



‘Frozen shoulder’ is ill-defined. How can it be described better?

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- Frozen shoulder, a common and debilitating shoulder complaint, has been the subject of uncertainty within the scientific literature and clinical practice.
- We performed an electronic PubMed search on all (1559) articles mentioning ‘frozen shoulder’ or ‘adhesive capsulitis’ to understand and qualify the range of naming, classification and natural history of the disease. We identified and reviewed six key thought leadership papers published in the past 10 years and all (24) systematic reviews published on frozen shoulder or adhesive capsulitis in the past five years.
- This revealed that, while key thought leaders such as the ISAKOS Upper Extremity Council are unequivocal that ‘adhesive capsulitis’ is an inappropriate term, the long-term and short-term trends showed the literature (63% of systematic reviews assessed) preferred ‘adhesive capsulitis’.
- The literature was divided as to whether or not to classify the complaint as *primary only* (9 of 24) or *primary and secondary* (9 of 24); six did not touch on classification.
- Furthermore, despite a systematic review in 2016 showing no evidence to support a three-phase self-limiting progression of frozen shoulder, 11 of 12 (92%) systematic reviews that mentioned phasing described a three-phase progression. Eight (33%) described it as ‘self-limiting’, three (13%) described it as self-limiting in ‘nearly all’ or ‘most’ cases, and six (25%) stated that it was not self-limiting; seven (29%) did not touch on disease resolution.
- We call for a data and patient-oriented approach to the classification and description of the natural history of the disease, and recommend authors and clinicians (1) use the term ‘frozen shoulder’ over ‘adhesive capsulitis’, (2) use an

updated definition of the disease which recognizes the often severe pain suffered, and (3) avoid the confusing and potentially harmful repetition of the natural history of the disease as a three-phase, self-limiting condition.

Keywords: adhesive capsulitis; classification; frozen shoulder; naming; natural history; phases; primary; secondary

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Introduction

Frozen shoulder, despite being a common and debilitating complaint, is a subject of considerable uncertainty both within scientific literature and clinical practice. Even its name is a topic of serious contention in the medical profession; across papers published over the past 70 years, alternative names put forward or utilized in leading journals have included ‘adhesive capsulitis’,¹ ‘fibrotic capsulitis’,² ‘primary idiopathic stiff shoulder’,³ and ‘contracture of the shoulder’.⁴ These terms have all been applied to the painful, debilitating contraction of the shoulder⁵ which has been the subject of many attempts at definition. Most of these attempts do not deviate far from that given by Codman in 1934,⁶ usefully provided in updated terminology by Bunker in 2009:

‘This is a condition which comes on slowly with pain over the deltoid insertion, inability to sleep, painful incomplete elevation and external rotation, the restriction of movement being both active and passive, with a normal radiograph, the pain being very trying and yet all patients are able to continue their daily habits and routines.’⁴

There have been very few notable improvements on Codman’s definition. For example, the American Shoulder and Elbow Surgeons (ASES) in their 2011 consensus paper provided the following definition, agreed by 82% of the 190 member clinicians who responded:

‘Frozen shoulder is a condition characterized by functional restriction of both active and passive shoulder motion for which radiographs of the glenohumeral joint are essentially unremarkable except for the possible presence of osteopenia or calcific tendonitis’⁷

While the ASES definition provides a simple, understandable definition for clinicians and patients, it does not mention pain at all; a very serious aspect of the disease particularly from a patient perspective.

Despite this inconsistency in definitions, the literature is at least relatively uniform in the description of the symptoms (insidious sleep-disturbing pain and stiffness,^{8–13} thickening of ligaments,^{14–16} contraction of the joint and reduced articular volume,^{2,17,18} or healing-associated biological reactions^{2,3,18}) and diagnosis (presence of the above symptoms in the face of a normal radiograph).^{2,3,6} Although assessment of symptoms is fairly consistent, consensus quickly breaks down when it comes to the naming, classification and natural history of the disorder. This is a serious concern, and one that we believe negatively impacts understanding of this relatively prevalent

disorder and research into improving that understanding, communication to patients of what they can expect, and – most importantly – the clinical treatment they receive.

We aim, through analysis of the available literature, to assess how the medical and scientific community understands frozen shoulder, identify inconsistencies, and inform clinicians and researchers as to how best to describe the condition to patients and in the literature.

Material and methods

To illustrate the uncertainty within the profession with respect to naming, classification and natural history, we analysed the literature in detail, including a meta-assessment of all articles on PubMed that have mentioned either ‘frozen shoulder’ or ‘adhesive capsulitis’, key thought leadership pieces from the past 10 years, and all systematic reviews published on the topic in the past five years. The six thought leadership articles from the past 10 years were identified through criteria of either consistent citation by journals, particular scientific importance and validity of content or being a consensus paper published by an august body. Thirty-nine systematic reviews published on PubMed with mentions of ‘frozen shoulder’ or ‘adhesive capsulitis’ in the past five years (since 2014) were identified. Of these, 15 were excluded after full-text revision due to mentioning the disease only incidentally, leaving 24 for analysis (Fig. 1).

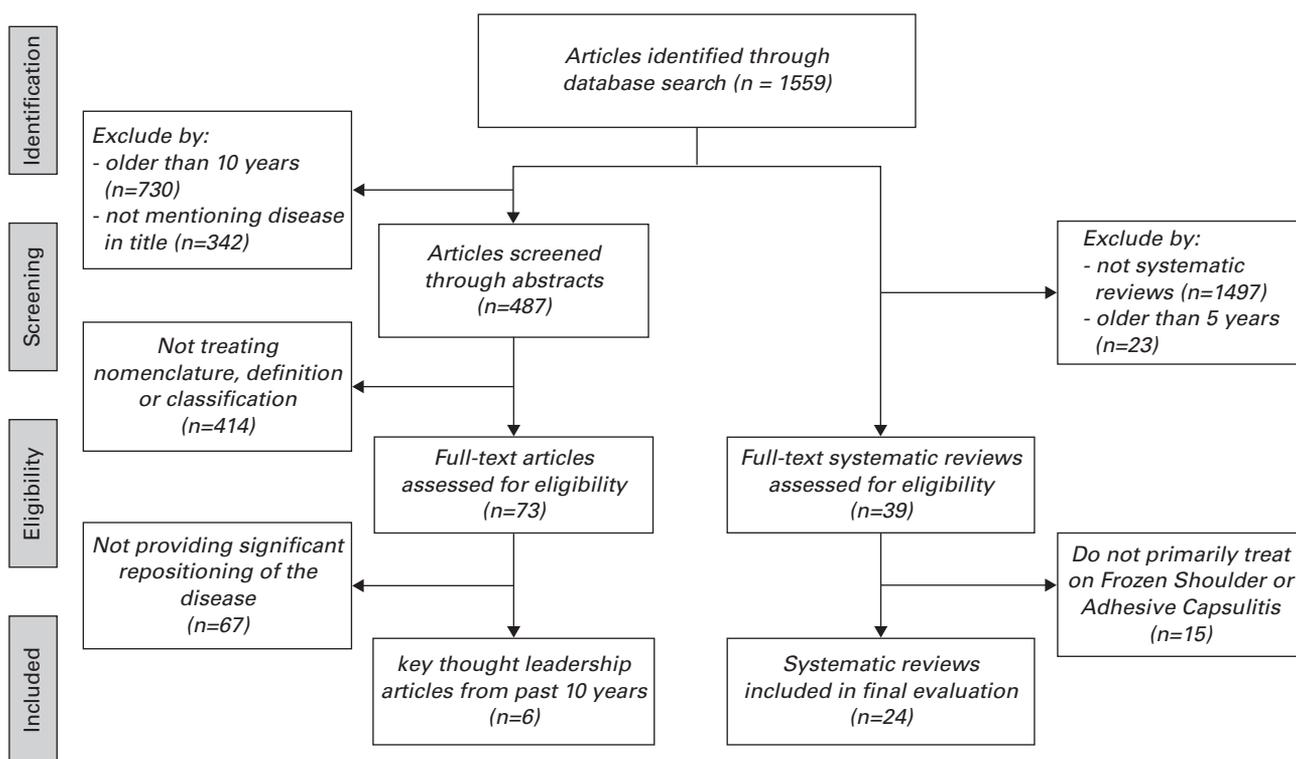


Fig. 1 Inclusion criteria for review of thought leadership and systematic reviews.

Nomenclature and classification

For some thought leaders,^{3,19} including the ISAKOS Upper Extremity Council, the term ‘frozen shoulder’ should only be applied to shoulder stiffness in the absence of an identifiable cause, while any stiffness with a known cause should be termed ‘secondary shoulder stiffness’ (they suggest ‘adhesive capsulitis’ should be discarded because adhesions are not consistently observed). For others,^{2,7,17,18} either frozen shoulder or adhesive capsulitis are broader terms which describe onset of the above symptoms whether primary (idiopathic), or secondary (with an identified cause).

Of the 24 systematic reviews analysed, we found that two (8%) used the term ‘frozen shoulder’ exclusively, seven (29%) used ‘adhesive capsulitis’ exclusively, seven (29%) used frozen shoulder predominantly but mentioned adhesive capsulitis, and eight (33%) used adhesive capsulitis predominantly but mentioned frozen shoulder (Fig. 2).

When classifying the disorder as either ‘primary only’ or ‘primary and secondary’, nine (37%) of 24 systematic reviews defined it as ‘primary only’, nine (37%) as ‘primary and secondary’ and six (25%) did not touch on classification. In addition to this, sub-categorization can be problematic: in the aforementioned consensus survey of ASES, in which 85% of respondents agreed that ‘frozen shoulder’ should include both primary and secondary types, only 66% agreed with the proposed sub-division of

secondary frozen shoulder into ‘extrinsic, intrinsic and systemic’.⁷ Elsewhere, authors have described the disorder in the presence of diabetes (a known risk factor)^{20,21} as an entirely separate category to primary or secondary.¹⁸

Poor understanding of how a disorder is defined can lead to sub-optimal patient management and hinder research endeavours. Study of the literature itself becomes very difficult. If nomenclature or definition is inconsistent across studies of the disease, then how does one draw conclusions across studies? An understanding or analysis of the prevalence, risk factors and health economics of the disease also becomes difficult, if not impossible. Finally, and most importantly, poor understanding will inevitably have a deleterious effect on treatment of the disease itself;⁴ ‘frozen shoulder’ as a term does not give a sense of the severe pain (described as a constant burning)¹⁸ suffered by patients, which is a primary aspect of the disease as described in all 30 systematic reviews assessed (100%). The alternative term, ‘adhesive capsulitis’, suggests the presence of adhesions, something which Neviaser, who coined the term¹, neither found nor wanted to convey.¹⁹ Use of either of these terms without attendant explanation may lead to confusion for patients, clinicians or both, potentially resulting in incorrect or unnecessary treatment and poor patient outcomes.⁴ Additionally, while bodies such as ISAKOS and ASES have published their preference for the term ‘frozen shoulder’, there is a clear discordance with the trends in the literature and in the wider world. For example, at the time of writing, the term ‘frozen

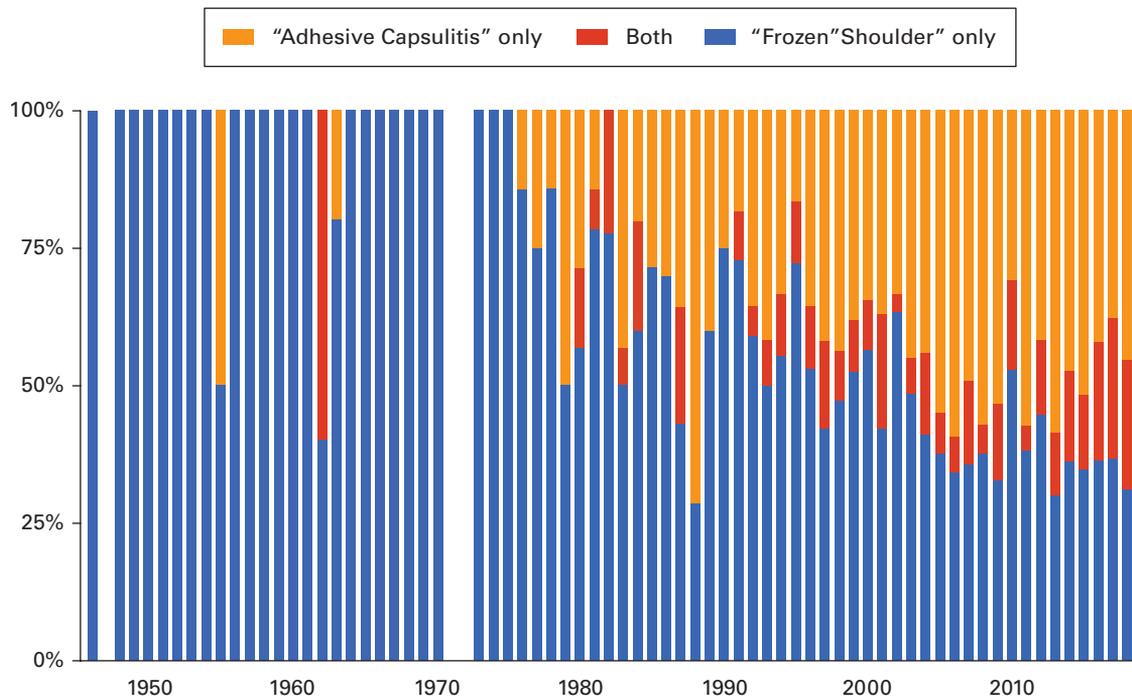


Fig. 2 Proportional instances of keywords ‘frozen shoulder’ and/or ‘adhesive capsulitis’ in PubMed.

shoulder’ on Wikipedia re-directs the reader to the entry for ‘adhesive capsulitis’,²² which presents to the general public an impression that the latter term is the correct one, despite the entry using the term ‘frozen shoulder’ and ‘adhesive capsulitis’ interchangeably (27 vs. 24 uses respectively).

Natural history

If nomenclature and classification of frozen shoulder has been fraught with disagreement, the natural history of the disorder has suffered much more serious misunderstanding, probably due to the careless propagation of poorly supported conclusions.

Throughout medical journals, text books^{23,24} and official documentation of population-wide medical services such as the National Health Service (NHS) in the United Kingdom,²⁵ advice is given that those who suffer from this

disorder should expect to go through three progressive phases of pain, stiffness and gradual recovery, as initially proposed by Reeves in 1975.²⁶ While all the studies reviewed concur that patients experience both pain and restriction of movement, the timing and extent of these symptoms is a matter of debate. Frozen shoulder is often described as ‘self-limiting’,²⁷ meaning that recovery will be achieved over time, regardless of treatment approach. Out of the 24 systematic reviews assessed, eight (33%) described frozen shoulder or adhesive capsulitis as ‘self-limiting’ in all cases; three (13%) described it as such in ‘nearly all’ or ‘most’ cases; six (25%), stated that it was not self-limiting or was previously believed to be; and seven (29%) did not mention disease resolution (see Table 1).

While various alternatives to the three-phase model have been proposed, including two-phase,¹⁷ four-phase²⁸ and phaseless⁸ descriptions, 11 out of the 12 systematic reviews which mention phasing perpetuate the three-phase model.

Table 1. Reviews, systematic reviews and meta-analyses treating frozen shoulder or adhesive capsulitis in the last five years

Author	Year	Journal	Study design	Disease name used (1st / 2nd)	Definition references	Etiology	Phases	Self-limiting?
Kitridis et al ³⁰	2019	<i>Am J Sports Med</i>	Network MA	AC	–	I & II	3	Yes
Alsubheen et al ⁸	2018	<i>Arch Phys Med Rehabil</i>	SR	AC / FS	Hsu et al, 2016 (<i>J Diabetes Investig</i>)	I & II	0	No
Suh et al ³³	2018	<i>Eur Radiol</i>	SR + MA	AC / FS	Hsu et al, 2011 (<i>JSES</i>)	I	–	–
Yang et al ³²	2018	<i>Evid Based Complement Alternat Med</i>	SR + MA*	AC / FS	Tighe and Oakley et al, 2008 (<i>South Med J</i>)	I & II	–	Yes
Saltychev et al ³¹	2018	<i>Scand J Surg</i>	SR + MA	AC	–	–	–	Yes
Tran et al ³⁴	2018	<i>Arthritis Care Res (Hoboken)</i>	SR	AC	–	–	–	–
Lin et al ³⁵	2017	<i>Arch Phys Med Rehabil</i>	SR + MA	FS / AC	–	I	3	Yes
Wu et al ³⁶	2017	<i>Sci Rep</i>	SR + MA*	FS / AC	–	–	–	–
Wang et al ³⁷	2017	<i>Medicine</i>	MA	AC / FS	Grey et al, 1978 (<i>JBJS Am</i>)	I	3	No
Catapano et al ³⁸	2017	<i>PM R</i>	SR	AC	Vastamäki et al, 2012 (<i>CORR</i>)	–	3	No
Prodromidis et al ³⁹	2016	<i>JBJS</i>	SR + MA	FS / AC	–	I & II	–	No, historically yes
Eljabu et al ⁴⁰	2016	<i>Arch Orthop Trauma Surg</i>	SR	FS	Shaffer et al, 1992 (<i>JBJS Am</i>)	I	3	Yes
Wong et al ²⁹	2016	<i>Physiotherapy</i>	SR	FS / AC	–	I & II	–	No
Ryan et al ⁴¹	2016	<i>BMC Musculoskelet Disord</i>	SR	FS	Codman et al, 1934 (<i>Ed. Thomas Todd</i>)	I & II	–	–
Koh et al ⁴²	2016	<i>Singapore Med J</i>	SR†	AC / FS	Hsu et al, 2011 (<i>JSES</i>), Neviasser et al, 2011 (<i>J Am Acad Orthop Surg</i>), Zuckerman et al, 2011 (<i>JBJS Br</i>)	I & II	3	No, historically yes
Sun et al ⁴³	2017	<i>AJSM</i>	SR + MA*	FS / AC	Dias et al, 2005 (<i>BMJ</i>), Gam et al, 1998 (<i>Scand J Rheumatol</i>)	–	3	Not always
Xiao et al ⁴⁴	2016	<i>Clin J Sport Med</i>	R	AC / FS	–	I & II	3	Yes
Noten et al ¹⁰	2016	<i>Arch Phys Med Rehabil</i>	SR	AC	–	I	3	Usually
Sun et al ¹²	2016	<i>Medicine</i>	SR + MA*	AC	–	–	3	–
Uppal et al ¹³	2015	<i>World J Orthop</i>	SR	FS	Codman et al, 1934 (<i>Ed. Thomas Todd</i>)	I & II	–	–
Lee et al ⁹	2015	<i>Biomed Res Int</i>	SR†	AC	–	I	–	–
Page et al ⁴⁵	2014	<i>Cochrane Database Syst Rev</i>	R	AC / FS	Codman et al, 1934 (<i>Ed. Thomas Todd</i>), Neviasser et al, 1945 (<i>JBJS</i>), Reeves et al, 1975 (<i>Scand J Rheumatol</i>)	I	–	Usually
Page et al ⁴⁶	2014 (b)	<i>Cochrane Database Syst Rev</i>	R	AC / FS	Codman et al, 1934 (<i>Ed. Thomas Todd</i>), Neviasser et al, 1945 (<i>JBJS</i>), Reeves et al, 1975 (<i>Scand J Rheumatol</i>)	I	–	Usually
Song et al ⁴⁷	2014	<i>PM R</i>	R	AC / FS	Tasto et al, 2007 (<i>Sports Med Arthrosc Rev</i>), Neviasser et al, 2011 (<i>J Am Acad Orthop Surg</i>), Hannafin et al, 2000 (<i>Clin Orthop</i>)	I	3	Yes

Note. R, review; SR, systematic review; MA, meta-analysis; AC, adhesive capsulitis; FS, frozen shoulder.
 †Of randomized controlled trial.

The remaining systematic review²⁹ indicated that there was no evidence supporting a phased approach and was the only study where the description was based solely on evidence from randomized controlled trials (RCTs). They showed that there was no objective data published to validate either the theory of spontaneous resolution to normal range of motion, or that of progression through phases of pain, then stiffness, then resolution. The descriptions given in the 11 other systematic reviews relied on low-quality evidence or secondary sources. Despite this, recent articles continue to employ the same poorly supported description of the natural history of frozen shoulder.^{30–32}

Recommendations

The main causes for confusion surrounding frozen shoulder stem from disagreement on how to name, classify and describe the natural history of the disorder. This appears to be getting worse rather than better, as evidenced by our analysis of terminology on PubMed since it first appeared over 70 years ago. There is, in the literature, a clear lack of scientific measurement of the known aspects of frozen shoulder (insidious sleep-disturbing pain, reduced range of active and passive motion, thickening of ligaments, contraction of the joint and reduced articular volumes, healing-associated biological reactions in spite of a normal radiograph where osteopenia or calcific tendonitis is not present) from onset until resolution, or not. Varying approaches to diagnosis, management techniques, and heterogeneity in the measurement of symptoms makes forming a meaningful consensus on natural history from the current literature extremely challenging or impossible. Currently it is not clear in which scenarios it would be appropriate to classify, sub-classify or re-classify the disease, or whether sub-groups of patients such as those with predisposing conditions like diabetes mellitus should be considered within these classifications at all.

A study applying a more rigorously empirical approach across a large sample and an appropriate time period, paying particular attention to the challenges described above, would lead to a clearer understanding of the natural history and appropriate phasing of the disease, and thus to more informed, measurable and comparable management. It may also become apparent that, in some instances, the terms and phases currently used are not appropriate and that new classifications or definitions are required. Until we have this data-driven model however, we make the following recommendations. Firstly, we add our voice to those of ISAKOS and ASES in encouraging the use of ‘frozen shoulder’ as the preferred term rather than ‘adhesive capsulitis’, as the former has a longer history and the latter incorrectly suggests the presence of adhesions. Secondly, while we commend the ASES definition⁷

for its clarity, we suggest an updated version to include reference to the often debilitating pain experienced by patients:

‘Primary frozen shoulder is a condition characterized by *often severe shoulder pain* and functional restriction of both active and passive shoulder motion in which radiographs of the glenohumeral joint are essentially unremarkable’.

Thirdly and finally, we entreat authors and clinicians to avoid repeating the description of the disease as a ‘three-phase, self-limiting condition’. We recommend using rather the best-evidenced natural history available of the disease as one ‘which often sees short-term improvement, but which bears a high chance of ongoing low-level restriction and pain’.²⁹ This may reduce the considerable confusion currently apparent in the literature and within the profession. More seriously, it may avoid distress and potential harm to the proportion of patients for whom the disease does not follow the predominantly described path to resolution, even when receiving the most appropriate treatment.

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