.1 mm. Among 36 shoulders with subscapularis tears, 31 underwent repair of the subscapularis during the SCR surgery. Regarding graft types, 2 studies[25,37)] used autogenous TFL, 1 study used dermal allografts,[40)] and 2 studies used Achilles tendon allografts (1 with bone[38)] and 1 without bone[39)]). Two studies reported a comparison between autogenous TFL and a dermal allograft.[33,36)]

Hamada Grade and Clinical Outcomes

The relationship between Hamada grade and the improvement in ASES score before and after surgery was investigated using data from 6 studies (Fig. 2A). Four studies showed a negative beta coefficient value, while 2 studies showed a positive value. This suggests that increasing Hamada grade may correlate with less improvement in ASES score. However, none of the 6 studies demonstrated statistical significance ($p > 0.05$).

Five studies were analyzed to investigate the relationship between Hamada grade and the improvement in pVAS (Fig. 2B). In all 5 studies, the beta coefficient values were negative. This suggests that as the Hamada grade progresses, there may be less improvement in pVAS. However, none of the 5 studies demonstrated statistical significance ($p > 0.05$). Seven studies were analyzed to investigate the relationship between Hamada grade and FF ROM (Fig. 3A). Among them, 6 studies showed a negative beta coefficient value, indicating a tendency for FF improvement to decrease as Hamada grade progresses. However, none of the studies demonstrated statistical significance ($p > 0.05$).

Three studies were analyzed to investigate the relationship between Hamada grade and Abd ROM (Fig. 3B). All 3 studies showed a negative beta coefficient value, indicating a tendency for Abd improvement to decrease as Hamada grade increases. However, none of the studies demonstrated statistical significance ($p > 0.05$). Seven studies were analyzed to investigate the relationship between Hamada grade and ER ROM (Fig. 3C). Among them, 5 studies showed a negative beta coefficient value, indicating a tendency for ER improvement to decrease as Hamada grade increases. However, none of the studies demonstrated statistical significance ($p > 0.05$). Six studies were analyzed to investigate the relationship between

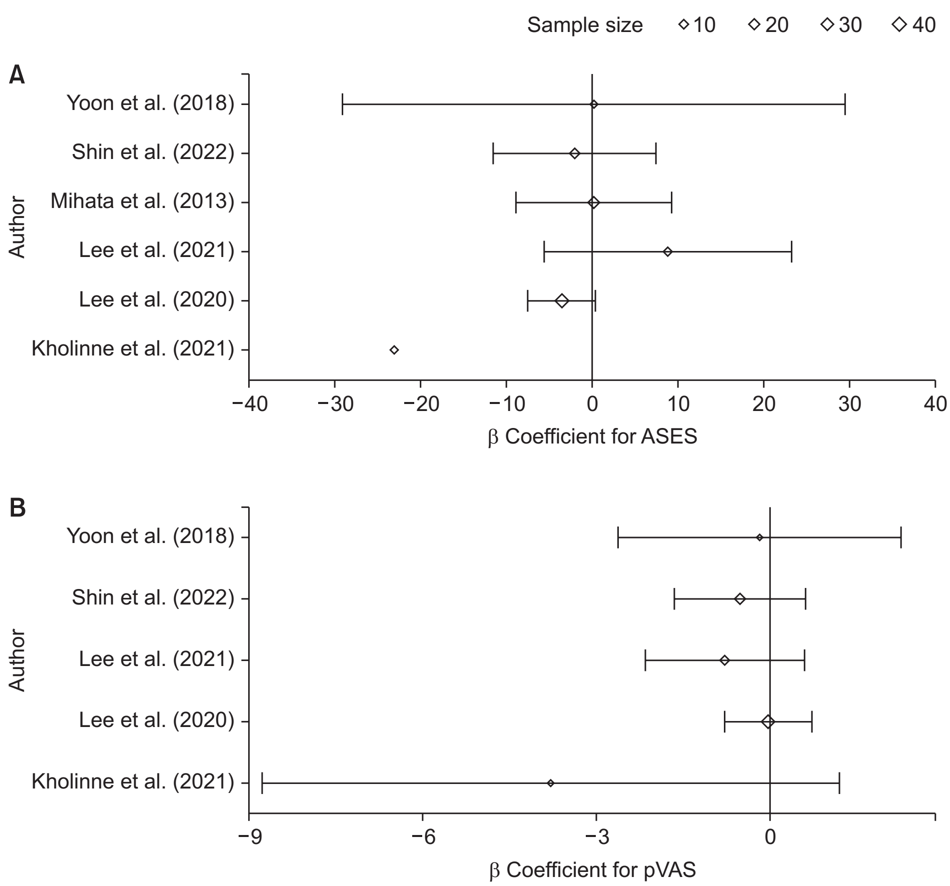

Fig. 2. Forest plots showing the variation in American Shoulder and Elbow Surgeons (ASES) score (A) and visual analog scale for pain (pVAS) (B) improvement according to Hamada grade. The 95% CI for Kholinne et al. (2021) is omitted due to its excessively long range.

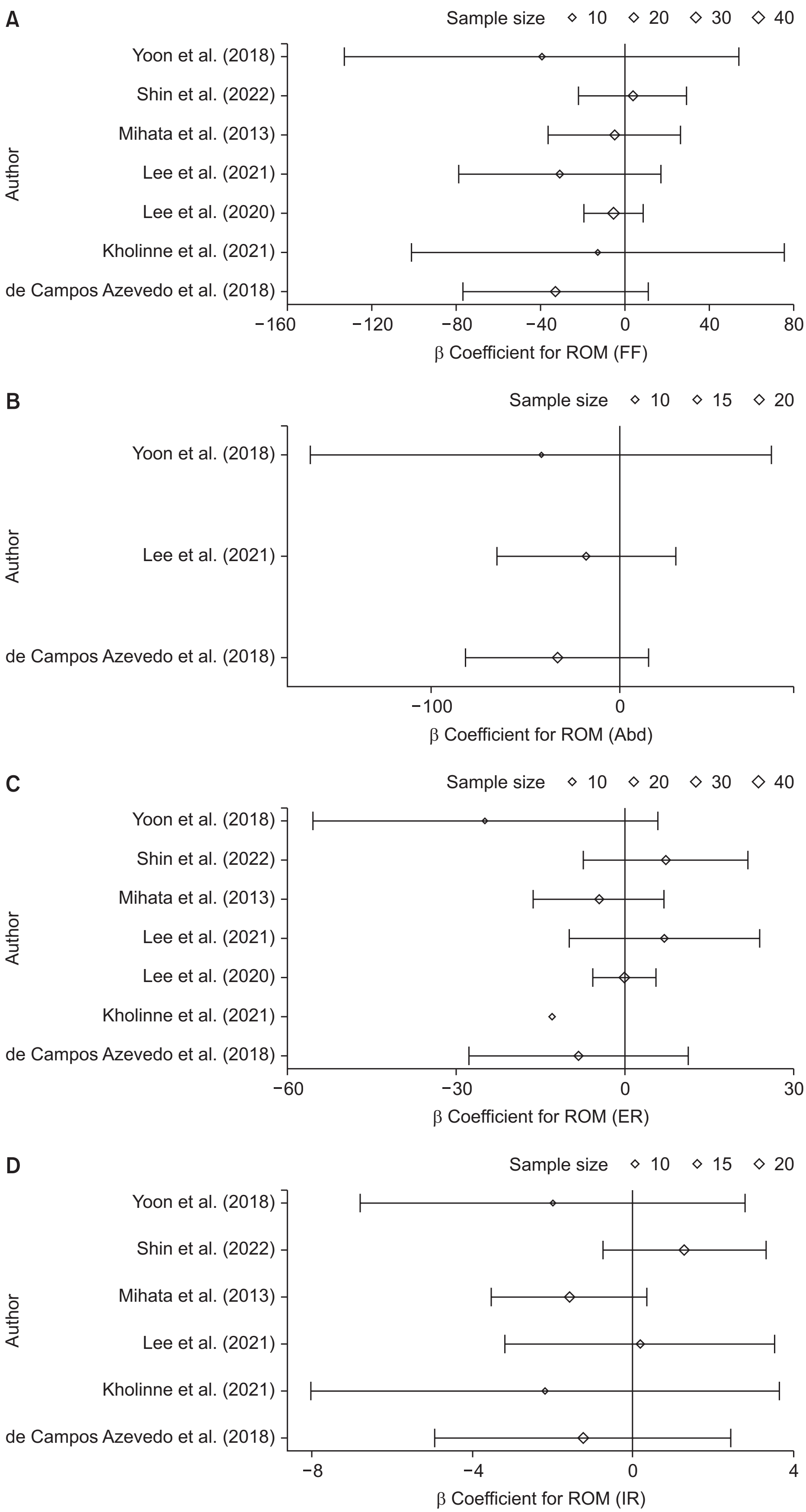

Fig. 3. Forest plots showing the variation in range of motion (ROM) improvement according to Hamada grade. (A) Forward flexion (FF). (B) Abduction (Abd). (C) External rotation (ER). (D) Internal rotation (IR). The 95% CI for Kholinne et al. (2021) is omitted due to its excessively long range.

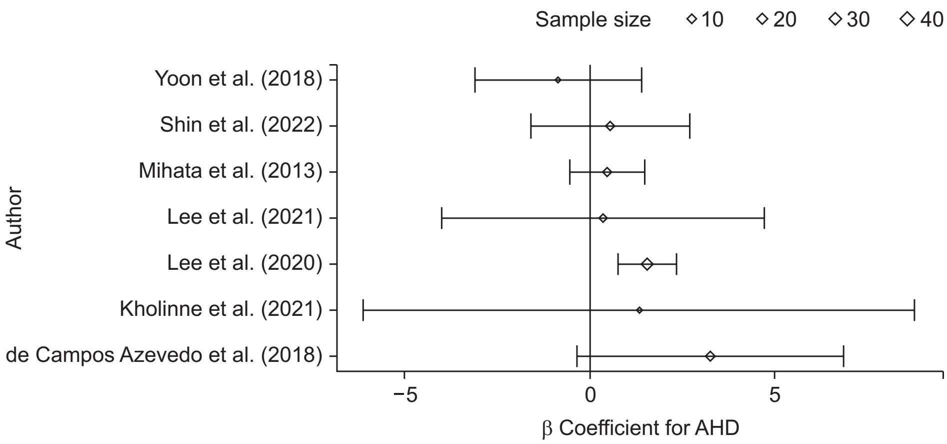

Fig. 4. Forest plots showing the variation in acromiohumeral distance (AHD) improvement according to Hamada grade.

Hamada grade and IR ROM (Fig. 3D). Among them, 4 studies showed a negative beta coefficient value, indicating a tendency for IR improvement to decrease as Hamada grade increases. However, none of the studies demonstrated statistical significance ($p > 0.05$).

Hamada Grade and Radiologic Outcomes

Seven studies were analyzed to investigate the relationship between Hamada grade and AHD (Fig. 4). Among them, 6 studies showed a positive beta coefficient value, while 1 study showed a negative value. Generally, the improvement in AHD after surgery tended to increase with higher Hamada grades. One study reported by Lee et al.[33] showed a positive beta coefficient and a p-value less than 0.05, indicating statistical significance. However, the remaining studies did not show statistical significance ($p > 0.05$).

DISCUSSION

ASES score, pVAS, and ROM (FF, Abd, ER, IR) demonstrated overall trends of less improvement as the Hamada grade progresses (beta coefficient < 0). However, statistical significance was not demonstrated in all studies ($p > 0.05$). Greater improvement in AHD after surgery was observed in higher Hamada grades in 6 out of 7 studies. However, only 1 study demonstrated statistical significance.[33]

Numerous studies have reported improvements in ASES score and pVAS after SCR surgery.[41-43] However, there is limited literature reporting on the association between Hamada grade and outcomes of SCR. Takayama et al.[44] studied autogenous TFL in 54 patients with massive RCT, and no discrepancies in postoperative ASES score or ROM were observed between Hamada grades 2 and 3. This study is consistent with our findings. Although our results indicated a trend of less ASES score, pVAS, and ROM improvement with progressing Hamada grade (beta coefficient < 0), none showed statistical significance.

AHD has been utilized as a prognostic radiographic marker following rotator cuff repair, as it signifies the restoration of force couples. This results in increased glenohumeral joint stability and improved shoulder biomechanics.[3] Lee and Min[45] studied arthroscopic SCR using autogenous TFL in 34 patients with massive RCTs and reported that the mean AHD was significantly higher in patients with graft thickness ≥ 6 mm than that in patients with graft thickness < 6 mm. In addition, a lack of improvement, or even minimal improvement, in AHD immediately postoperatively after arthroscopic SCR was associated with poor graft survival and increased incidence of re-tear.[45] According to our research findings, in 6 out of 7 studies, there was a greater improvement in AHD after surgery as Hamada grade progressed. It is presumed that as the Hamada grade progresses, the preoperative AHD is narrower, resulting in a relatively greater improvement in AHD after surgery.

The reason for the improvement in AHD after surgery is likely due to the thickness of the inserted graft. A thicker graft tends to increase AHD more, acting as a spacer between the humeral head and the acromion.[31,42] The TFL autograft used by Mihata et al.[25] had a thickness of approximately 6–8 mm, whereas dermal allografts used in SCR averaged around 3–4 mm in thickness. According to the systematic review reported by Abd Elrahman et al.,[46] there was improvement in postoperative AHD in both groups, with a tendency toward greater improvement in the TFL autograft group than in the human dermal allograft group. In our findings, it was observed that studies using autograft showed higher beta coefficient values compared to those using allograft, indicating that in the autograft group, the increase in AHD in relation to the degree in Hamada grade was greater. Compared to the group using allograft, the group using autograft exhibited a greater degree of AHD improvement based on Hamada grade.

Although statistical significance was not demonstrated, these findings suggest that SCR may still be considered in carefully selected patients with higher Hamada grades. In particular, younger and more active individuals, for whom arthroplasty may not yet be desirable, could represent a subgroup where SCR may be attempted. This implication may help refine surgical indications and enhance clinical decision-making.

While this paper is based on studies meeting strict inclusion criteria, there are certain limitations. First, we primarily analyzed lower levels of evidence. All included articles are levels III or IV evidence, mostly retrospective case series lacking a control group, and therefore the strength of evidence is inevitably low. Second, there was considerable heterogeneity across indications, surgical techniques, graft types, and postoperative rehabilitation protocols, which may have introduced bias and reduced the reliability of the pooled results. Third, the articles included short-term follow-up results, typically spanning 1 to 2 years, thus lacking long-term follow-up data and restricting the evaluation of arthropathy progression after SCR. Fourth, the limited number of shoulders with Hamada grade 4 (n = 4) was insufficient for statistical significance compared to other groups, and this point should be emphasized when interpreting the results. Finally, assessing cuff tear arthropathy severity was solely based on Hamada grade, while the Samilson-Prieto classification,[47] which categorizes the degree of arthritic changes of the glenohumeral joint, could not be analyzed.[48]

Despite various limitations, this paper has the following significance. To the best of our knowledge, this study may be the first to investigate the impact of Hamada grade on both clinical and radiological outcomes after SCR surgery. Given that the effect of Hamada grade on SCR surgical outcomes was not statistically significant, it could be inferred that SCR surgery may be considered a viable option for Hamada grades 3 and 4. There was no consistent trend observed regarding the impact of the severity of arthritis on the improvement of ASES score. However, there was a trend of decreasing improvement in pVAS and FF after surgery as arthritis progressed. SCR could be a viable option even in cases of Hamada grades 3 and 4.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ORCID

Tae-Hoon Park https://orcid.org/0000-0002-0965-5009
Hyungsuk Kim https://orcid.org/0000-0003-3400-0263
Sukil Kim https://orcid.org/0000-0001-9730-9845
Jongin Lee https://orcid.org/0000-0003-4337-8444
Gerald R. Williams Jr https://orcid.org/0000-0003-3547-8322
Hyun Seok Song https://orcid.org/0000-0002-7844-2293

REFERENCES

1. Gerber C, Fuchs B, Hodler J. The results of repair of massive tears of the rotator cuff. J Bone Joint Surg Am. 2000;82(4):505-15.

2. Oh JH, Park MS, Rhee SM. Treatment strategy for irreparable rotator cuff tears. Clin Orthop Surg. 2018;10(2):119-34.

3. Chung SW, Kim JY, Kim MH, Kim SH, Oh JH. Arthroscopic repair of massive rotator cuff tears: outcome and analysis of factors associated with healing failure or poor postoperative function. Am J Sports Med. 2013;41(7):1674-83.

4. Miller BS, Downie BK, Kohen RB, et al. When do rotator cuff repairs fail? Serial ultrasound examination after arthroscopic repair of large and massive rotator cuff tears. Am J Sports Med. 2011;39(10):2064-70.

5. Park JY, Lhee SH, Oh KS, Moon SG, Hwang JT. Clinical and ultrasonographic outcomes of arthroscopic suture bridge repair for massive rotator cuff tear. Arthroscopy. 2013;29(2):280-9.

6. Gumina S, Kim H, Jung Y, Song HS. Rotator cuff degeneration and healing after rotator cuff repair. Clin Shoulder Elb. 2023;26(3):323-9.

7. Oh JH, Jeong HJ, Won YS. Implant selection for successful reverse total shoulder arthroplasty. Clin Shoulder Elb. 2023;26(1):93-106.

8. Samuelsen BT, Wagner ER, Houdek MT, et al. Primary reverse shoulder arthroplasty in patients aged 65 years or younger. J Shoulder Elbow Surg. 2017;26(1):e13-7.

9. Rockwood CA, Williams GR, Burkhead WZ. Débridement of degenerative, irreparable lesions of the rotator cuff. J Bone Joint Surg Am. 1995;77(6):857-66.

10. Boileau P, Baqué F, Valerio L, Ahrens P, Chuinard C, Trojani

C. Isolated arthroscopic biceps tenotomy or tenodesis improves symptoms in patients with massive irreparable rotator cuff tears. J Bone Joint Surg Am. 2007;89(4):747-57.

11. Walch G, Edwards TB, Boulahia A, Nové-Josserand L, Neyton L, Szabo I. Arthroscopic tenotomy of the long head of the biceps in the treatment of rotator cuff tears: clinical and radiographic results of 307 cases. J Shoulder Elbow Surg. 2005;14(3):238-46.
12. Burkhart SS, Nottage WM, Ogilvie-Harris DJ, Kohn HS, Pachelli A. Partial repair of irreparable rotator cuff tears. Arthroscopy. 1994;10(4):363-70.
13. Kim DH, Cho CH. Patch augmentation in patients with large to massive rotator cuff tear. Clin Shoulder Elb. 2023;26(1):1-2.
14. Hong SY, Lee SJ, Hahm HB, Chang JW, Hyun YS. Onlay patch augmentation in rotator cuff repair for moderate to large tears in elderly patients: clinical and radiologic outcomes. Clin Shoulder Elb. 2023;26(1):71-81.
15. Lee GW, Kim JY, Lee HW, Yoon JH, Noh KC. Clinical and anatomical outcomes of arthroscopic repair of large rotator cuff tears with allograft patch augmentation: a prospective, single-blinded, randomized controlled trial with a long-term follow-up. Clin Orthop Surg. 2022;14(2):263-71.
16. Jo CH, Wang PW. Arthroscopic supraspinatus advancement for retracted rotator cuff tears: a technical note. Clin Shoulder Elb. 2022;25(4):328-33.
17. Stewart RK, Kaplin L, Parada SA, Graves BR, Verma NN, Waterman BR. Outcomes of subacromial balloon spacer implantation for massive and irreparable rotator cuff tears: a systematic review. Orthop J Sports Med. 2019;7(10):2325967119875717.
18. Khanna A, Fares MY, Koa J, Abboud JA. Improving shoulder function and pain in a paraplegic patient with massive irreparable rotator cuff tear using a subacromial balloon spacer. Clin Shoulder Elb. 2024;27(3):380-5.
19. Elhassan BT, Wagner ER, Werthel JD. Outcome of lower trapezius transfer to reconstruct massive irreparable posterior-superior rotator cuff tear. J Shoulder Elbow Surg. 2016;25(8):1346-53.
20. Joo MS, Kim JW. Significant radiologic factors related to clinical outcomes after arthroscopic rotator cuff retear repair. Clin Shoulder Elb. 2022;25(3):173-81.
21. Ishihara Y, Mihata T, Tamboli M, et al. Role of the superior shoulder capsule in passive stability of the glenohumeral joint. J Shoulder Elbow Surg. 2014;23(5):642-8.
22. Hamada K, Fukuda H, Mikasa M, Kobayashi Y. Roentgenographic findings in massive rotator cuff tears. A long-term observation. Clin Orthop Relat Res. 1990;(254):92-6.
23. Brolin TJ, Updegrove GF, Horneff JG. Classifications in brief: Hamada classification of massive rotator cuff tears. Clin Orthop Relat Res. 2017;475(11):2819-23.
24. Mihata T, McGarry MH, Pirolo JM, Kinoshita M, Lee TQ. Superior capsule reconstruction to restore superior stability in irreparable rotator cuff tears: a biomechanical cadaveric study. Am J Sports Med. 2012;40(10):2248-55.
25. Mihata T, Lee TQ, Watanabe C, et al. Clinical results of arthroscopic superior capsule reconstruction for irreparable rotator cuff tears. Arthroscopy. 2013;29(3):459-70.
26. Mihata T, McGarry MH, Kahn T, Goldberg I, Neo M, Lee TQ. Biomechanical role of capsular continuity in superior capsule reconstruction for irreparable tears of the supraspinatus tendon. Am J Sports Med. 2016;44(6):1423-30.
27. Hartzler RU, Burkhart SS. Superior capsular reconstruction. Orthopedics. 2017;40(5):271-80.
28. Sochacki KR, McCulloch PC, Lintner DM, Harris JD. Superior capsular reconstruction for massive rotator cuff tear leads to significant improvement in range of motion and clinical outcomes: a systematic review. Arthroscopy. 2019;35(4):1269-77.
29. Altintas B, Scheidt M, Kremser V, et al. Superior capsule reconstruction for irreparable massive rotator cuff tears: does it make sense? A systematic review of early clinical evidence. Am J Sports Med. 2020;48(13):3365-75.
30. Makovicka JL, Chung AS, Patel KA, Deckey DG, Hassebrock JD, Tokish JM. Superior capsule reconstruction for irreparable rotator cuff tears: a systematic review of biomechanical and clinical outcomes by graft type. J Shoulder Elbow Surg. 2020;29(2):392-401.
31. Ohta S, Komai O, Onochi Y. Outcomes of superior capsule reconstruction for massive rotator cuff tears and risk factors for postoperative retear. Arch Orthop Trauma Surg. 2020;140(10):1319-25.
32. Gilat R, Haunschild ED, Williams BT, et al. Patient factors associated with clinical failure following arthroscopic superior capsular reconstruction. Arthroscopy. 2021;37(2):460-7.
33. Lee SJ, Kang SW, Chung I, Jang H. Which factors influence clinical outcomes after superior capsular reconstruction surgery? Orthop J Sports Med. 2020;8(12):2325967120966410.
34. Slim K, Nini E, Forestier D, Kwiatkowski F, Panis Y, Chipponi J. Methodological index for non-randomized studies (minors): development and validation of a new instrument. ANZ J Surg. 2003;73(9):712-6.
35. Han SH, Oh KS, Han KJ, Jo J, Lee DH. Accuracy of measuring tape and vertebral-level methods to determine shoulder internal rotation. Clin Orthop Relat Res. 2012;470(2):562-6.

36. Yoon JY, Kim PS, Jo CH. Clinical and radiological results after arthroscopic superior capsular reconstruction in patients with massive irreparable rotator cuff tears. Clin Shoulder Elb. 2018;21(2):59-66.

37. de Campos Azevedo CI, Ângelo AC, Vinga S. Arthroscopic superior capsular reconstruction with a minimally invasive harvested fascia lata autograft produces good clinical results. Orthop J Sports Med. 2018;6(11):2325967118808242.

38. Kholinne E, Sun Y, Kwak JM, Kim H, Koh KH, Jeon IH. Failure rate after superior capsular reconstruction with Achilles tendon-bone allograft for irreparable rotator cuff tears. Orthop J Sports Med. 2021;9(5):23259671211002280.

39. Lee KW, Choi HG, Yang DS, Yu YT, Kim WS, Choy WS. Achilles tendon allograft for superior capsule reconstruction in irreparable massive rotator cuff tears. Clin Orthop Surg. 2021;13(3):395-405.

40. Shin SJ, Lee S, Hwang JY, Lee W, Koh KH. Superior capsular reconstruction using acellular dermal allograft combined with remaining rotator cuff augmentation improved shoulder pain and function at 1 year after the surgery. Arthroscopy. 2022;38(4):1089-98.

41. Degan TJ, Hartzler RU, Rahal A, DeBerardino TM, Burkhart SS. Prospective 1-year outcomes are maintained at short-term final follow-up after superior capsular reconstruction augmentation of complete rotator cuff repair. Arthroscopy. 2022;38(5):1411-9.

42. Mihata T, Lee TQ, Hasegawa A, et al. Five-year follow-up of arthroscopic superior capsule reconstruction for irreparable rotator cuff tears. J Bone Joint Surg Am. 2019;101(21):1921-30.

43. Pashuck TD, Hirahara AM, Cook JL, Cook CR, Andersen WJ, Smith MJ. Superior capsular reconstruction using dermal allograft is a safe and effective treatment for massive irreparable rotator cuff tears: 2-year clinical outcomes. Arthroscopy. 2021;37(2):489-96.e1.

44. Takayama K, Yamada S, Kobori Y. Clinical outcomes and temporal changes in the range of motion following superior capsular reconstruction for irreparable rotator cuff tears: comparison based on the Hamada classification, presence or absence of shoulder pseudoparalysis, and status of the subscapularis tendon. J Shoulder Elbow Surg. 2021;30(11):e659-75.

45. Lee SJ, Min YK. Can inadequate acromiohumeral distance improvement and poor posterior remnant tissue be the predictive factors of re-tear? Preliminary outcomes of arthroscopic superior capsular reconstruction. Knee Surg Sports Traumatol Arthrosc. 2018;26(7):2205-13.

46. Abd Elrahman AA, Sobhy MH, Abdelazim H, Omar Haroun HK. Superior capsular reconstruction: fascia lata versus acellular dermal allograft: a systematic review. Arthrosc Sports Med Rehabil. 2020;2(4):e389-97.

47. Samilson RL, Prieto V. Dislocation arthropathy of the shoulder. J Bone Joint Surg Am. 1983;65(4):456-60.

48. Kellgren JH, Lawrence JS. Radiological assessment of osteoarthrosis. Ann Rheum Dis. 1957;16(4):494-502.