

Trends in Practice Among Shoulder Specialists in the Management of Frozen Shoulder

A Consensus Survey

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Background: The management of frozen shoulder (FS) differs depending on experience level and variation between scientific guidelines and actual practice.

Purpose: To determine the current trends and practices in the management of FS among shoulder specialists and compare them with senior shoulder specialists.

Study Design: Consensus statement.

Methods: A team of 15 senior shoulder specialists (faculty group) prepared a questionnaire comprising 26 questions regarding the definition, terminology, clinical signs, investigations, management, and prognosis of FS. The questionnaire was mailed to all the registered shoulder specialists of Shoulder and Elbow Society, India (SESI) (specialist group; n = 230), as well as to the faculty group (n = 15). The responses of the 2 groups were compared, and levels of consensus were determined: strong (>75%), broad (60%-74.9%), inconclusive (40%-59.9%), or disagreement (<40%).

Result: Overall, 142 of the 230 participants in the specialist group and all 15 participants in the faculty group responded to the survey. Both groups strongly agreed that plain radiographs are required to rule out a secondary cause of FS, routine magnetic resonance imaging is not indicated to confirm FS, nonsteroidal anti-inflammatory drugs should be administered at bedtime, steroid injection (triamcinolone or methylprednisolone) is the next best option if analgesics fail to provide pain relief, passive physical therapy should be avoided in the freezing phase, <10% of patients would require any surgical intervention, and patients with diabetes and thyroid dysfunction tend to fare poorly. There was broad agreement that routine thyroid dysfunction screening is unnecessary for women, a single 40-mg steroid injection via intra-articular route is preferred, and arthroscopic capsular release (ACR) results in a better outcome than manipulation under anesthesia (MUA). Agreement was inconclusive regarding the use of combined random blood sugar (RBS) and glycosylated hemoglobin versus lone RBS to screen for diabetes in patients with FS, preference of ACR versus MUA to treat resistant FS, and the timing of surgical intervention. There was disagreement over the most appropriate term for FS, the preferred physical therapy modality for pain relief, the most important movement restriction for early diagnosis of FS, and complications seen after MUA.

Conclusion: This survey summarized the trend in prevalent practices regarding FS among the shoulder specialists and senior shoulder surgeons of SESI.

Keywords: frozen shoulder; adhesive capsulitis; shoulder; survey; trend; consensus

Frozen shoulder (FS) is a common cause of shoulder pain and stiffness. It develops without any specific trauma or underlying disease process.²³ The prevalence of FS is estimated to affect 2% to 5% of the population,^{4,60} with peak incidence observed between the ages of 40 and 60 years.²⁸

Although the primary FS is idiopathic, 2 medical conditions are typically associated with it: diabetes mellitus and thyroid dysfunction.^{5,59,71} FS has been one of the most debated shoulder conditions, from its terminology (eg, “frozen shoulder” vs “adhesive capsulitis” vs “periarthrosis of the shoulder”) to the most optimal treatment and prognosis.²³

Many concepts about the FS are now well-established, such as the role of diabetes as a risk factor; physical therapy (PT) is the key to improving function in the frozen and

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thawing stages of the FS, and nonoperative treatment is successful in more than 90% of patients.^{34,64} However, many practices are still being debated, such as the relevance of the 3 clinicopathological stages (freezing, frozen, and thawing); the role of radiographic imaging in a clinically confirmed case of FS; the optimal screening blood test in patients with FS if one must rule out diabetes and thyroid dysfunction; the timing of analgesics; route, dose, and number of steroid injections; treatment of choice if nonoperative treatment fails; and prognostic factors.

Apart from their level of expertise, surgeons treat FS according to available literature and guidelines for appropriate management. Aside from the presence of objective scientific evidence, multiple subjective factors may influence their decisions, such as regional versus institutional practices, state versus privately funded health care, the impact of medical conferences, recent updates and advances, and the personal experience of the surgeon.³² This variability between objective scientific evidence and subjective factors results in variability in decision-making. When so many variables affect the treatment of FS, it is essential to achieve a level of consensus among surgeons when managing this condition. It is also important to have consensus between general orthopaedic surgeons and shoulder specialists.

Surveys among peers with variable experience help bridge this divide of scientific evidence versus subjective experience, as one gets to evaluate the consensus regarding the pathological condition with many contentious issues, which would further help standardize the understanding and management of the condition. Although a few surveys about FS have already been conducted by various shoulder societies,^{9,31,32} many practical aspects about the FS have not been discussed in those surveys.

The purpose of this survey-based study was to determine the current trends and practices in the management of FS among shoulder specialists and to compare them with those of senior shoulder specialists. We believe that surveys among experienced shoulder surgeons and other younger shoulder surgeons will be a great tool to understand the similarities and contrasts in FS practice and may help iron out the disparities in practices.

METHODS

As part of an initiative taken on behalf of the scientific committee of the Shoulder and Elbow Society, India (SESI), 15 senior shoulder specialists (faculty group) who each had more than 15 years of experience in shoulder surgery framed a preliminary questionnaire. After considerable deliberation, discussions, and suggestions, all faculty group

members approved the final questionnaire, which comprised 26 questions covering relevant practices concerning the definition, clinicopathological staging, clinical diagnosis, imaging, and management of FS (Appendix Table A1).

The questionnaire was then emailed on May 25, 2020, in Google Doc format to all the registered shoulder specialists of SESI at that time (n = 230; specialist group), in addition to being sent separately to the faculty group (n = 15). The single-response form was not editable once submitted. The survey continued for 10 days, with repeated reminders to the SESI members.

The survey results were analyzed by comparing the percentage of surgeons in each group who opted for a particular response. For each question, the level of consensus between the groups was categorized as strong (>75% of the respondents),¹² broad (60%-74.9%), inconclusive (40%-59.9%), or disagreement (<40%). In case of variation in consensus level between the groups regarding a specific practice, the lower of the 2 percentages was considered for overall consensus categorization. For ease of understanding, the results were divided into 3 categories according to current trends and practices: part A, terminology for FS, clinical presentation, and investigations in patients with FS; part B, clinicopathological staging and nonoperative treatment; and part C, surgical treatment and prognostic factors. Since this survey study did not involve patient-specific or animal data, institutional ethics committee approval was not required.

The definition of FS was adopted from the Upper Extremity Committee of the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS), which states that the term “frozen shoulder” should be used exclusively to describe the primary idiopathic stiff shoulder: “[FS] develops without any trauma or specific shoulder disease period. If a patient has a condition linked to a stiff shoulder but is not known to cause the stiffness specifically, it will still be considered idiopathic. Examples include predisposing factors such as diabetes, thyroid conditions, Dupuytren contracture, smoking, etc.”²³

RESULTS

All 15 members of the faculty group and 142 of the 230 members (61.7%) of the specialist group responded to the survey. Most specialist surgeons (57%) had more than 10 years of experience in performing shoulder arthroscopies (Figure 1), and 54.3% of specialist surgeons performed more than 50 shoulder arthroscopies per year (Figure 2). The essential findings of the survey among the specialist group and faculty group, along with levels of consensus among the responses, are discussed below.

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Ethical approval was not sought for the present study.

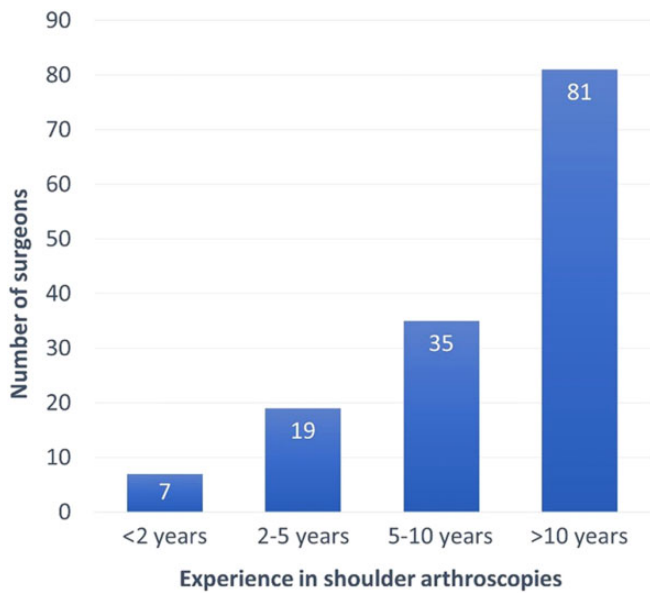


Figure 1. Bar chart showing experience performing shoulder arthroscopy among the specialist surgeons who participated in the survey.

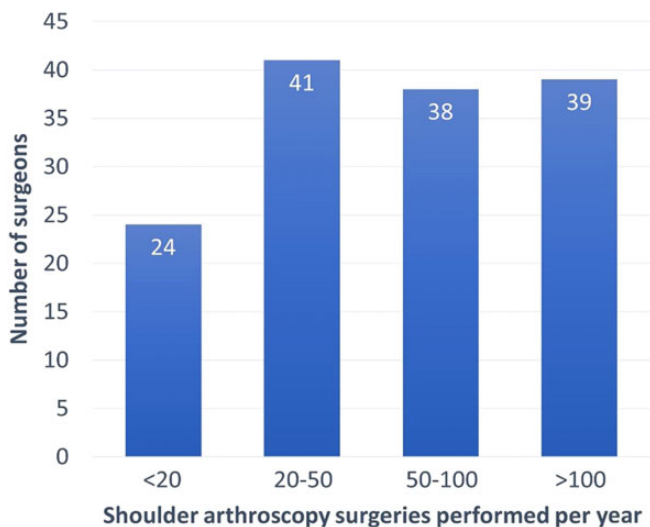


Figure 2. Bar chart showing shoulder arthroscopy surgeries performed per year by the specialist surgeons who participated in the survey.

Part A: Trends and Consensus Regarding the Terminologies and Definition of FS, Clinical Signs, and Investigations

Table 1 shows the percentages of the responses for each item according to group. Results are summarized here.

- *Item 1: Terminology of FS.* Both groups remained indecisive over individual terminology used to address FS. While 39.4% of the specialist group preferred “adhesive

capsulitis,” 58.3% of the faculty group called it “frozen shoulder.”

- *Item 2: ISAKOS definition of FS.* Both the specialist (67.6%) and the faculty (83.3%) groups were aware of the definition of FS by ISAKOS.
- *Item 3: Movement restriction crucial to diagnosing early FS.* Both groups remained indecisive regarding which movement restriction is most critical in making the clinical diagnosis of FS.
- *Item 4: Use of plain radiographs after clinical diagnosis of FS is established.* Surgeons in both groups had a strong consensus (specialist, 75.4%; faculty, 75%) that a plain radiograph of the shoulder is a must to rule out any secondary condition causing a stiff shoulder.
- *Items 5 and 6: Performing MRI or USG if plain radiographs are normal.* Both groups strongly agreed (specialist, 80.4%; faculty, 100%) that routine magnetic resonance imaging (MRI) or ultrasonography (USG) is not warranted to confirm the clinical diagnosis of FS and should be done only if there is doubt in the primary diagnosis.
- *Item 7: USG versus MRI to confirm the diagnosis of FS if required.* Both specialist and faculty groups strongly agreed (specialist, 85.2%; faculty, 83.3%) that MRI is preferred over USG to establish the diagnosis of FS, if needed, as the former is more reliable than the latter.
- *Item 8: Screening blood test of choice to rule out diabetes.* While the specialist group strongly agreed (91%) that they prefer to perform random blood sugar (RBS) and hemoglobin A1c (HbA1c) tests together to rule out patients who are normoglycemic prediabetic, the faculty group remained indecisive (50%) over the tests being performed concurrently. Further, 41.7% of surgeons of the faculty group do not perform routine serum glucose evaluation until there is clinical suspicion.
- *Item 9: Thyroid function testing in female patients.* Surgeons of both groups broadly agreed (specialist, 61.8%; faculty, 66.7%) that routine screening of the thyroid with thyroid-stimulating hormone (TSH) is not required and should be done only if there is clinical suspicion.

Part B: Trends and Consensus Regarding Clinicopathological Stages and Medical Treatment

Table 2 shows the percentages of the responses for each item according to group. Results are summarized here.

- *Item 10: Following the “freezing,” “frozen,” and “thawing” staging system.* The majority of surgeons in both groups broadly agreed regarding the staging system to treat FS (specialist, 66.9%; faculty, 66.7%).
- *Item 11: Timing of nonsteroidal anti-inflammatory drugs (NSAIDs)/other analgesics.* Both groups strongly agreed (specialist, 82.5%; faculty, 84.3%) that they advise their patients to take analgesics at bedtime.
- *Item 12: Drug of choice if NSAIDs fail to relieve pain within 2 to 3 weeks.* Surgeons of both groups strongly agreed (specialist, 83.1%; faculty, 100%) that they prefer to give steroid injections if NSAIDs fail to alleviate pain. However, if NSAIDs failed to alleviate pain, 13.4% of the

TABLE 1
Survey Results Concerning Terminology, Definition, Sign, and Investigations^a

Group	Response
(1) Terminology of FS	
Specialist	Adhesive capsulitis (39.4%); frozen shoulder (16.2%); frozen shoulder or adhesive capsulitis (25.4%); peri-arthritis of the shoulder (4.9%); any terminology is acceptable (14.1%)
Faculty	Frozen shoulder (58.3%); adhesive capsulitis (25%); frozen shoulder or adhesive capsulitis (16.7%); peri-arthritis of the shoulder (0%); any terminology is acceptable (0%)
(2) Aware of ISAKOS definition of FS	
Specialist	Yes (67.6%); no (32.4%)
Faculty	Yes (83.3%); no (16.7%)
(3) Which movement restriction is important for diagnosis of FS?	
Specialist	Rotation (38.7%); abduction and rotation (31.7%); global (28.2%)
Faculty	Rotation (33.3%); abduction and rotation (33.3%); global (33.3%)
(4) Should plain x-ray be always asked after clinical diagnosis of FS?	
Specialist	Yes (75.4%); no (19%); only if doubt of secondary pathology (5.6%)
Faculty	Yes (75%); no (0%); only if doubt of secondary pathology (25%)
(5) If plain x-ray is normal, should routine MRI or USG be performed to confirm the diagnosis of FS?	
Specialist	No (35.9%); only if doubt of secondary cause (44.5%); yes, routinely (19.6%)
Faculty	No (66.7%); only if doubt of secondary cause (33.3%); yes, routinely (0%)
(6) Are you aware that USG can be performed to diagnose FS?	
Specialist	Yes (73.2%); no (26.8%)
Faculty	Yes (83.3%); no (16.7%)
(7) Among USG/MRI, which one should be used to diagnose FS if required?	
Specialist	MRI (85.2%); USG (14.8%)
Faculty	MRI (83.3%); USG (16.7%)
(8) Screening blood test of choice in patients with FS (RBS, RBS + HbA1c)	
Specialist	RBS and HbA1c (91%); only RBS (7.7%); do not do routinely until doubt (1.3%)
Faculty	RBS and HbA1c (50%); only RBS (8.3%); do not do routinely until doubt (41.7%)
(9) Do you perform TSH in a woman with FS?	
Specialist	Yes (38.2%); no (30.3%); only if doubt of condition (31.5%)
Faculty	Yes (33.3%); no (25%); only if doubt of condition (41.7%)

^aFS, frozen shoulder; HbA1c, hemoglobin A1c; ISAKOS, International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine; MRI, magnetic resonance imaging; RBS, random blood sugar; TSH, thyroid-stimulating hormone; USG, ultrasonography.

specialist group also mentioned exploring other options, such as centrally acting analgesics (opioids), an anticonvulsant class drug such as pregabalin, and nerve block. However, the faculty group surgeons did not show an interest in other measures.

- *Item 13: Preferred injectable steroid drug, dose, and site.* Both groups strongly agreed on triamcinolone (TA) over methylprednisolone (MP) (specialist, 76.3%; faculty, 87.6%) as an injectable steroid drug. Regarding dose, the specialist group broadly agreed (72.1%) on a 40-mg dose over 80 mg, and the faculty group strongly agreed (93.8%) on 40 mg. Further, both groups broadly agreed (specialist, 67.6%; faculty, 66.7%) that their preferred injection site is intra-articular rather than subacromial.
- *Item 14: Preferred injection method (blind vs USG guided vs fluoroscopic).* Both specialists and the faculty group strongly agreed (specialist, 77.5%; faculty, 83.3%) that they use a blind clinical technique guided by the anatomical landmarks to inject the steroid into the desired site.
- *Item 15: Number of steroid injections.* Both groups strongly pitched for a single steroid injection shot,

followed by 1 more injection after 3-4 weeks if there is no response (specialist, 90.8%; faculty, 100%). Repeated injections were barely preferred (2.8%, specialist group only).

- *Items 16 and 17: Preferred pain-relieving PT method in the freezing phase.* While the specialist group remained divided over various modalities of therapy for pain relief (moist heat, short-wave diathermy, laser therapy, ultrasound therapy), the faculty group strongly agreed (75%) that they do not ask for any pain-relieving therapy in the acute phase. Furthermore, both groups strongly agreed (specialist, 87.5%; faculty, 93.4%) that the physical therapist should avoid passive manipulation therapy in the freezing phase.
- *Items 18 and 19: Use and timing of HD.* In both groups, more than three-quarters of surgeons did not perform hydrodilatation (HD) (specialist, 76.1%; faculty, 81.3%). Regarding timing to perform HD, the groups opted for different approaches. The specialist group broadly agreed (66.1%) to perform HD during the early frozen phase (11.9% in freezing phase, 22% in the late frozen phase), while the faculty group strongly agreed (100%) to perform HD only during the early frozen phase.

TABLE 2
Survey Results Concerning Medical Practices to Manage FS^a

Group	Response
(10) Do you follow the classic “freezing,” “frozen,” and “thawing” staging system for FS?	
Specialist	Yes (66.9%); no (19.7%); I do not believe in the staging system (13.4%)
Faculty	Yes (66.7%); no (16.7%); I do not believe in the staging system (16.7%)
(11) Timing of analgesics to be taken in FS	
Specialist	Night at bedtime (82.5%); time does not matter (5.5%); morning (8.5%); afternoon (3.5%)
Faculty	Night at bedtime (84.3%); time does not matter (13.3%); morning (2.4%); afternoon (0%)
(12) If pain fails to respond to NSAIDs, what should be added?	
Specialist	Steroid injection (83.1%); oral cortisone (3.5%); other (13.4%)
Faculty	Steroid injection (100%); oral cortisone (0%); other (0%)
(13) Preferred site, drug and dose for steroid injection	
Specialist	intra-articular (67.6%); subacromial (15.5%); TA 40 mg (58%); TA 80 mg (18.3%); MP 40 mg (14.1%); MP 80 mg (4.7%); I do not give injections at all (4.9%)
Faculty	intra-articular (66.7%); subacromial (33.3%); TA 40 mg (81.3%); TA 80 mg (6.3%); MP 40 mg (12.5%); MP 80 mg (0%); I do not give injections at all (0%)
(14) Preferred method of local steroid injection	
Specialist	Blind, using bony and soft tissue landmarks (77.5%); USG guided (16.9%); fluoroscopy guided (5.6%)
Faculty	Blind, using bony and soft tissue landmarks (83.3%); USG guided (16.7%); fluoroscopy guided (0%)
(15) How many steroid injections do you prefer to give?	
Specialist	Single shot only (50%); second shot repeated after 4-6 wk if there is no response to first injection (40.8%); 2-3 injections repeated after 2-3 wk (2.8%); no injections at all (6.3%)
Faculty	Single shot only (58.3%); second shot repeated after 4-6 wk if there is no response to first injection (41.7%); 2-3 injections repeated after 2-3 wk (0%); no injections at all (0%)
(16) Preferred pain-relieving physical therapy method (eg, SWD, IFT, US)	
Specialist	Leave it to physical therapist (28.9%); combination (27.5%); I do not believe in any hot/cold therapy (23.9%); US (13.4%); SWD (6.3%)
Faculty	Leave it to physical therapist (6.3%); combination (16.7%); I do not believe in any hot/cold therapy (75%); US (13.4%); SWD (6.3%)
(17) Do you prefer passive mobilization by physical therapist in freezing phase?	
Specialist	Yes (12.5%); no (87.5%)
Faculty	Yes (6.6%); no (93.4%)
(18) Do you prefer HD in treating FS?	
Specialist	No (76.1%); yes (23.9%)
Faculty	No (81.3%); yes (18.7%)
(19) If you perform HD, what is the timing?	
Specialist	Early frozen phase (66.1%); late frozen phase (22%); freezing phase (11.9%)
Faculty	Early frozen phase (100%); late frozen phase (0%); freezing phase (0%)

^aFS, frozen shoulder; HD, hydrodilataion; IFT, interferential therapy; MP, methylprednisolone; NSAID, nonsteroidal anti-inflammatory drug; SWD, short-wave diathermy; TA, triamcinolone; US, ultrasound; USG, ultrasonography.

Part C: Trends and Consensus Regarding Surgical Treatment and Prognostic Factors

Table 3 shows the percentages of the responses for each item according to group. Results are summarized here.

- *Item 20: ACR versus MUA if nonoperative treatment fails.* While the specialist group broadly agreed on arthroscopic capsular release (ACR; 73.9%), the faculty group remained indecisive between opting for ACR or continuing nonoperative treatment (56.3% vs 37.5%). Manipulation under anesthesia (MUA) remained the least preferred among both groups (specialist, 10.6%; faculty, 6.3%).
- *Item 21: Timing of ACR or MUA.* Both groups were balanced between 4 to 6 months (specialist, 40.8%;

faculty, 50%) and 7 to 9 months (specialist, 38.7%; faculty, 43.8%) and therefore remained indecisive. None preferred intervening before 4 months, and there were few takers after 9 months (specialist, 16.2%; faculty, 6.3%).

- *Item 22: Percentage of patients requiring ACR or MUA.* Both groups strongly agreed (specialist, 80.9%; faculty, 87.6%) that <10% of patients require any surgical treatment, and nonoperative treatment should be given a sincere attempt as most patients improve with nonoperative options.
- *Item 23: Comparison of results between ACR and MUA.* While the specialist group broadly agreed (72.5%) that ACR provides a better result in their personal clinical experience (published or unpublished) than MUA, the faculty group strongly advocated for ACR over MUA (81.3%).

TABLE 3
Survey Results Concerning Surgical Practices and Prognostic Factors^a

Group	Response
(20) Preferred surgical treatment option, MUA vs ACR	
Specialist	ACR (73.9%); MUA (10.6%); neither, just nonoperative treatment (15.5%)
Faculty	ACR (56.3%); MUA (6.3%); neither, just nonoperative treatment (37.5%)
(21) Most optimal time to perform ACR or MUA	
Specialist	4-6 mo (40.8%); 7-9 mo (38.7%); 9-12 mo (16.2%); >12 mo (4.2%)
Faculty	4-6 mo (50%); 7-9 mo (43.8%); 9-12 mo (0%); >12 mo (6.3%)
(22) What percentage of your patients undergo MUA/ACR if nonoperative treatment fails?	
Specialist	<5% of patients (57.7%); 5%-10% of patients (23.2%); 10%-15% of patients (8.5%); >15% of patients (10.6%)
Faculty	<5% of patients (68.8%); 5%-10% of patients (18.8%); 10%-15% of patients (6.3%); >15% of patients (6.3%)
(23) Which procedure in your practice has given better results as per your published/unpublished experience?	
Specialist	ACR (72.5%); MUA (7%); equivocal (20.4%)
Faculty	ACR (81.3%); MUA (6.3%); equivocal (12.5%)
(24) Have you encountered any complications after MUA?	
Specialist	Yes (47.2%); no (52.8%)
Faculty	Yes (62.5%); no (37.5%)
(25) Most common complication with MUA	
Specialist	Fractures of proximal humerus (26.1%); rotator cuff tear (20.4%); labral tear (4.9%)
Faculty	Fractures of proximal humerus (32%); rotator cuff tear (25.4%); labral tear (5.1%)
(26) Do you think that patients with diabetes or hypothyroid fare poorly and take longer to recover than those without diabetes or a euthyroid condition?	
Specialist	Patients with diabetes and hypothyroid fare poorly (87.3%); no difference between those without diabetes, hypothyroid vs other (12.7%)
Faculty	Patients with diabetes and hypothyroid fare poorly (92.3%); no difference between those without diabetes, hypothyroid vs other (7.7%)

^aACR, arthroscopic capsular release; MUA, manipulation under anesthesia.

- *Items 24 and 25: Complications of MUA.* While the specialist group remained indecisive (47.2%) about the possibility of complications after MUA, the faculty group broadly agreed (62.5%) that they had seen quite a few complications of MUA. Both groups concluded that the most common complication after MUA is a proximal humeral fracture, followed by rotator cuff tear.
- *Item 26: Prognosis of FS in patients with diabetes or thyroid disorder.* Both groups strongly agreed (specialist, 87.3%; faculty, 92.3%) that patients with diabetes and hypothyroid fare poorly compared with patients with normoglycemia or a euthyroid condition.

Levels of Consensus

The consensus over various practices is summarized in Table 4.

DISCUSSION

The most significant finding of our survey is that we have strong agreements on several pertinent issues: plain radiographs are a must in a patient with FS, routine MRI is futile to establish the diagnosis of FS, steroid injections are the next best option if NSAIDs fail to control pain, passive mobilization in the freezing phase of FS should be avoided, <10% of patients with FS require surgical treatment, and patients with diabetes and thyroid dysfunction fare poorly compared

with patients with normoglycemia and a euthyroid condition. Furthermore, surgeons broadly agreed that routine screening of TSH in women with FS should be avoided, a 40-mg dose is preferred over 80-mg dose, intraarticular injection is preferred over subacromial injection, and HD (if performed) should be done in the early frozen phase. They remained indecisive over performing RBS and glycosylated hemoglobin together to screen patients with diabetes, the preferred surgical treatment (ACR or MUA), and the optimal timing of ACR or MUA.

Trends and Consensus Regarding Terminology, Definition, Signs, and Investigations

The most acceptable and appropriate terminology regarding FS is still debated globally.^{9,23,29} The terms “frozen shoulder,” “adhesive capsulitis,” and “periartthritis of the shoulder” and some other local terms (eg, *gojukata* in Japan) have been used at the surgeon’s convenience.^{9,23,29} Our survey observed that both groups interchangeably used “frozen shoulder” and “adhesive capsulitis” with minimal use of “periartthritis of the shoulder.” ISAKOS guidelines suggest that the most acceptable term is “frozen shoulder” and discourage using the term “adhesive capsulitis,” as there are no adhesions in the joint.²³ A single common term across the globe for a condition for a particular disease would help researchers in various search portals during the literature review process.

TABLE 4
Levels of Consensus Regarding Various Practices of FS^a

Strong Agreement (>75%)	Broad Agreement (60%-74.9%)	Inconclusive (40%-59.9%)	Disagreement (<40%)
Part A: Terminology, Definition, Signs, and Investigation			
<ul style="list-style-type: none"> ■ Plain x-ray is required after clinical diagnosis of FS to rule out an underlying secondary cause ■ Routine MRI is not required if x-rays are normal ■ Between MRI and USG, MRI is the investigation of choice, if one needs to be done 	<ul style="list-style-type: none"> ■ Routine TSH is not required to screen women with FS who are clinically euthyroid 	<ul style="list-style-type: none"> ■ RBS and HbA1c are the screening blood tests of choice in patients with FS who are normoglycemic 	<ul style="list-style-type: none"> ■ Terminology of FS (FS/AC/PA) ■ Restriction of a particular movement important for the diagnosis of FS
Part B: Clinicopathological Stages and Medical Treatment			
<ul style="list-style-type: none"> ■ Analgesics to be taken at night in FS ■ Steroid injection is the next step if there is no pain relief with analgesics ■ Triamcinolone is the preferred injectable steroid drug ■ Single-shot steroid, repeat after 3-4 wk if required ■ The blind clinical technique is the preferred method of local steroid injection ■ Avoid passive mobilization PT in the freezing phase ■ HD is not a standard practice in FS treatment 	<ul style="list-style-type: none"> ■ Belief in classic clinicopathologic 3-stage system to treat FS ■ An intra-articular injection is preferred over subacromial ■ For steroid injection, 40-mg dose is preferred ■ If performed, HD should be performed in the early frozen phase 	<ul style="list-style-type: none"> ■ None 	<ul style="list-style-type: none"> ■ Leave preferred pain-relieving PT method (SWD, IFT, US) to the physical therapist
Part C: Surgical Treatment and Prognostic Factors			
<ul style="list-style-type: none"> ■ <10% patients require surgical intervention ■ Patients with diabetes and thyroid dysfunction fare poorly and take a longer time to recover 	<ul style="list-style-type: none"> ■ Clinical results of ACR are better than those of MUA 	<ul style="list-style-type: none"> ■ ACR is the preferred surgical treatment option in FS over MUA ■ The optimal time to perform ACR or MUA (4-6 mo/7-9 mo) ■ Possibility of complications during MUA 	<ul style="list-style-type: none"> ■ None

^aAC, adhesive capsulitis; ACR, arthroscopic capsular release; FS, frozen shoulder; HbA1c, hemoglobin A1c; HD, hydrodilataion; IFT, interferential therapy; MRI, magnetic resonance imaging; MUA, manipulation under anesthesia; PA, periarthritis shoulder; PT, physical therapy; RBS, random blood sugar; SWD, short-wave diathermy; TSH, thyroid-stimulating hormone; US, ultrasound; USG, ultrasonography.

Limitation of Any Particular Movement as a Sign of FS. The specialist and faculty groups did not agree on the restriction of any particular movement as one of the earliest signs of FS. The faculty group gave equal importance to all 3 movement restrictions (external and internal rotations, abduction, and global), and the specialist group favored restricted rotations above other combinations of restrictions. Although the ISAKOS group summarized the clinical findings of FS as “the typical finding in the FS is a global reduction of the range of motion, by definition in 2 or more planes, and equal in passive and active examination,” the group suggested that limitation of external rotation is the earliest sign observed in FS.²³

Utility of Radiological Investigation in Established FS. Although taking a plain radiograph of the shoulder is essentially normal in patients with FS, both groups

strongly agreed (>75%) that one must acquire a plain radiograph of the shoulder to rule out any underlying secondary cause, such as calcific tendinitis, glenohumeral arthritis, or a neoplastic process that classifies a stiff shoulder as a secondary stiff shoulder.²³ Further, disuse osteopenia of the humeral head is not uncommon in FS, and that should alert the surgeon if MUA is planned.⁴⁶

Furthermore, both groups strongly agreed that if the plain radiograph is normal, there is no need to proceed with an MRI or USG to confirm the diagnosis of FS unless there is a doubt. Also, both groups preferred MRI over USG to confirm the diagnosis of FS and rule out any underlying pathology, as the former can detect other intra-articular pathologies, has higher diagnostic accuracy, and has a lesser possibility of interobserver variation than USG.⁶⁹ However, USG is quick, relatively inexpensive, and widely

available to patients with reasonable sensitivity and specificity.¹⁶ Future research is needed to compare USG with MRI for aiding in the diagnosis of FS.

Screening Serological Investigation. While the faculty group remained indecisive, specialist surgeons strongly agreed that HbA1c and RBS assessment should be done together rather than RBS alone to screen for diabetes in a patient who is not known to have it to avoid not identifying those who have prediabetes.

It is widely accepted that FS is common and often severe in patients who have diabetes^{3,71} and thyroid dysfunction.^{11,22,59} Hence, it is essential to rule out diabetes and thyroid dysfunction unknown to the patient. To rule out diabetes, the American Diabetes Association recommends the assessment of fasting blood sugar (FBS, >126 mg%), glycosylated hemoglobin (prediabetes, 5.7%-6.4%; diabetes, ≥6.5%), or RBS (prediabetes, 140-199 mg%; diabetes, >200 mg%) in an outpatient setting to screen for diabetes.¹ However, in a clinical setting, the patient does not arrive fasting while visiting an orthopaedic surgeon for shoulder pain, which results in the inability to perform FBS. At the same time, RBS could often be <140 mg% in a patient who is prediabetic, resulting in missing the patient's prediabetic status, and his or her diagnosis would now depend on whether the clinician has asked for glycosylated hemoglobin. HbA1c detects the plasma sugar fluctuation over the past 3 months. Recent literature has discussed the association between those who are prediabetic and FS, which is why the assessment of HbA1c and FBS/RBS could be of interest.^{7,49,51} Several meta-analyses suggest that lone FBS or HbA1c is neither sensitive nor specific enough to detect prediabetes, and a combination of both might help detect prediabetes.^{2,25} In contrast, Safran et al⁵⁷ concluded that routine diabetes workup is not warranted in patients with FS. However, we believe that both (RBS/FBS and HbA1c) need to be evaluated as a standard screening method through future rigorous prospective studies to confirm their utility in detecting a patient who is prediabetic, compared with mere RBS/FBS.

Screening Thyroid Dysfunction, Especially in Women. The opinion between the 2 groups on this issue was divided. Milgrom et al⁴¹ reported that the prevalence of thyroid dysfunction as a risk factor for FS in an age-matched population is more common in women than men, with a risk ratio of 7.3 in women and 2.6 in men. Although thyroid dysfunction is more common in women,⁴³ we suggest that routine TSH screening in all female patients with FS without any clinical features of thyroid dysfunction may not be justified unless we have robust global data justifying the same.

Trends and Consensus Regarding Pathology and Medical Management

Clinicopathological Staging System. Both groups broadly agreed that following the clinicopathological staging system of FS with 3 stages helps them manage FS.^{45,55} It is generally agreed that pain control is the primary aim of the freezing stage by either NSAIDs or steroids. Once the

pain of the freezing stage eases, FS moves into the frozen stage, characterized by grossly restricted range of motion (ROM) and mild to moderate pain. Therefore, regular PT to improve ROM and occasional analgesics to relieve pain are essential for treating the frozen stage. With the gradual restoration of ROM and minimal pain, the FS moves into the third stage, thawing, wherein regular, sustained stretching exercises are advocated until symptoms are resolved. If the patient's ROM does not improve over several months in the frozen stage, surgical treatment can be advocated to hasten the recovery.⁴⁸ However, not many agree with the staging system in other surveys.³¹

Timing of Analgesics. To relieve the pain of FS, both groups strongly agreed that NSAIDs must be administered at bedtime. Since the pain in the FS is usually felt at night, disturbing sleep quality,^{44,63} it is prudent to administer analgesics at bedtime to provide adequate pain relief and improve sleep quality.⁴⁴ Of note, a short course of NSAIDs or any other analgesics does not alter the natural course of FS but enables the patient to carry out one's activities of daily living more comfortably and perform PT with ease.

Options if NSAIDs Fail to Provide Adequate Pain Relief. Both groups strongly agreed that injecting steroids is the next best option if the pain is not relieved by NSAIDs. Oral steroids were the least preferred option. Multiple studies have confirmed the strong evidence favoring steroid injections in improving pain and ROM compared with placebo in the short term, with moderate evidence in the midterm.^{15,65} Many randomized trials have confirmed that injectable steroids provide superior clinical results to oral steroids.^{37,67} Further, one must not forget the systemic side effects of oral steroids, such as avascular necrosis of the hip, even if administered for a short duration.⁴⁰ It may be prudent to avoid oral steroids for fear of raising blood sugar levels, as many patients with FS have diabetes.

Even though a few surgeons of the specialist group (13.4%) mentioned using other measures for pain relief (opioids, nerve blocks, pregabalin, etc) as the next step in case NSAIDs fail, the current literature shows no benefit of these measures in isolation.⁷⁰ These adjunct measures work best along with other standard treatments.⁷⁰

Steroid Injections. Surgeons in both groups also broadly agreed that the intra-articular site is preferred over the subacromial, and the preferred dose by most surgeons in both groups is 40 mg. A recent meta-analysis by Shang et al⁶¹ confirmed that improvement in pain and functional scores are better with intra-articular injection than subacromial injection, while blood glucose level is less altered with subacromial injection. Although none of our surgeons preferred a 20-mg dose, recent randomized trials confirmed no difference between 40- and 20-mg doses.^{27,68} Further, the literature rarely supports the use of doses higher than 40 mg.³⁹

Both groups strongly favored TA (specialist, 76.3%; faculty, 87.6%) over MP. A few studies have found TA slightly superior to MP in providing pain relief and improving ROM,^{10,58} while another author confirmed the superiority of MP.⁸ It is important to note that steroid injections risk a transient increase in blood glucose levels occurring within 1 to 5 days in patients with diabetes.⁶⁶ Hence, it seems that a

40-mg dose should be administered until it is proven that higher doses are more efficacious than lower ones.

Almost all surgeons in both groups agreed that a single steroid injection suffices in most situations, and another steroid injection can be given after 3 to 4 weeks if there was no response to the first one. Most surgeons strongly disagreed with the use of multiple injections at repeated intervals. In a study on 1377 patients, Erickson et al¹⁴ concluded a futility of multiple steroid injections over a single injection in patients with FS.

Most surgeons in both groups preferred the blind technique of steroid injection based on standard landmarks over sonography-guided injection. Although Song et al⁶² concluded in a systematic review that image-guided injection resulted in significant improvement in ROM, the superiority of image-guided injection over a blind technique needs further evaluation by more prospective comparative studies keeping the logistical and cost challenges of an image-guided procedure in mind.

Pain-Relieving PT in the Freezing Stage of FS. The beneficial role of PT is well-established in the frozen and thawing stages.^{15,19} However, many surgeons explore various adjunct pain-relieving options in the freezing stage and methods to retain and regain movement. While the specialist surgeon group remains divided over the most beneficial pain-relieving modality in the early painful stage of FS, the faculty group strongly agreed (>75%) that one must avoid any such measures in the acute stage.

Although the literature is replete with various modalities of pain-relieving PT, such as laser therapy, short-wave diathermy, ultrasonography, and hot packs,^{15,47} surgeons in another survey were also indecisive about the utility of the same.³¹ A Cochrane database review suggested very low or low-quality evidence in favor of electrotherapy modalities in isolation for achieving pain relief in FS, except for laser therapy and extracorporeal shock wave therapy.⁴⁷ Nevertheless, it is essential to understand that the impact of a single modality of PT on the natural course of FS is difficult to determine, as therapeutic modalities are typically applied as additional measures to other options, such as analgesics and steroids, and therapeutic exercises.²⁶

Further, most surgeons agreed that they were against passive capsular mobilization techniques in the acute freezing stage. The literature suggests that surgeons should avoid aggressive mobilization techniques of the shoulder to avoid exacerbation of pain,^{6,13} as low-grade PT programs show better results than high-intensity programs.^{24,56}

Use of HD. Most surgeons (>75%) in both groups did not prefer to perform HD, as they felt that it is more invasive than lone steroid injection, and its efficacy is similar to that of the steroid injection. Although several level 1 evidence studies have not found any difference between HD and steroid injection,^{35,50} few meta-analyses have found HD to be one of the most effective nonoperative measures in treating FS by significantly improving pain and function.^{33,70} We recommend more well-designed prospective trials to establish the utility of invasive HD over a lone steroid injection.

Trends and Consensus Regarding Surgical Practices and Prognostication

MUA and ACR. Both groups strongly agreed that <10% of patients require any surgical treatment, which is in concordance with the literature that nonoperative treatment of FS is successful in up to 90% of patients.^{54,64} Hence, a sincere effort of nonoperative treatment should suffice in most patients, and only a few would require any surgical intervention.

Further, our surgeons preferred ACR over MUA and had better results with ACR than MUA. However, the literature disagrees with this statement, as most studies have confirmed similar treatment outcomes with both options.^{36,53}

Although the 2 groups strongly agreed that either surgical intervention should be done between 4 and 9 months, the groups remained almost equally divided on whether intervention should occur early (4-6 months) or late (7-9 months). Although most of the literature supports surgical treatment between 6 and 9 months,^{52,54} a recent study concluded that the results of surgery before 6 months (mean, 3.8 months) or after 6 months (mean, 11.1 months) are similar. Furthermore, early intervention might shorten the overall duration of symptoms in FS and is not associated with inferior clinical outcomes when compared with late operative intervention.²¹

Regarding the safety of MUA, almost half the surgeons from both groups did experience some complications associated with MUA. However, they were not asked to specify whether the complications occurred with their patient or someone else's. The overall complication rate reported in the literature after MUA is 0.4%,³⁰ including fractures of the humerus, cuff and labral tear, and reflex sympathetic dystrophy.^{38,42,48} In a systematic review of 22 studies, Grant et al¹⁷ concluded that the complication rate with either procedure (MUA or ACR) is <0.5%. Interestingly, a recently published randomized trial by Rangan et al⁵³ concluded that ACR is a costlier procedure associated with more serious adverse events (4%) than MUA (1%).⁵³ Nevertheless, as ACR allows the surgeon to better watch the procedure and the fear of unwanted complications during MUA that might result in legal entanglement have prompted surgeons to shift their practice toward the ACR.

Given similar outcome and complication rates between the 2 procedures, we cannot provide a consensus statement in favor of or against either procedure. Well-designed prospective studies must be conducted to establish the clinical superiority and safety of the 2 procedures, MUA and ACR.

Prognostication of FS. Both groups strongly agreed that patients with diabetes and thyroid dysfunction fare poorly compared with those without diabetes and a euthyroid condition. Although the literature concludes that the recovery of patients with diabetes is poor and prolonged compared with the recovery of those without diabetes, by both nonoperative and operative treatment,^{18,20} more prospective studies are required to confirm the recovery pattern of patients with thyroid dysfunction.

Limitations

Although our study emphasizes consensus and disagreements in many practices, our research has some limitations.

First, our survey may have several biases. The survey covered only 62% of specialist shoulder surgeons registered with the society. However, other surveys, too, had similar or less response rates.^{9,31,32} Many more surgeons are performing shoulder surgeries but are not registered with SESI, resulting in nonresponse bias. Further, questionnaire bias could result from unanticipated communication barriers between the investigator and respondents that yielded inaccurate results. Desirability bias could have happened, as surgeons might have opted for a socially desirable response. Second, although the consensus in many practices in our survey is similar to the worldwide pattern, signifying that the sample covered is adequate, the unsurveyed shoulder specialists could have possibly affected certain responses via a sampling bias. Third, the opinion of surgeons varies according to their experience level. However, such a heterogeneous surgeon population is a norm in all general surveys. Fourth, we could not assess the effect of PT and other adjunct modalities in detail (hyaluronic acid injections, laser therapy, extracorporeal shock wave therapy, nerve blocks, etc) during the frozen and thawing phases, as we wished to avoid overcomplicating the survey. However, the effectiveness of PT and other adjunct therapies compared with a placebo is a well-documented fact.⁷⁰

CONCLUSION

This survey summarized the trend in prevalent practices regarding FS among shoulder specialists and senior shoulder surgeons of SESI. Surgeons have a strong and broad consensus regarding many practices, while they remain indecisive regarding many others. We recommend that the practices in which surgeons have remained indecisive or have strongly disagreed require well-designed prospective studies to understand the clinical utility or futility of the practice.

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APPENDIX

TABLE A1
The 26 Survey Questions Used in This Study^a

Item	Question
1	What do you prefer to call "frozen shoulder"?
2	Are you aware of the ISAKOS definition of frozen shoulder?
3	Restriction of which movement is important to make a diagnosis of frozen shoulder?
4	Is plain x-ray of the shoulder a must once the clinical diagnosis of the frozen shoulder is established?
5	If plain x-ray is normal, is it important to ask for MRI to establish the diagnosis of frozen shoulder and rule out other conditions?
6	Given a choice, which is your preferred investigation of choice, USG or MRI to establish the diagnosis of frozen shoulder?
7	Do you know that USG can also be done to confirm the diagnosis of frozen shoulder?
8	Which is the screening blood test to rule out diabetes (if the patient is not a known case of diabetes) of your choice if patient is suspected to have frozen shoulder?
9	Do you routinely perform thyroid function test (at least TSH) in a woman with frozen shoulder?
10	Do you follow the 3 clinicopathological stages (freezing, frozen, and thawing) while treating your patient with frozen shoulder?
11	What time of the day do you prescribe NSAIDs/other analgesic in frozen shoulder?
12	If pain fails to respond to NSAIDs, what is the most preferred measure you take for pain relief?
13	Which is your preferred drug (with dose) and route/site for steroid injection?
14	Which one is your preferred method of local steroid injection?
15	How many steroid injections do you prefer to give?
16	Which is your preferred "pain-relieving physical therapy" modality to relieve moderate to severe pain in frozen shoulder?
17	Do you avoid passive mobilization measures in early phase of frozen shoulder?
18	Do you prefer to use hydrodilatation of shoulder in your practice while managing frozen shoulder?
19	If you perform hydrodilatation, what is the most optimal time you select to do it? (This question can be skipped by people who do not perform hydrodilatation.)
20	If patient fails to respond to conservative treatment, what do you prefer to perform (MUA/ACR)?
21	If you prefer to perform MUA/ACR in refractory frozen shoulder, what is the most optimal time to perform the procedure after the onset of frozen shoulder?
22	What percentage of your patients with frozen shoulder undergo MUA/ACR if conservative therapy fails?
23	In your practice, which procedure (MUA/ACR) has given better results as per your published/unpublished experience?
24	Have you ever encountered any complications of MUA (performed either by you or by other surgeon) such as fracture, cuff tear, etc?
25	Which was the most common complication you encountered with MUA (in your hands/by someone else)?
26	Do you think that patients with diabetes or hypothyroid fare poorly and take longer time to recover compared with nondiabetics or those with euthyroid condition?

^aACR, arthroscopic capsular release; ISAKOS, International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine; MRI, magnetic resonance imaging; MUA, manipulation under anesthesia; NSAID, nonsteroidal anti-inflammatory drug; TSH, thyroid-stimulating hormone; USG, ultrasonography.