Concise report

CS injection of tenosynovitis in patients with chronic inflammatory arthritis: the role of US

Luca Di Geso¹, Emilio Filippucci¹, Gary Meenagh², Marwin Gutierrez¹, Alessandro Ciapetti¹, Fausto Salaffi¹ and Walter Grassi¹

Abstract

Objective. The main aim of this study was to investigate the short-term efficacy of CS loco-regional treatment performed under US guidance in tenosynovitis of patients with chronic inflammatory arthritis.

Methods. Thirty consecutive patients affected by chronic arthritis and with clinical suspicion of tenosynovitis were recruited to undergo US assessment. In the sonographically proven cases, US-guided CS injection was performed. A visual analogue scale for pain (ranging from 0 to 10) and a tenderness score (ranging from 0 to 3) were used for the clinical evaluation. Sonographic pathological findings indicative of tenosynovitis were scored using a semi-quantitative 4-grade scoring system, for both grey-scale and power Doppler US, at baseline and during a follow-up visit at 2 weeks after the CS injection.

Results. In 21 (70%) of 30 patients, the clinical suspicion of tenosynovitis was confirmed (9 with RA, 11 with PsA and 1 with ReA). In the other nine patients, US revealed synovitis of the adjacent joints, bursitis, oedema of the s.c. tissue or a partial tear. In all cases the appropriate needle placement and subsequent CS injection into the tendon sheath were obtained with US confirmation. A significant reduction in all clinical and sonographic scorings was found during the follow-up visit.

Conclusions. The present study shows the efficacy of US-guided peritendinous CS injections in the management of patients with chronic inflammatory arthritis presenting as US-proven tenosynovitis.

Key words: ultrasound, power Doppler, injection, tenosynovitis, arthritis.

Introduction

A growing number of rheumatologists are using US in the management of patients with chronic arthritis because of its ability to identify sub-clinical signs of inflammation and its use as guidance in SF aspiration and joint, bursa and tendon injections [1–10].

A body of medical literature supports the role of US as a reliable tool for detecting and scoring inflammation and subsequent tissue damage [1–8], but only a few reports have investigated the role of US in the management of tendon pathology in patients with chronic arthritis [3, 11–17].

It is well recognized that US is a useful tool for guiding joint injections, but limited data exist on US-guided peritendinous injection therapy [8, 9]. The main aim of this study was to investigate the efficacy of CS loco-regional treatment performed under US guidance in tenosynovitis of patients with chronic inflammatory arthritis, using US itself as a tool first to confirm the clinical finding and subsequently to monitor the effect of the injection.

Materials and methods

Study design

Thirty consecutive patients with chronic arthritis, who presented with clinical findings of tenosynovitis requiring CS injection treatment, were recruited to undergo US assessment. All patients were attending the Rheumatology Department of the Università Politecnica delle Marche, Jesi, Ancona, Italy. Only patients with sonographic confirmation of tenosynovitis without tendon tear who were on a stable treatment regime (including NSAIDs, DMARDs...
and CSs) for at least 4 weeks before study entry were included. Patients recruited into the study did not modify their current treatment during the 2-week period following injection. The study was conducted according to the Declaration of Helsinki and local regulations. The institutional ethics committee approved the study (Comitato Etico dell’Azienda Sanitaria Unica Regionale di Ancona) and informed consent was obtained from all patients. A visual analogue scale (VAS) for pain (ranging from 0 to 10) and a tenderness score (ranging from 0 to 3) were adopted in the clinical evaluation at baseline and during the follow-up visit at 2 weeks.

US scanning technique

US examinations were performed using a My Lab 70 XVG (Esaote S.p.A., Genoa, Italy) equipped with a high-frequency linear probe (6-18 MHz) by a rheumatologist experienced in musculoskeletal US and trained in US-guided injection. US examinations were performed according to the scanning technique described by EULAR guidelines and particular attention was paid to avoid compression of the soft tissues under examination with the probe [17, 18]. All the tendons were scanned both in transverse view from the more proximal to the more distal portion and longitudinal view from the more medial to the more lateral portion of the synovial sheath [17]. Grey-scale setting parameters were adjusted in order to obtain the maximal contrast of the different soft tissues under examination and indications provided by Torp-Pedersen et al. [18] were applied to optimize the power Doppler (PD) setting.

US findings interpretation

The preliminary definition of tenosynovitis established by the OMERACT US special interest group was adopted: ‘Hypoechic or anechoic thickened tissue with or without fluid within the tendon sheath, which is seen in 2 perpendicular planes and which may exhibit Doppler signal’ [19].

For each patient, the presence or absence of the following pathological findings were recorded: tendon sheath widening, due to synovial effusion and/or proliferation, and intra- and/or peritendinous PD signal. Moreover, all US grey-scale and PD findings were scored using a semi-quantitative scoring system (0 = normal; 1 = mild; 2 = moderate; 3 = severe).

For the grey-scale assessment, the longitudinal view was adopted and tendon sheath widening was scored as mild if the hypoechic or anechoic thickened tissue with or without fluid within the tendon sheath was focal. We scored it as moderate if these abnormalities were found in more than one portion of the tendon, but with part of the tendon sheath that presented a normal sono-graphic appearance, i.e. the involvement was multi-focal. Finally, we considered severe involvement of >50% of the tendon sheath.

For the PD assessment we adopted the scoring system used for joint synovitis in several previous investigations [3, 20, 21]. Thus the following semi-quantitative scoring system was used: mild, the presence of up to three intra- and/or peritendinous PD signals or two single and one confluent signal; moderate, greater than Grade 1 to <50% of the intra- and peritendinous area filled with PD signals and Grade 3 if >50% of the intra- and peritendinous area filled with PD signals. The PD assessment was made scoring the transverse view showing the maximal expression of PD signal. After having scored both grey-scale and PD findings, the sonographer selected the most suitable route for needle insertion and performed the injection under sonographic guidance.

The position of the tip of the needle was followed in real time to verify its correct placement, and the CS was visualized during the injection and after the procedure to document its spreading within the tendon sheath. All sites were injected using methylprednisolone acetate (at a dose of 20 mg), which may be considered the most commonly recommended CS for soft-tissue injections [22]. After 2 weeks, a follow-up US scan was performed by the same sonographer.

Statistical analysis

For statistical analysis, MedCalc (Mariakerke, Belgium) version 11.1.6 for Windows XP was used. Wilcoxon’s signed rank sum test was adopted for the comparison of the clinical and US findings at baseline and at follow-up.

Results

The 30 consecutive patients recruited with the clinical suspicion of tenosynovitis were affected by the following chronic inflammatory arthritides: 15 RA, 13 PsA, 1 ReA and 1 gout. In 21 (70%; 12 females and 9 males; 9 with RA, 11 with PsA and 1 with ReA) of 30 patients, the tenosynovitis was sonographically confirmed (11 finger flexor tendons, 3 extensor carpi ulnaris tendons, 2 peroneal tendons, 2 tibialis posterior tendons, 1 extensor digitorum tendons, 1 flexor digitorum tendons). In these cases a US-guided CS injection was performed. In the other nine patients, US found synovitis of the adjacent joints, bursitis, oedema of the s.c. tissue or a tendon partial tear.

In all of them appropriate needle placement and subsequent CS injection into the tendon sheath was sonographically confirmed, and no damage of tendons and peritendinous structures was recorded. Furthermore, incidental damage of adjacent non-target structures (such as tendons, nerves, blood vessels, ligaments and s.c. fat) caused by the needle, the injected drug or both was avoided.

Table 1 reports patient demographic and clinical characteristics together with sonographic data obtained at baseline and 2 weeks post-CS injection. Fig. 1 shows a representative example of sonographic findings improvement recorded at follow-up assessment.

Significant improvement was recorded in the clinical assessment both for the reduction of the VAS value ($P = 0.0001$) and the tenderness score ($P < 0.0001$). In line with the clinical results, a significant reduction of sonographic scorings was found ($P < 0.0001$ for grey scale and $P = 0.0001$ for PD).
Discussion

There is an increasing body of evidence supporting the role of US as a bedside procedure for helping clinicians with the diagnosis and the monitoring of chronic arthritis. Moreover, it is becoming increasingly popular in the outpatient setting as a tool to maximize accuracy during interventional procedures, such as aspiration of SF and drug injection [9, 10].

Injections performed under sonographic guidance ensure correct placement of the medication and the avoidance of damage to adjacent non-target tissues [23]. It has yet to be proven scientifically whether greater accuracy of CS placement equates directly with improved clinical outcome [24-26]. The use of US scanning in the post-injection period may be a superior method of objectively demonstrating improvement rather than the standardized physical examination commonly undertaken by the clinician [14].

To date most studies have centred upon the impact of US-guided CS joint injection and not to the soft tissues such as tendon sheaths. The first report highlighting the potential role of PD US in therapy monitoring dates back to 1996 [28]. In that report, a qualitative decrease in synovial perfusion was observed in seven of eight symptomatic knees after CS injections. Dramatic changes were also found within the small joints of the hand in rheumatoid patients who received systemic CS therapy (i.v. or oral prednisolone) [29]. More recently, US-guided IA CS injection treatment was shown to improve clinical outcome measures (VAS for pain and tenderness) in a cohort of 20 patients with chronic synovitis of the wrist and hand [30]. In a recent study, in hand OA, the response

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Disease</th>
<th>Treatment (DMARD)</th>
<th>Anatomical site</th>
<th>VAS/tenderness</th>
<th>Grey scale/PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>82</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>EUC</td>
<td>8/3</td>
<td>2/2</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>III FF</td>
<td>9/3</td>
<td>2/2</td>
</tr>
<tr>
<td>3</td>
<td>78</td>
<td>F</td>
<td>PsA</td>
<td>MTX</td>
<td>LHB</td>
<td>8/2</td>
<td>3/3</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>EUC</td>
<td>8/3</td>
<td>3/2</td>
</tr>
<tr>
<td>5</td>
<td>31</td>
<td>M</td>
<td>PsA</td>
<td>MTX</td>
<td>ED</td>
<td>9/3</td>
<td>2/3</td>
</tr>
<tr>
<td>6</td>
<td>66</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>P</td>
<td>8/3</td>
<td>1/2</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>F</td>
<td>PsA</td>
<td>SSZ</td>
<td>III FF</td>
<td>5/3</td>
<td>2/3</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>F</td>
<td>PsA</td>
<td>MTX</td>
<td>II FF</td>
<td>10/3</td>
<td>2/3</td>
</tr>
<tr>
<td>9</td>
<td>56</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>IV FF</td>
<td>10/3</td>
<td>1/0</td>
</tr>
<tr>
<td>10</td>
<td>44</td>
<td>M</td>
<td>PsA</td>
<td>SSZ</td>
<td>III FF</td>
<td>6/2</td>
<td>1/2</td>
</tr>
<tr>
<td>11</td>
<td>78</td>
<td>M</td>
<td>RA</td>
<td>MTX</td>
<td>FD</td>
<td>8/2</td>
<td>3/3</td>
</tr>
<tr>
<td>12</td>
<td>24</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>III FF</td>
<td>8/3</td>
<td>3/3</td>
</tr>
<tr>
<td>13</td>
<td>38</td>
<td>F</td>
<td>ReA</td>
<td>SSZ</td>
<td>II FF</td>
<td>8/3</td>
<td>3/3</td>
</tr>
<tr>
<td>14</td>
<td>59</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>P</td>
<td>10/3</td>
<td>3/3</td>
</tr>
<tr>
<td>15</td>
<td>45</td>
<td>M</td>
<td>PsA</td>
<td>MTX</td>
<td>II FF</td>
<td>9/3</td>
<td>3/3</td>
</tr>
<tr>
<td>16</td>
<td>62</td>
<td>M</td>
<td>PsA</td>
<td>SSZ</td>
<td>TP</td>
<td>7/3</td>
<td>3/3</td>
</tr>
<tr>
<td>17</td>
<td>41</td>
<td>M</td>
<td>PsA</td>
<td>SSZ</td>
<td>TP</td>
<td>8/3</td>
<td>3/3</td>
</tr>
<tr>
<td>18</td>
<td>61</td>
<td>M</td>
<td>PsA</td>
<td>SSZ</td>
<td>I FF</td>
<td>6/2</td>
<td>3/3</td>
</tr>
<tr>
<td>19</td>
<td>31</td>
<td>M</td>
<td>PsA</td>
<td>MTX</td>
<td>III FF</td>
<td>9/3</td>
<td>3/3</td>
</tr>
<tr>
<td>20</td>
<td>31</td>
<td>M</td>
<td>PsA</td>
<td>SSZ</td>
<td>IV FF</td>
<td>8/3</td>
<td>3/3</td>
</tr>
<tr>
<td>21</td>
<td>52</td>
<td>F</td>
<td>RA</td>
<td>MTX</td>
<td>EUC</td>
<td>8/3</td>
<td>3/3</td>
</tr>
</tbody>
</table>

F: female; M: male; EUC: extensor carpi ulnaris tendon; FF: finger flexor tendons; LHB: long head of the biceps tendon; ED: extensor digitorum tendons; FD: flexor digitorum tendons; P: peroneal tendons; TP: tibialis posterior tendon.
to a single dose of 120 mg of i.m. methylprednisolone was assessed using both clinical and sonographic evaluation. No direct link between change in symptoms and sonographic findings of inflammation was found during the follow-up at 4 and 12 weeks [31].

Our study is the first aiming to investigate the role of US in three different steps of management of patients with tenosynovitis: confirmation of the diagnosis, guidance of the CS injection and therapy monitoring. The results of the present data should be interpreted in the light of the use of US in selecting patients to inject (with tenosynovitis, without partial tendon tear) and in documenting exact positioning of the tip of the needle (not damaging the tendon) and CS spreading within the synovial sheath. Moreover, tendons located in different anatomic sites were investigated.

This study presents the following limitations: first, a small cohort of patients was assessed; second, the lack of a control group for comparing the blind approach or systemic administration of CS or NSAIDs vs the US-guided CS injection. These comparative assessments in a larger cohort of patients could provide a more accurate evaluation of the potential additional value (including higher efficacy and/or less adverse effects) of the US-guided CS injections in tenosynovitis [32, 33]. Finally, the concomitant inflammatory involvement adjacent to the tendons (i.e. joints and bursae) was not considered, which may result in underestimation of the CS injection therapy efficacy (for instance, such as Patients 1, 2, 4 and 9).

In conclusion, the present study provides evidence supporting the role of US-guided CS injection as an effective procedure in the management of tenosynovitis in patients with chronic inflammatory arthritis. Furthermore, US can be used as a tool to confirm the clinical indication for performing CS injection in the tendon sheath and monitoring its effect. Such an application of US is of value considering the frequent use of injections in clinical practice of management of RA and PsA according to current recommendations [34, 35].

Rheumatology key messages

- US-guided CS injection is an effective procedure for tenosynovitis in chronic arthritis.
- US is useful for confirming clinical tenosynovitis, guiding CS injection and monitoring its effect.

Disclosure statement: The authors have declared no conflicts of interest.

References


