INPLASY

Transarterial embolization for adhesive capsulitis: a protocol for a systematic review (with meta-analysis, if feasible)

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Tiralongo, F; Pittari, A; Rosta, G; Basile, A.

Corresponding author:
Francesco Tiralongo

tiralongofrancesco91@hotmail.it

Author Affiliation:
University of Catania.

ADMINISTRATIVE INFORMATION

Support - No specific funding or sponsorship.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 2 November 2025 and was last updated on 2 November 2025.

INTRODUCTION

Review question / Objective In adults with primary adhesive capsulitis refractory to conservative management, what are the clinical outcomes and safety of transarterial embolization (TAE) compared with baseline and, where available, alternative treatments?

Rationale Primary adhesive capsulitis (AC) is characterized by inflammation, capsular fibrosis, and peri-articular neovascularization associated with pain. TAE targets abnormal neovessels to reduce pain and improve function. Evidence has grown but remains methodologically heterogeneous; an updated, registered synthesis will clarify benefits, harms, and evidence certainty, and reduce duplication.

Condition being studied Primary adhesive capsulitis ("frozen shoulder") in adults (≥18 years), excluding secondary capsulitis due to other shoulder pathologies.

METHODS

Search strategy MEDLINE via PubMed; Scopus. (If available: Embase via Ovid; Web of Science.) Full line-by-line examples:
Pubmed
("adhesive capsulitis"[Title/Abstract] OR "frozen shoulder"[Title/Abstract])
AND
(embolization[Title/Abstract] OR embolisation[Title/Abstract] OR "transcatheter arterial embolization"[Title/Abstract] OR "shoulder artery embolization"[Title/Abstract] OR TAE[Title/Abstract])
NOT (animals[MeSH Terms] NOT humans[MeSH Terms])

Scopus
(TITLE-ABS-KEY("adhesive capsulitis" OR "frozen shoulder"))
AND
(TITLE-ABS-KEY(embolization OR embolisation OR "transcatheter arterial embolization" OR "shoulder artery embolization" OR TAE))

AND (PUBYEAR > 1999)
AND (LIMIT-TO(LANGUAGE, "English")).

Participant or population Inclusion: Adults (≥18) with primary AC refractory to conservative therapy (typically ≥3 months of symptoms despite medication/injection/physiotherapy).
Exclusion: Secondary capsulitis related to rotator cuff tear, calcific tendinitis, infection, malignancy, prior shoulder surgery, or inflammatory arthritis. For mixed populations, include only if primary AC data are reported separately; otherwise exclude.

Intervention Transarterial embolization (TAE) of abnormal peri-articular neovessels supplying the glenohumeral/pericapsular structures. Any access (radial/femoral/brachial) and embolic agent (e.g., imipenem–cilastatin suspension/particles, calibrated microspheres, ethiodized-oil emulsion). Co-interventions (e.g., physiotherapy) will be extracted.

Comparator Not required. If available: pre-post within-subject baseline; alternative non-operative treatments; manipulation under anesthesia; arthroscopic release.

Study designs to be included Prospective or retrospective cohorts and case series with ≥10 patients; randomized or quasi-randomized trials (if any). Exclude case reports and series <10 patients, narrative reviews, editorials, non-English, and studies before 2000. (Design choices reflect feasibility and adverse-event capture for interventional evidence.)

Eligibility criteria Population: As per Item 12; English language; 2000–present to capture modern TAE techniques.
Intervention: As per Item 13.
Comparator: Not required.
Outcomes: Must report at least pain (VAS/NRS) or a validated functional score at ≥1-month follow-up.
Study design: As per Item 15.
Rational, pre-specified restrictions minimize bias and empty-review risk; any post-registration changes will be justified and sensitivity-tested.

Information sources MEDLINE (PubMed), Scopus (and, if available, Embase, Web of Science), trial registries (ClinicalTrials.gov, WHO ICTRP), and reference lists/forward citations.

Main outcome(s) Pain intensity (VAS or NRS), at prespecified windows: ≤3 months, 3–6 months, and 6–12 months. Include change from baseline when available; endpoint values otherwise. Undesirable outcomes (harms) will always be captured.

Additional outcome(s) Functional scores (ASES, QuickDASH, SANE); range of motion (flexion, abduction, internal/external rotation); clinical success (author-defined); technical success; re-interventions; analgesic reduction; adverse events classified per SIR/CIRSE/CTCAE/Clavien-Dindo (major/minor).

Data management Two independent reviewers will screen titles/abstracts and full texts; disagreements resolved by consensus or a third reviewer. Data will be extracted in duplicate using a piloted template (study design, setting, eligibility, sample size, demographics/comorbidities, imaging work-up, TAE details—access, target arteries, embolic agent/dose, vessels embolized, fluoroscopy time—co-interventions, follow-up schedule, all outcomes and time points, adverse events, funding/conflicts). Decisions and forms will be managed in a shared spreadsheet or SR software; version control maintained.

Quality assessment / Risk of bias analysis Non-randomized studies: ROBINS-I (two reviewers, consensus adjudication).
Randomized trials: Cochrane RoB 2.
Case series (≥10): JBI checklist for case series.
Quality of evidence for key outcomes will be graded with GRADE (domains: risk of bias, inconsistency, indirectness, imprecision, publication bias).

Strategy of data synthesis Primary plan: narrative synthesis due to expected heterogeneity. If ≥3 sufficiently homogeneous studies report the same metric at comparable time points, conduct random-effects meta-analysis (REML):
Continuous outcomes: mean difference (MD) or standardized mean difference (Hedges g) with 95% CIs. Prefer change scores; if only endpoints, meta-analyze endpoints. If change-score SDs are missing, impute using correlation r = 0.5 (sensitivity r = 0.25–0.75).
Proportions (clinical success, AEs): logit-transformed proportions under random effects with 95% CIs.
Heterogeneity: τ^2 and I^2; explore via prespecified subgroups.
Small-study effects: funnel plot and Egger's test if ≥10 studies.
Assumptions and conversions (e.g., median/IQR to mean/SD) will follow standard methods and be documented.

Subgroup analysis Embolic agent (imipenem–cilastatin vs microspheres vs ethiodized-oil), access route (radial vs femoral), disease phase (acute/intermediate/late, if reported), baseline symptom duration (<6 vs ≥6 months), diabetes vs no diabetes. Keep subgroups limited and prespecified to avoid spurious findings.

Sensitivity analysis Exclude studies at serious/critical ROBINS-I risk; exclude very small cohorts; vary imputed correlation for change-score SDs; re-analyze excluding studies with unclear AC phenotype or major protocol deviations. Consistency across sensitivity sets will increase robustness.

Language restriction English-language studies only (documented a priori).

Country(ies) involved Italy.

Keywords Adhesive capsulitis; frozen shoulder; shoulder artery embolization; transarterial embolization; interventional radiology; musculoskeletal pain.

Dissemination plans Manuscript submission to a peer-reviewed interventional/musculoskeletal radiology journal and presentation at radiology/IR meetings.

Contributions of each author

Author 1 - Francesco Tiralongo - conceiving the review; designing the review; coordinating the review; data collection; data management; analysis of data; interpretation data; writing the protocol or review; providing funding; conceived the review; designed protocol; search strategy; screening; data extraction; risk of bias; analysis; interpretation; drafting; critical revision; guarantor.
Email: tiralongofrancesco91@hotmail.it
Author 2 - Alessandra Pittari - designing the review; data collection; data management; analysis of data; interpretation data; writing the review; conceived the review; designed protocol; search strategy; screening; data extraction; analysis; interpretation; drafting.
Email: alessandrapittari@gmail.com
Author 3 - Giuliana Rosta - designing the review; interpretation data; writing the protocol; screening; interpretation.
Email: giulianarosta@gmail.com
Author 4 - Antonio Basile - conceiving the review;coordinating the review;providing funding; conceived the review; interpretation; drafting; critical revision; guarantor.
Email: basile.antonello73@gmail.com