



# Treatment of Primary Shoulder Stiffness: Results of a Survey on Surgeon Practice Patterns in Italy

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## Abstract

**Objectives** Shoulder stiffness is a condition of restricted glenohumeral range of motion (ROM), which can arise spontaneously or as consequence of a known cause. Several treatment options are available and currently no consensus has been obtained on which treatment algorithm represents the best choice for the patient. The aim of this study was to investigate surgeon practice patterns in Italy regarding treatment of primary shoulder stiffness.

**Methods** A literature review was performed to identify randomized controlled trials reporting results of shoulder stiffness treatment. The following controversial or critical points in the treatment of primary shoulder stiffness were identified: modalities of physical therapy; indication for oral corticosteroid; indication and frequency for injective corticosteroid; technique and site of injection; and indication, timing, and technique for surgery. A survey composed by 14 questions was created and administered to the members of a national association specialized in orthopaedics and sports traumatology (SIGASCOT at the time of survey completion, recently renamed SIA-GASCOT after the fusion of the societies SIGASCOT and SIA).

**Results** A total of 204 completed questionnaires were collected. Physical therapy was recommended by 98% of the interviewed. The use of oral corticosteroids was considered by 51%, and injections of corticosteroids by 72%. The posterior injection approach was the one preferred and a number of three was considered the upper limit

## Keywords

- ▶ shoulder stiffness
- ▶ adhesive capsulitis
- ▶ frozen shoulder
- ▶ treatment
- ▶ steroid
- ▶ results
- ▶ review
- ▶ survey

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for repeated injections. Injective therapy with local anesthetics and hyaluronic acid was considered by more than 20% of the interviewed. Thirty percent of the interviewed did not treat shoulder stiffness surgically.

**Conclusion** Several approaches to shoulder stiffness have been proposed and high-level evidence is available to analyze and discuss their results. Several controversial points emerged both from a literature review and from this national survey. Treatment of shoulder stiffness should be tailored to the patient's clinical situation and the stage of its pathology and should aim at pain reduction, ROM restoration, functional regain, and shortening of symptoms duration, with conservative therapy remaining the mainstay of treatment.

## Introduction

Shoulder stiffness (SS) is defined as a condition of restricted active and passive glenohumeral range of motion (ROM). It can be classified into primary (or idiopathic forms, also known as "frozen shoulder") and secondary forms (which arise as a consequence of a known cause).<sup>1</sup>

Several risk factors have been described, nevertheless the exact etiology and pathology of primary SS have not been clarified yet: an unspecific underlying proinflammatory condition has recently been postulated to be a possible predisposing risk factor for the development of SS, which could explain also the known associations with hormonal and metabolic diseases, such as diabetes, hyper-, and hypothyroidism.<sup>2,3</sup> Several treatment options have been proposed to address primary SS, ranging from conservative therapies to surgical approaches. As a general rule, treatment of SS should begin addressing known risk factors, to avoid relapses; the treatment is completed by strategies for pain reduction, ROM restoration, functional regain, and shortening of symptoms duration. The choice between treatments needs to be tailored to the stage of shoulder pathology and to the patient's clinical situation. Although several studies have tried to outline the most appropriate treatment options, no consensus has been obtained on which treatment algorithm represents the best choice for the patient.

Between 2006 and 2014, the Cochrane Company summarized the evidence derived from the randomized controlled trials (RCTs) available at that time on different approaches to SS treatment.<sup>4-9</sup> More recently, a review of the literature was performed to identify RCTs reporting results of SS treatment from December 2005 onwards, updating the evidence-based indications provided by the Cochrane Company.<sup>10</sup> Analyzing the available evidences, several still controversial points have emerged. For this reason, a survey was proposed to the members of SIGASCOT (Società Italiana Ginocchio Artrosopia Sport Cartilagine Tecnologie Ortopediche), a national scientific society focusing on arthroscopy and sports traumatology (recently renamed SIAGASCOT - Società Italiana di Artrosopia, Ginocchio, Arto Superiore, Sport, Cartilagine, Tecnologie Ortopediche - after the fusion of the societies SIGASCOT and SIA), regarding the conservative and operative treatment of SS, with the aim to investigate their attitudes toward this frequent condition.

This article reports and discusses the results of the survey, comparing the gathered data with the results of the available studies with a high level of evidence, which should be considered a guide for clinical practice.

## Methods

### Study Design

The following controversial or critical points in the treatment of primary SS were identified through a literature review including the RCTs encompassed in the Cochrane systematic reviews (published between 2006 and 2014<sup>4-9</sup>) and all newer RCTs published from 2005 onwards<sup>10</sup>:

- Different modalities of physical therapy.
- Indication for oral corticosteroids.
- Indication, frequency, and timing for injective corticosteroids.
- Technique and site of injection for injective corticosteroids.
- Conservative treatments alternative to painkillers, physical therapy, and corticosteroids.
- Indication, timing, and technique for surgical treatment.

A cross-sectional survey draft was prepared by two orthopaedic surgeons and then optimized by the members of the SIGASCOT Basic Science Committee (currently renamed Comitato Scienza di Base SIAGASCOT), composed of basic and clinical researchers and orthopaedic surgeons. The drafting process included several iterations between the Basic Science Committee and external opinion leaders in shoulder surgery, resulting in a final version composed of 14 questions which was approved by the whole research team and by the SIGASCOT Board (and later on by the SIAGASCOT Board).

The survey was generated using an online format (<https://docs.google.com/forms>) and first distributed at the Society's national congress in October 2018 to all the participants. To further increase the response rate the survey was then sent to the active members using the Society's official e-mailing list together with a short message explaining the purpose and contents of the questionnaire. Members who agreed to respond gave an implicit informed consent to the treatment of their data in an anonymous way. Three reminders were then sent 6 weeks, 3 months, and 6 months after the initial

mailing. Possibly duplicated answer were sorted based on demographic and professional data and eliminated. The results of the survey were reported following specific guidelines.<sup>11</sup>

**Sample Size**

At the time of Survey completion and before the new SIAGASCOT society was created with the fusion of SIGASCOT and SIA, the SIGASCOT e-mail contacts were approximately 800, of which 90% working in Italy as orthopaedic surgeons. Based on a maximum total of 800 responses, at least 202 participants would be needed to achieve a statistical precision at 90% confidence intervals with a type I error rate of 5%.

**Data Collection and Procedure**

Completion of the questionnaire was voluntary, and no incentives were offered. Ethical approval for the study was not required. A pilot test, involving four health professional experts, was conducted to test the reliability of our survey by assessing the clarity and the accuracy of the items. The survey was comprised of two main sections: (1) general information—demographic data, region of origin, place(s) of work, education, and professional role; (2) personal attitudes toward the treatment of SS with references to both conservative and surgical approaches.

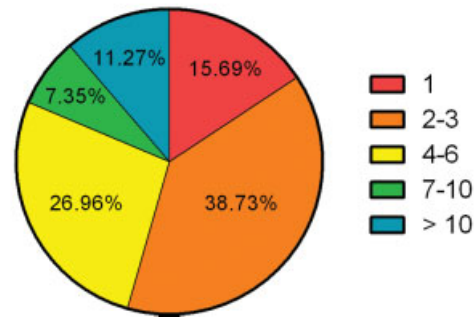
**Data Analysis**

Data obtained from the completed questionnaires were entered into a spreadsheet for analysis (Microsoft Excel Package Office 2007 for Windows). Statistical analysis and plotting of the data was then performed using GraphPad Prism v 6.0 software (GraphPad Software Inc.). The Kolmogorov–Smirnov normality test was used to evaluate the normal distribution of the sample. Continuous variables were expressed as the mean ± standard deviation or medians and first and third quartiles [Q1–Q3] as appropriate. Response rates were summarized in terms of proportions of respondents.

**Results**

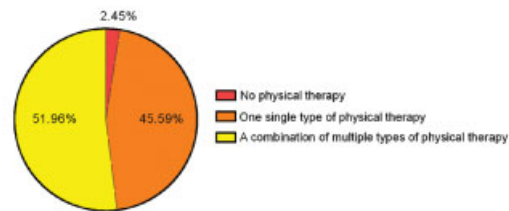
A total of 204 completed questionnaires were collected. The median age of the responders was 43 years (35–54). Thirty-seven percent of them practiced in northeast Italy, 22% in northwest, 20% in central Italy, and 22% in southern Italy, Sicily or Sardinia. Thirty-eight percent of the interviewed subjects were practicing as orthopaedic surgeons since 5 years or less, and 15% since 30 years or more. The majority of the interviewed subjects reported counseling between 4 and 6 patients affected by SS each month (→Fig. 1). Physical therapy was recommended by 98% of the responders, with a similar distribution between physician suggesting a single type of physiotherapy and those recommending a combination of different types of physical therapy (→Fig. 2A). The vast majority of the interviewed (88%) indicated passive rehabilitation as the preferred type of treatment (→Fig. 2B). The use of oral corticosteroids was considered by 51% of the interviewed, 19% of whom indicated them as their first choice of

**1. How many patients with shoulder stiffness do you see, on average, in a month?**

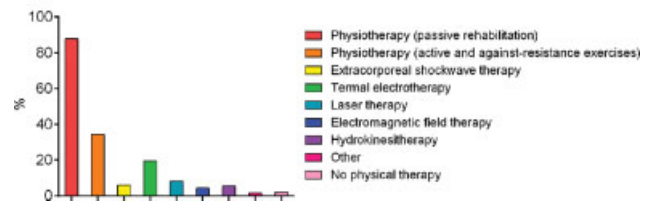


**Fig. 1** Distribution of answers to question number 1.

**2A. What kind of physical therapy do you recommend to your patients with shoulder stiffness?**



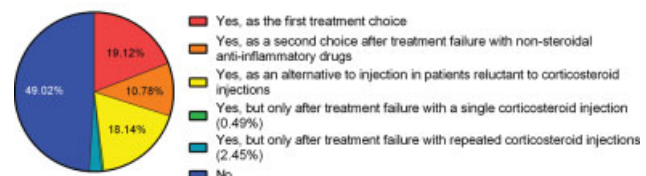
**2B. What kind of physical therapy do you recommend to your patients with shoulder stiffness?**



**Fig. 2** (A, B) Distribution of answers to question number 2.

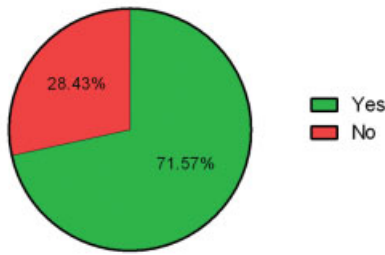
treatment (→Fig. 3). Injections of corticosteroids were considered by 72% of the interviewed (→Fig. 4A). Among those using injective steroids, 53% considered their use suitable both in stages I and II (→Fig. 4B) and one-third of them encouraged their administration as soon as the diagnosis of SS is made (→Fig. 4C). →Fig. 4D summarizes the timing choices according both to disease stage and response to physical therapy. The number of three injections was considered as an upper limit by over three-quarters of the surgeons using repeated corticosteroid injections, with only 8% considering acceptable to use more than three

**3. Do you use oral corticosteroids?**

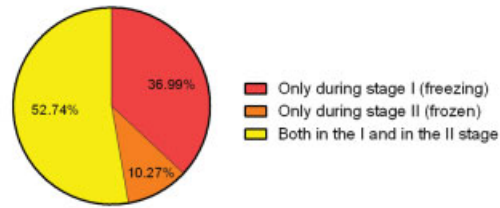


**Fig. 3** Distribution of answers to question number 3.

4A. Do you use corticosteroid injections?



4B. In which stage of the disease do you take corticosteroid infiltrations into consideration?



4C. How much time after the diagnosis do you take corticosteroid infiltrations into consideration?

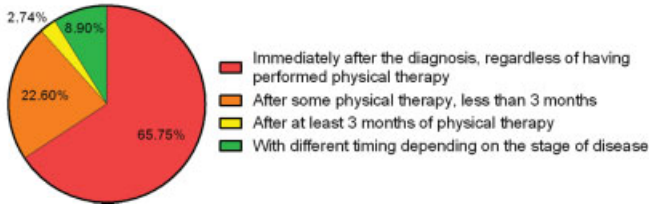


Fig. 4 (A–C) Distribution of answers to question number 4.

5. How many corticosteroid injections do you consider useful/necessary?



Fig. 5 Distribution of answers to question number 5.

injections (→Fig. 5). A quite variable attitude toward the distance between repeated injections was encountered (→Fig. 6). Ultrasound (US) guidance was regarded as unnecessary to assist injections by the half of those surgeons considering steroid injective therapy (→Fig. 7). The posterior approach was the preferred one to inject steroids in the shoulder and a double injection was considered by 20% of the surgeons (→Fig. 8). Among alternative treatments for SS, injections of local anesthetics and of hyaluronic acid were the only options considered by at least 20% of the interviewed surgeons (→Fig. 9). Hydrodilatation and manipulation under anesthesia were considered, respectively, by 13

6. If you use repeated injections, what is the distance between injections?

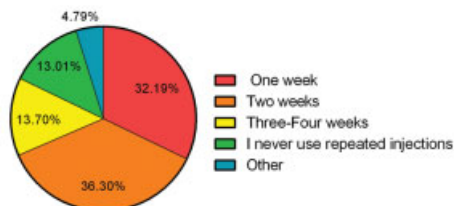


Fig. 6 Distribution of answers to question number 6.

7. Do you use ultrasound to guide corticosteroid injection?

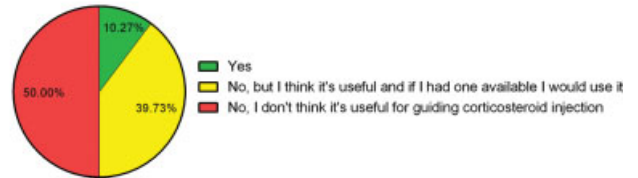


Fig. 7 Distribution of answers to question number 7.

8. How do you perform corticosteroid injections?

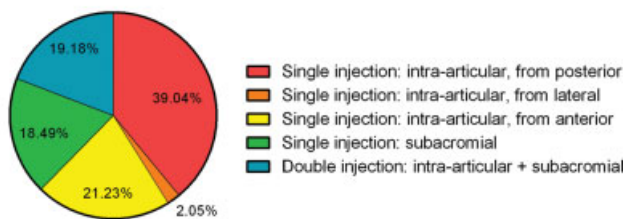


Fig. 8 Distribution of answers to question number 8.

9. Have you ever used some of these conservative treatment methods?

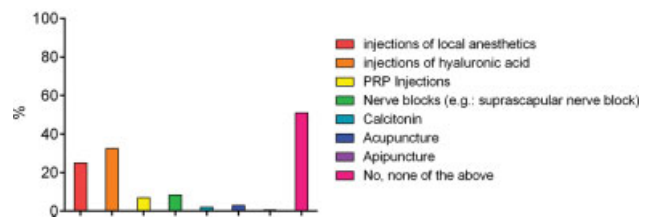


Fig. 9 Distribution of answers to question number 9.

10. Do you consider hydrodilatation?

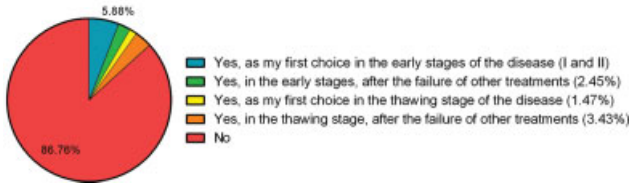


Fig. 10 Distribution of answers to question number 10.

11. Do you consider manipulation under anesthesia?

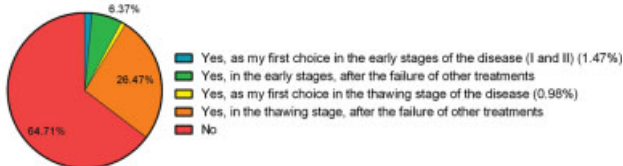


Fig.11. Distribution of answers to question number 11.

and 35% of the surgeons, across different stages of the disease (►Figs. 10 and 11). About 30% of the interviewed subjects declared not to treat SS surgically; of the remaining 70%, the majority allocated to surgery not more than 10% of the patients, with only 10% of the responders declaring to treat more than 10% of their patients surgically (►Fig. 12). Timing for surgical treatment was controversial (►Fig. 13); almost 40% of the interviewed declared to wait at least 6 months of noneffective conservative treatment before indicating surgery. Arthroscopic pancapsular release and arthroscopic capsular release associated to rotator interval release were the preferred approaches, equally distributed among the survey's participants, and clearly outnumbering open approaches (►Fig. 14).

12. In how many cases do you indicate surgery?

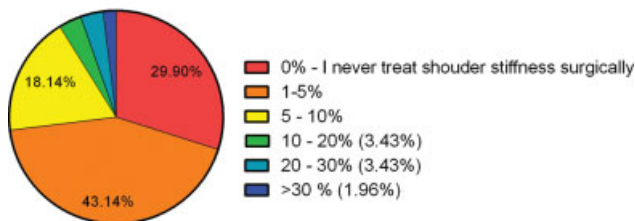


Fig. 12 Distribution of answers to question number 12.

13. After how many months of conservative treatment do you indicate surgery?



Fig. 13 Distribution of answers to question number 13.

14. What surgical technique do you use?

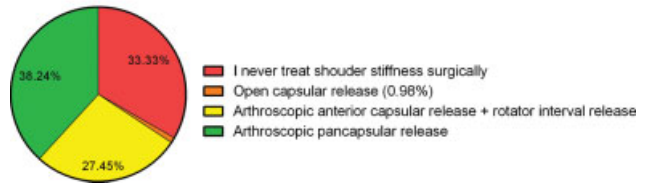


Fig.14. Distribution of answers to question number 14.

## Discussion

The results of this survey among the members of largest subspecific orthopaedic Italian society confirmed that a consensus among Italian orthopaedic surgeons regarding the treatment of SS does not exist yet. In particular, several different approaches are considered across the country and numerous points remain controversial, well reflecting the panorama of other European countries.<sup>12</sup> A good agreement among respondents on the treatment of this disease was only obtained regarding the indication to physical therapy and to injective corticosteroid.

### Medical Therapy

Oral steroids can reduce pain and disability and can improve ROM in the short term. Therefore, they may be indicated for short periods in patients without internistic contraindications to the administration of this medication.<sup>4</sup> Oral steroids were considered only by the half of the interviewed surgeons and only less than 20% of them considered oral steroids as a first-choice medication (►Fig. 3).

As opposed to these data, over 70% of the interviewed surgeons considered injective corticosteroids relevant for the treatment of primary SS (►Fig. 4A); within this subgroup, 53% considered their use suitable both in the I and in the II stages (►Fig. 4B) and one-third of them stated that the administration of injective corticosteroids is indicated as soon as the diagnosis of SS is made (►Fig. 4C).

Twelve trials investigating the role of injective corticosteroids in the treatment of primary SS were identified by the Cochrane Company, two of which suggested a possible early benefit and concluded that an intra-articular (IA) injection may be beneficial.<sup>7</sup> More recent literature confirmed that the use of corticosteroid injections in the treatment of idiopathic SS leads to fast pain relief and improves ROM, with superior results to nonsteroidal anti-inflammatory drugs.<sup>13,14</sup> Two meta-analyses recently summarized the available evidence on injective corticosteroid treatment for SS: both Wang et al (5 studies, 225 patients) and Sun et al (8 studies, 416 patients) confirmed that IA steroid injections are effective and safe and provide pain reduction, functional performance improvement, and ROM increase.<sup>15,16</sup> As compared with physiotherapy, no superiority was noted in favor of either treatment, but a single steroid injection was demonstrated to improve symptoms faster and provide greater external rotation.<sup>17</sup> A low dose of steroid should be preferred, since higher doses did not show a significant superiority.<sup>18,19</sup> No high-

level evidence indicates which is the ideal number of injections to choose, with most surgeons preferring not to inject steroids more than three times (►Fig. 5).

The widespread of US imaging permits to add it to the traditional localization of the injection site, guided by anatomical landmarks alone. In a recent publication, US-guided injections appeared to be more accurate and to yield to superior results as compared with blind injections,<sup>20</sup> updating the results of a previously published Cochrane Company review, which was unable to establish any advantage for US-guided injections.<sup>8</sup> The increased time required to perform the US-guided injections and the additional costs are issues to consider.<sup>20</sup> As a result, only 10% of the interviewed surgeons reported to use US imaging to guide injections and 50% of them reported that they do not see any additional benefit in this technique (►Fig. 7).

The injection site has also been postulated to possibly influence the clinical outcome: initial investigations indicated that the efficacy of a single corticosteroid injection was not related to the site of injection,<sup>21</sup> even though IA (glenohumeral) injections led to earlier pain relief compared with subacromial (SA) injections.<sup>22</sup> These results are currently a topic of open discussion: in 2015, Prestgaard et al reported superiority of steroid treatment to placebo but no significant differences between the IA and the combined IA + SA corticosteroid injections in a three-arm, double-blind, sham-controlled RCT.<sup>23</sup> On the contrary, in 2016 Cho et al presented the results of a RCT on 126 patients, which indicated that the efficacy of SA injections was inferior to IA injections up to 12 weeks. Furthermore, the authors suggested that a combination of both injections could have an additive effect on increasing the internal rotation, indicating that the SA space may be a contributing site, although the glenohumeral joint remains a major site in the pathogenesis of primary SS.<sup>24</sup> For this reason, multiple injections can be considered: for example, a three-site injection (posterior capsule, SA, and subcoracoid) was proposed as an alternative to the single-site injection: Pushpasekaran et al randomized 85 patients to receive the same dose of steroid with these different approaches and concluded that a three-site injection is a safe method and provides early recovery and better improvement in shoulder function with less relapses.<sup>25</sup> A single RCT evaluated patient positioning for IA corticosteroid injections: similar satisfactory outcomes and accuracy were recorded using either the anterior or posterior US-guided approach, but positioning time was shorter for the anterior approach.<sup>26</sup>

### Physical Therapy

Physical therapy should aim at pain reduction, ROM restoration, and functional regain, preventing or reducing capsular contracture in the early phases and improving ROM in the latter stages of the disease. The available literature suggests a conservative treatment as the first approach to SS treatment, with physical therapy appearing the most prescribed treatment. Consistently with these data, the survey revealed that only less than 3% of the interviewed surgeons prefer not to prescribe any physical treatment (►Fig. 2A).

Several physical therapy approaches are available, with passive rehabilitation appearing to be the preferred one among the responders to this survey. A multimodal therapy, which was considered by more than the half of the interviewed surgeons, is recommended, since it can lead to superior results than a single treatment.<sup>27,28</sup>

Electrotherapy modalities, like laser therapy, thermal electrotherapy, and pulsed electromagnetic field therapy, have been described as possible, effective adjuncts to active and passive rehabilitation.<sup>5</sup> These treatments aim to reduce pain and improve function through an increase in transfer of different forms of energy (thermal, electrical, light, sound) to the body. Almost 20% of the interviewed surgeons reported to prescribe thermal electrotherapy, although the evidence regarding this treatment is low (►Fig. 2B). High-intensity laser therapy is the only form of electrotherapy which was investigated in a prospective placebo-controlled RCT on patients affected by primary SS, showing pain relief at early follow-up time points.<sup>29</sup> Approximately 8% of the interviewed surgeons reported to prescribe laser therapy for primary SS.

Although extracorporeal shockwave therapy has been described as safe, efficient, tolerable, and with only transient side effects in a recent study, Italian surgeons appeared not to be attracted by this method, with only less than 6% of the interviewed physician prescribing it.<sup>30</sup>

### Other Conservative Treatment Options

Several adjunctive or alternative approaches have been described to treat primary SS, some of which belong also to the therapeutic portfolio of Italian surgeons (►Fig. 9). The IA injection of anesthetics can reduce pain and improve patients' compliance to physiotherapy, possibly improving its results.<sup>31</sup> However, the negative effects of local anesthetics on cartilage should be kept in mind when performing this procedure.<sup>32</sup> Injections of hyaluronic acid are not supported by current literature since they did not provide benefits as compared with a physiotherapy program<sup>33</sup> or IA corticosteroid injections.<sup>34,35</sup> A single RCT evaluated the role of platelet-rich plasma in the treatment of SS; however, since the chosen control group did not reflect the currently accepted gold-standard treatment, the relevance of the presented conclusions is questionable.<sup>36</sup> Although the application of a suprascapular nerve block has been described as a well-tolerated, safe, and effective method to reduce physiotherapy-related pain, it is not clear if this benefit is sufficient to justify the increased technical effort and the added cost.<sup>37</sup>

Acupuncture and bee venom acupuncture are a supporting pillar of traditional Oriental medicine and can be used to treat primary SS. Although RCTs exist, which demonstrate safety and efficacy of such approaches, their diffusion in Italy is minimal.<sup>38,39</sup>

The possible beneficial effect of calcitonin administration was initially suggested by Waldburger et al. More recently, this hypothesis was supported by a placebo-controlled RCT on 64 patients, which indicated calcitonin to be effective in reducing the use of IA steroids as rescue medication.<sup>40,41</sup>

Arthrographic distension of the glenohumeral joint (hydrodilatation) showed short-term benefits in terms of pain, ROM, and function in a Cochrane review published in 2008.<sup>9</sup> Shortly after this publication, Tveitå et al questioned the role of hydrodilatation, since their RCT on 76 patients could not demonstrate any significant differences in ROM between hydrodilatation and corticosteroid injections.<sup>42</sup> A recent meta-analysis on 12 studies concluded that hydrodilatation does not provide a clinically significant benefit in terms of pain reduction and ROM improvement.<sup>43</sup> Nowadays, hydrodilatation is mainly considered in cases resistant to other conservative approaches, in the later phases of the disease, since in the early inflammatory phase the patient may be unable to tolerate adequate dilatation.<sup>44</sup> The addition of an interscalene block and joint manipulation could improve patient satisfaction and ROM as compared with hydrodilatation alone.<sup>45</sup> The vast majority of the interviewed Italian surgeons did not consider hydrodilatation, whereas almost two-thirds considered manipulation under anesthesia, in different phases of the disease (► **Figs. 10 and 11**). Since manipulation under anesthesia did not show superiority as compared with IA steroid injections with distension<sup>46</sup> and hydrodilatation<sup>47</sup> and given the concerns about possible serious complications derived from forceful rotation maneuvers,<sup>1</sup> its use in the treatment of SS is not supported by current literature.

### Surgical Treatment

The vast majority of SS cases can be effectively treated with a conservative approach, with surgery playing a minor role treating this pathology; subsequently, the number of RCTs that investigated invasive strategies to treat SS is markedly limited as compared with those investigating conservative approaches. Furthermore, the indications for surgical options remain highly subjective and need to be individualized to each patient. About 30% of the interviewed subjects did not treat SS surgically; of the remaining 70%, less than 10% allocated to surgical treatment to more than 10% of their patients (► **Fig. 12**). Timing for surgical treatment is controversial (► **Fig. 13**), as well as the preferred type of surgical approach (► **Fig. 14**). Arthroscopic arthrolysis and capsular release is preferred over open procedures as it is a less invasive intervention. The addition of a posterior capsular release permits to obtain a more rapid improve in ROM within the first 3 months postoperatively, however without improvement in patient function or ROM at 6 months.<sup>48</sup>

### Conclusion

This national survey revealed that a consensus among Italian orthopaedic surgeons regarding the treatment modalities for SS does not yet exist and indicated that several different approaches are considered across the country. Despite a good agreement regarding the indication to physical therapy and to the use injective corticosteroids, controversies exist regarding the different modalities of physical therapy available, as well as indications for oral

corticosteroids, frequency and timing for injective corticosteroids, technique and site of injection for IA administration of corticosteroids, and indication, timing, and technique for surgical treatment.

In this regard, active scientific societies can play an important role in providing adequate information for their members who want to deepen their knowledge of SS and to obtain practical suggestions for the daily clinical practice. Following the result of this survey, SIGASCOT first and later on SIAGASCOT have proposed further initiatives aimed at increasing awareness and discussion among society members, with the goal of trying to align the treatment choices for SS patients, basing them on the high-quality evidences available in literature.

### Authors' Contributions

D.C.: study design, survey preparation, data collection, original draft preparation; S.D.G.: survey preparation, manuscript correction; M.F.S.: survey preparation, manuscript correction; F.U.: recruitment, management of Web platform for survey administration; A.M.: statistical analysis; M.F.: original draft preparation; S.W.: original draft preparation; L.D.G.: study design, manuscript correction.

### Ethical Approval

The final version of the survey was approved by the SIGASCOT Board (and later on by the SIAGASCOT Board).

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None.

### Conflict of Interest

L.D.G. declares payment for development of personal fees from Geistlich and Lipogem; institutional grants from IGEA, outside the submitted work. The other authors declare no conflict of interest.

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