




# Panorama of Infiltration for Painful Shoulder Among Shoulder Specialists\*

## *Panorama da infiltração para ombro doloroso entre especialistas em ombro*

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### Abstract

**Objective** To assess how shoulder specialists have used infiltration in their daily practice.

**Methods** A survey study in which shoulder and elbow specialists answered a questionnaire on the use of infiltration in painful shoulders.

**Results** Most of the doctors (45.9%) have > 10 years of experience in the area and have carried out up to 10 infiltrations in the last 12 months. The main indications for glenohumeral and subacromial infiltration are glenohumeral arthrosis and rotator cuff tendinopathy, respectively. The most used portals are the posterior (52.2%) for glenohumeral infiltration and the lateral (57.5%) for subacromial infiltration. The majority of the doctors (752%) infiltrate in an outpatient setting without imaging methods, and the most commonly used drug is the combination of corticoid and anesthetic. The main contraindication cited is the presence of diabetes, and the most common complication is pain after infiltration.

**Conclusion** Subacromial infiltrations are indicated especially for the treatment of rotator cuff tendinopathies and bursitis, performed by the lateral portal, in an outpatient setting, with low index of long-term complications. Glenohumeral infiltrations are indicated especially for glenohumeral arthrosis, with a combination of a corticoid and anesthetic, performed mostly in an outpatient setting.

### Keywords

- shoulder
- infiltration
- tendinopathy
- arthrosis

### Resumo

**Objetivo** Avaliar como especialistas de ombro têm utilizado a infiltração na sua prática diária.

**Métodos** Estudo tipo survey interseccional em tempo único, no qual especialistas em ombro e cotovelo responderam a um questionário sobre o uso de infiltrações no ombro doloroso.

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**Palavras-chave**

- ombro
- infiltração
- tendinopatia
- artrose

**Resultados** A maior parte (45,9%) dos entrevistados possui experiência > 10 anos na área e realizaram até 10 infiltrações nos últimos 12 meses. As principais indicações para infiltração glenoumeral e subacromial são artrose glenoumeral e tendinopatia do manguito rotador, respectivamente. Os portais mais utilizados são o posterior (52,2%) para infiltração glenoumeral e o lateral (57,5%) na subacromial. A maioria (75,2%) dos entrevistados realiza a infiltração ambulatorialmente sem auxílio de métodos de imagem, e a droga mais utilizada é a combinação de corticoide e anestésico. A principal contraindicação citada é a presença de diabetes, e a complicação mais comum é a dor após a infiltração.

**Conclusão** Infiltrações subacromiais são indicadas especialmente para tratamento de tendinopatias do manguito e bursites, realizadas pelo portal lateral, em ambiente ambulatorial, com baixo índice de complicações em longo prazo. As infiltrações glenoumerais são indicadas especialmente para artrose glenoumeral, com combinação de corticoide e anestésico, realizadas, em sua maioria, ambulatorialmente.

## Introduction

Painful shoulder is a frequent symptom in adults, with a prevalence of 7 to 34%, affecting mainly individuals > 40 years old.<sup>1,2</sup> Approximately 10 to 16% of the general population report > 1 episodes of shoulder pain during their lifetime.<sup>1,3,4</sup> Recovery may be slow, and poor prognosis factors are: patients aged 45 to 54 years old, and pain lasting > 3 months.<sup>1</sup> About 40 to 50% of the patients experience pain refractory to treatment or relapse after 1 year.<sup>5</sup>

Several processes can lead to a clinical picture of shoulder pain, including inflammatory tendon changes with or without calcification, and degenerative bone or myotendinous diseases.<sup>4,6</sup>

Infiltration to improve shoulder pain has been used for many years, and there are several options of drugs to be infiltrated, of infiltration sites, with or without the help of imaging methods and indications. The purpose of the present study is to evaluate how shoulder specialists have been using infiltration in their daily practice.

## Materials and Methods

The present research project was approved by the Ethics Committee under the number 70018617.2.0000.5505.

The present study was a one-time intersectional survey with a nonprobability convenience sampling, in which 179 orthopedic specialists in shoulder and elbow were interviewed during the V Closed Meeting of the Brazilian Shoulder and Elbow Society, in 2017, through a questionnaire created by the authors (**Annex 1** - Available online). Of this total, 23 participants (12.8%) reported no infiltration in the previous 12 months. The subsequent responses from these individuals were disregarded. There were 250 subscribers, and we obtained a response rate of 71.6%. If we consider the total of 890 specialists, there was a response rate of 20.1%. There was no identification of the orthopedists, and they were asked to answer only once. There was no pretest to evaluate the questionnaire.

The questionnaires were self-applicable and were distributed by the authors of the study during the breaks of the 3-day congress. Some questions allowed more than one answer, which led to a sum of the variables above 100%.

The softwares IBM SPSS Statistics for Windows, version 20.0 (IBM Corp. Armonk, NY, USA), Minitab 16 (Minitab, LLC, State College, PA, USA) and Microsoft Excel Office 2010 (Microsoft Corporation, Redmond, WA, USA) were used for statistical analysis, performed by proportional equality test. A significance level was defined for this work (*p-value*, that is, the statistical error allowed in the analyzes was of 0.05). The chi-squared test was used to compare distributions. All results other than this parameter will be detailed. We would also like to point out that all confidence intervals defined throughout the study were assumed with 95% statistical confidence.

## Results

Among the respondents, 46.9% have > 10 years of experience in shoulder surgery; 24% between 5 and 10 years; 19.6% between 1 and 5 years; and 9.5% of the surgeons have < 1 year of experience. Among the study population, 36.3% reported > 10 indications of infiltration during the previous year. There was no statistical difference between responses up to 10 and from 10 to 30 infiltrations ( $p = 0.658$ ).

Regarding the repetition of the procedure, 39% indicate it only after 4 months, and 5.7% do not insist on a new infiltration if the patient does not respond satisfactorily to the previous injection.

Indications for the use of infiltrations with subacromial and glenohumeral corticosteroid are arranged below in ► **Tables 1 and 2**.

Regarding the portal for subacromial infiltration (► **Table 3**), 57.5% opted for lateral access, 32.5% for the posterior, and 10% for the anterior; 4.4% mentioned other accesses (suprascapular, Neviaser, and superior). For glenohumeral infiltration (► **Table 4**), 52.2% use a posterior access

**Table 1** Indications for subacromial infiltration

| Indication  | %     |
|---|-------|
| Rotator cuff tendinopathy                         | 55.6% |
| Bursitis  | 42.5% |
| Rotator cuff partial lesion on the bursal surface | 33.1% |
| Calcaneous tendinitis                             | 29.4% |

**Table 2** Indications for glenohumeral infiltration

| Indication                | %     |
|---------------------------|-------|
| Glenohumeral arthrosis    | 45.9% |
| Adhesive capsulitis       | 32.5% |
| Synovitis                 | 21.7% |
| Rotator cuff tendinopathy | 8.3%  |

**Table 3** Access Portals for subacromial infiltration

| Indication                                    | %     |
|---|-------|
| Lateral                                       | 57.5% |
| Posterior                                     | 32.5% |
| Anterior                                      | 10%   |
| Others: suprascapular, Neviaser, and superior | 4.4%  |

**Table 4** Access portals for glenohumeral infiltration

| Indication                   | %     |
|------------------------------|-------|
| Posterior                    | 52.2% |
| Anterior                     | 35.8% |
| Other: suprascapular         | 1.3%  |
| Do not perform the procedure | 11.3% |

point, 35.8% an anterior, and 11.3% do not perform the procedure. Only 2 individuals (1.3%) use another access (suprascapular).

Ultrasound-guided infiltration is not used to help the infiltration procedure by a majority of 88.8% of respondents, that is, 10.6% use the imaging method to aid in the glenohumeral access, and only 0.6% for both the subacromial and glenohumeral accesses; 98.1% perform subacromial infiltration in a medical office, and only 1.3% in a surgical center. Regarding glenohumeral infiltration, 75.2% infiltrate in a medical office, while 13.4% infiltrate in a surgical center.

When asked which drug was chosen for infiltration, 72.3% of the respondents chose the combination of corticosteroids and anesthetic; 32% use corticosteroids alone, and 8.2% infiltrate anesthetics only. Only 0.6% use anti-inflammatory drugs, and 1.9% use other substances, such as hyaluronic acid. Regarding the type of corticosteroid most used, 39.4% opt for

triamcinolone, 27.5% for dexamethasone, and 26.9% for betamethasone.

Regarding contraindications to the use of corticosteroids, 17.7% believe that there are no contraindications, while 82.3% mentioned complications. Among them, the most cited were diabetes (67.2%), especially poorly controlled or decompensated diabetes (7%), hypertension (14.7%), allergies (11.6%), and glaucoma (10%).

The main complication found by respondents was pain after infiltration (48.1%), followed by skin depigmentation (13.5%) and infection (3.8%), while 40.4% reported not finding any kind of complication in their practice. We found no statistical difference between the most recurrent response (pain after infiltration) and the no complication response ( $p=0.171$ ).

## Discussion

Painful shoulder is a condition that can affect up to between 26 to 34% of the adult population. Pain, and consequent shoulder dysfunction, affect negatively the quality of life of these patients. Several conditions are concurrent with shoulder pain, including glenohumeral arthrosis, rotator cuff tendinopathy, cuff tear, adhesive capsulitis, and calcaneous tendonitis.<sup>7</sup>

Rotator cuff syndrome is the most common diagnosis in painful shoulder conditions, reaching a prevalence of up to 40%, ranging from bursitis to complete cuff tears, affecting the daily activities of patients, especially in overhead maneuvers.<sup>8</sup> Characterized by reduced active and passive range of motion and shoulder pain, adhesive capsulitis afflicts ~2% of the general population,<sup>9</sup> and up to 20% among diabetics.<sup>10</sup> Rotator cuff calcium deposits are found in 6.8% of the patients with painful shoulder, especially housed in the supraspinatus tendon.<sup>11</sup> Glenohumeral osteoarthritis is characterized by mechanical and biological destruction of the articular cartilage, a condition that is difficult to control and is highly debilitating.<sup>12</sup>

Infiltration for the treatment of painful shoulder is still quite controversial; however, we found that ~83% of the respondents incorporate this method in their practice, depending on the underlying disease. Randelli et al<sup>13</sup> conducted a survey study in which 72% of the respondents considered glenohumeral infiltration with corticosteroids appropriate or very appropriate as treatment for adhesive capsulitis, and 66% had the same opinion about subacromial infiltration to treat selected cases of cuff arthropathy.

Among the indications of subacromial infiltration, the most frequent was for the treatment of rotator cuff syndrome (55.6% for tendinopathies, 42.5% for bursitis, and 33.1% for partial bursal lesions). According to Vieira et al,<sup>8</sup> shoulder and elbow surgeons tend to opt for early repair of complete rotator cuff injuries, which may explain the low incidence of infiltration indication for the treatment of these lesions, although studies show that this procedure can prevent the need for surgical treatment in up to half of the cases.<sup>14</sup>

It is known that infiltration with corticosteroids is not able to modify the natural history of rotator cuff syndrome, and animal histological studies show changes in the molecular structure of the collagen of the tendons, weakening them after

repeated injections with corticosteroids, which leads us to believe that this condition could be translated into humans.<sup>15,16</sup> However, according to Bhatia et al,<sup>17</sup> there is no increased incidence of rotator cuff tear in patients that underwent multiple infiltrations. Therefore, we believe that this procedure is a viable option in the conservative treatment arsenal for rotator cuff syndrome in selected cases.

Shoulder arthrosis was the main indication for glenohumeral infiltration (45.9%), followed by adhesive capsulitis (33.1%). When comparing these numbers with the findings of the literature, we came across divergent information. On the one hand, according to Randelli et al,<sup>13</sup> 31% of the respondents stated glenohumeral infiltration to be the best conservative treatment method for adhesive capsulitis; but only 15% infer the same about its indication for shoulder arthrosis. Corticosteroid infiltration to treat glenohumeral arthrosis finds little support in the literature, with studies with low evidence,<sup>18</sup> to such an extent that the American Academy of Orthopedic Surgeons (AAOS) does not indicate the procedure.<sup>19</sup> On the other hand, the use of this procedure in the treatment of frozen shoulder has great support, being a satisfactory option as an adjuvant in conservative treatment.<sup>20–22</sup>

Most respondents choose lateral access for subacromial infiltration (57.5%) and posterior access for intra-articular infiltration (52.2%), which may be explained by the anterior greater presence of noble neurovascular structures, thus making posterior glenohumeral infiltration safer.<sup>23</sup> This data becomes important in light of the findings of Marder et al,<sup>24</sup> demonstrating greater accuracy in blind subacromial infiltration through the lateral portal. However, the familiarity of each professional with the chosen route is certainly a determining factor for this definition.

Few professionals choose to perform subacromial infiltration in the surgical center; however, the indication increases when it comes to the intra-articular procedure. This may be explained by the greater discomfort and pain reported at the time of glenohumeral infiltration. Another important finding is that most respondents (88.8%) do not use ultrasound to assist in the procedure. The lack of intimacy of the orthopedic surgeon with the apparatus, and especially the cost of these devices, make it difficult to spread this technique. However, this practice should be reconsidered, since blind infiltrations have lower accuracy and less predictable results.<sup>25</sup> Wu et al<sup>26</sup> found in their meta-analysis that the subacromial infiltrations guided by ultrasound performed better in controlling pain caused by rotator cuff syndrome than when it is performed blindly. Other studies show a large variation in glenohumeral infiltration accuracy if performed without imaging methods (between 45.7 and 100%).<sup>27,28</sup>

Among the contraindications, the most cited was diabetes, especially when decompensated. There is little evidence in the literature that subacromial or glenohumeral infiltration can raise blood glucose to alarming levels; however, it is prudent to maintain vigilance in the weeks following the procedure.<sup>29</sup> Moon et al<sup>30</sup> studied blood glucose after glenohumeral infiltration with 40 mg triamcinolone in patients with and without diabetes and observed increased glucose

levels on the first day after the procedure, and return to the preinfiltration parameter in both groups, without reports of clinical complications.

Finally, the main complication observed by respondents was pain after infiltration, which is a self-limiting condition; and 40% of respondents did not observe any adverse effects.

The results of the present study are related to a specific population of specialists, and should not be extrapolated to general orthopedists. There was no differentiation of the type of infiltration chosen for each disease and, therefore, there may be other unidentified nuances. However, the study has a very representative population of 170 questionnaires, in a universe of ~800 shoulder and elbow specialists in our country (21.25% of the total population of specialist surgeons).

## Conclusion

Thus, it can be concluded that the profile of subacromial infiltrations shows that its indication is made primarily for the treatment of cuff tendinopathies and bursitis, performed in a blind way using the lateral portal in a medical office setting, with a low rate of long-term complications. Moreover, the observed profile of glenohumeral infiltration is that its use is mainly for glenohumeral arthrosis, with combination of corticosteroid and anesthetic, performed posteriorly in a blind way, and mostly in a medical office setting.

## Conflict of interest

The authors have no conflicts of interests to declare.

## References

- 1 Diercks R, Bron C, Dorrestijn O, et al. Dutch Orthopaedic Association. Guideline for diagnosis and treatment of subacromial pain syndrome: a multidisciplinary review by the Dutch Orthopaedic Association. *Acta Orthop* 2014;85(03):314–322
- 2 Codsi MJ. The painful shoulder: when to inject and when to refer. *Cleve Clin J Med* 2007;74(07):473–474, 477–478, 480–482 *passim*
- 3 Stevenson K. Evidence-based review of shoulder pain. *Musculoskelet Care* 2006;4(04):233–239
- 4 Holt TA, Mant D, Carr A, et al. Corticosteroid injection for shoulder pain: single-blind randomized pilot trial in primary care. *Trials* 2013;14:425
- 5 Laslett M, Steele M, Hing W, McNair P, Cadogan A. Shoulder pain patients in primary care—part 1: Clinical outcomes over 12 months following standardized diagnostic workup, corticosteroid injections, and community-based care. *J Rehabil Med* 2014;46(09):898–907
- 6 Saccomanni B. Inflammation and shoulder pain—a perspective on rotator cuff disease, adhesive capsulitis, and osteoarthritis: conservative treatment. *Clin Rheumatol* 2009;28(05):495–500
- 7 Sun Y, Chen J, Li H, Jiang J, Chen S. Steroid Injection and Nonsteroidal Anti-inflammatory Agents for Shoulder Pain: A PRISMA Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Medicine (Baltimore)* 2015;94(50):e2216
- 8 Vieira FA, Olawa PJ, Belangero PS, Arliani GG, Figueiredo EA, Ejnisman B. Rotator cuff injuries: current perspectives and trends for treatment and rehabilitation. *Rev Bras Ortop* 2015;50(06):647–651
- 9 Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Curr Rev Musculoskelet Med* 2008;1(3–4):180–189
- 10 Dehghan A, Pishgooei N, Salami MA, et al. Comparison between NSAID and intra-articular corticosteroid injection in frozen

- shoulder of diabetic patients; a randomized clinical trial. *Exp Clin Endocrinol Diabetes* 2013;121(02):75–79
- 11 Diehl P, Gerdesmeyer L, Gollwitzer H, Sauer W, Tischer T. Calcific tendinitis of the shoulder. *Orthopade* 2011;40(08):733–746
  - 12 Millett PJ, Gobeze R, Boykin RE. Shoulder osteoarthritis: diagnosis and management. *Am Fam Physician* 2008;78(05):605–611
  - 13 Randelli P, Arrigoni P, Cabitza F, Ragone V, Cabitza P. Current practice in shoulder pathology: results of a web-based survey among a community of 1,084 orthopedic surgeons. *Knee Surg Sports Traumatol Arthrosc* 2012;20(05):803–815
  - 14 Plafki C, Steffen R, Willburger RE, Wittenberg RH. Local anaesthetic injection with and without corticosteroids for subacromial impingement syndrome. *Int Orthop* 2000;24(01):40–42
  - 15 Lee HJ, Kim YS, Ok JH, Lee YK, Ha MY. Effect of a single subacromial prednisolone injection in acute rotator cuff tears in a rat model. *Knee Surg Sports Traumatol Arthrosc* 2015;23(02):555–561
  - 16 Wei AS, Callaci JJ, Juknelis D, et al. The effect of corticosteroid on collagen expression in injured rotator cuff tendon. *J Bone Joint Surg Am* 2006;88(06):1331–1338
  - 17 Bhatia M, Singh B, Nicolaou N, Ravikumar KJ. Correlation between rotator cuff tears and repeated subacromial steroid injections: a case-controlled study. *Ann R Coll Surg Engl* 2009;91(05):414–416
  - 18 Colen S, Geervliet P, Haverkamp D, Van Den Bekerom MP. Intra-articular infiltration therapy for patients with glenohumeral osteoarthritis: A systematic review of the literature. *Int J Shoulder Surg* 2014;8(04):114–121
  - 19 Izquierdo R, Voloshin I, Edwards S, et al. American academy of orthopaedic surgeons clinical practice guideline on: the treatment of glenohumeral joint osteoarthritis. *J Bone Joint Surg Am* 2011;93(02):203–205
  - 20 Bal A, Eksioglu E, Gulec B, Aydog E, Gurcay E, Cakci A. Effectiveness of corticosteroid injection in adhesive capsulitis. *Clin Rehabil* 2008;22(06):503–512
  - 21 De Carli A, Vadalà A, Perugia D, et al. Shoulder adhesive capsulitis: manipulation and arthroscopic arthrolysis or intra-articular steroid injections? *Int Orthop* 2012;36(01):101–106
  - 22 Wang W, Shi M, Zhou C, et al. Effectiveness of corticosteroid injections in adhesive capsulitis of shoulder: A meta-analysis. *Medicine (Baltimore)* 2017;96(28):e7529
  - 23 Bell AD, Conaway D. Corticosteroid injections for painful shoulders. *Int J Clin Pract* 2005;59(10):1178–1186
  - 24 Marder RA, Kim SH, Labson JD, Hunter JC. Injection of the subacromial bursa in patients with rotator cuff syndrome: a prospective, randomized study comparing the effectiveness of different routes. *J Bone Joint Surg Am* 2012;94(16):1442–1447
  - 25 Henkus HE, Cobben LP, Coerkamp EG, Nelissen RG, van Arkel ER. The accuracy of subacromial injections: a prospective randomized magnetic resonance imaging study. *Arthroscopy* 2006;22(03):277–282
  - 26 Wu T, Song HX, Dong Y, Li JH. Ultrasound-guided versus blind subacromial-subdeltoid bursa injection in adults with shoulder pain: A systematic review and meta-analysis. *Semin Arthritis Rheum* 2015;45(03):374–378
  - 27 Tobola A, Cook C, Cassas KJ, et al. Accuracy of glenohumeral joint injections: comparing approach and experience of provider. *J Shoulder Elbow Surg* 2011;20(07):1147–1154
  - 28 Kraeutler MJ, Cohen SB, Ciccotti MG, Dodson CC. Accuracy of intra-articular injections of the glenohumeral joint through an anterior approach: arthroscopic correlation. *J Shoulder Elbow Surg* 2012;21(03):380–383
  - 29 Povlsen B, Povlsen SD. Steroid injection for shoulder pain causes prolonged increased glucose level in type 1 diabetics. *BMJ Case Rep* 2014;2014:bcr2014203777
  - 30 Moon HJ, Choi KH, Lee SI, Lee OJ, Shin JW, Kim TW. Changes in blood glucose and cortisol levels after epidural or shoulder intra-articular glucocorticoid injections in diabetic or nondiabetic patients. *Am J Phys Med Rehabil* 2014;93(05):372–378