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Consensus statement

Safety in the use of ultrasound in rheumatology during the COVID-19 pandemic. Spanish Society of Rheumatology positioning paper[☆]



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ABSTRACT

Ultrasound is a widely implemented imaging modality in rheumatology practice that implies a great interaction between patient and professional. The COVID-19 pandemic requires a change in our clinical practice, through the adoption of new strategies that allow comprehensive care for our patients, guaranteeing the safety of both patients and healthcare professionals.

Objective: Our objective was to develop practical recommendations, agreed among a panel of experts, on the use and safety of rheumatological ultrasound during the COVID-19 pandemic.

Methods: We performed a narrative review of the available literature. Based on the literature review, we produced preliminary recommendations that were subsequently agreed among a panel of experts using the Delphi methodology with a 1–5 Likert scale. Agreement for each recommendation was considered if 75% of the panel members scored the item ≥ 4 on the Likert scale.

Results: 5 overarching principles and 28 recommendations were issued and agreed among the panel. Group consensus was achieved in 100% of items.

Conclusions: The document provides useful information about preventive measures in the practice of ultrasound in rheumatology in times of a COVID-19 pandemic based on the experience and literature available to date.

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Seguridad en el uso de la ecografía en reumatología durante la pandemia COVID-19. Documento de posicionamiento de la Sociedad Española de Reumatología

R E S U M E N

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La ecografía es una técnica de amplia implantación en reumatología que implica una gran interacción entre paciente y profesional. La pandemia COVID-19 hace necesario un cambio en nuestra práctica clínica, mediante estrategias que permitan la asistencia integral de nuestros pacientes, garantizando la seguridad tanto de los pacientes como de los profesionales sanitarios.

Objetivo: Desarrollar unas recomendaciones prácticas, consensuadas entre un panel de expertos, sobre el uso y seguridad de la ecografía reumatológica durante la pandemia COVID-19.

Métodos: Analizando la literatura disponible se realizaron unas recomendaciones preliminares, posteriormente consensuadas con un panel de expertos mediante el método Delphi con una escala Likert 1–5.

Resultados: Se elaboraron y consensuaron por el panel 5 principios fundamentales y 28 recomendaciones. El consenso del grupo se logró en el 100% de ítems (acuerdo para cada recomendación ≥ 4 en escala de Likert del 75% de componentes del panel).

Conclusiones: El documento proporciona información de utilidad acerca de medidas preventivas en la práctica de ecografía en reumatología en tiempos de pandemia COVID-19 de acuerdo a la experiencia y literatura disponible hasta el momento.

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Introduction and background

Since its emergence in December 2019, the COVID-19 epidemic, caused by the new SARS-CoV-2 coronavirus, rapidly spread to become a global pandemic.¹ This exceptional situation calls for a change in our daily clinical practice towards new comprehensive care strategies, to ensure the safety of patients and healthcare professionals.²

Ultrasound, an imaging modality widely used in rheumatology practice, is a technique in which there is high interaction between doctor and patient. This is a great advantage as it allows real-time visualisation of the structure to be explored and interactive dialogue with the patient. However, during the COVID-19 pandemic, this positive healthcare aspect of ultrasound has become a potential risk factor for the transmission of infection. In a study by Wang et al. conducted in Wuhan, the epicentre of the pandemic, the rate of COVID-19 infection in sonographers was approximately 3.4%, considerably higher than the overall infection rate among healthcare workers (2.2%) of any specialty.^{2,3} Therefore, special recommendations to ensure safety during this examination are essential. Specific recommendations and guidelines have already been published to reduce the risk of exposure of radiology staff involved in the diagnosis of patients with COVID-19 in other areas, such as CT and plain radiology.^{4,5}

The Spanish Society of Rheumatology (SER) recently published a positioning paper on the operation and re-establishing of rheumatology service activity in light of COVID-19,⁶ setting out general and specific safety measures for patients and professionals. Although ultrasound is practiced widely in most rheumatology departments in Spain, it is only mentioned in recommendation 6, with a 71% level of agreement, which states: “*If specific techniques (arthrocentesis, infiltration, ultrasound, capillaroscopy) need to be performed, an FFP2 type mask, facial protection (goggles or face shield) and body protection with scrubs, gloves and closed footwear must be worn*”. However, they provide no specific recommendations for patients and professionals for performing ultrasounds, nor information on disinfecting ultrasound equipment.

Objective

To develop practical recommendations, agreed by a panel of experts, on the use and safety of rheumatological ultrasound during the COVID-19 pandemic.

Methods

The methodology of this work comprised the following consecutive phases:

- Selection by the scientific coordinators (EN, LM) and the Internal Affairs Committee of the SER of a panel of 14 specialists in rheumatology, radiology and technology, experts, and users of ultrasound of the locomotor system and with geographical distribution in Spain.
- Narrative literature review (JMC, FMFH).

A literature review was carried out in PubMed and Embase up to 1/6/2020 using the keywords “ultrasound OR echography OR sonography” AND “viral infection OR viral transmission OR SARS OR coronavirus” AND “security measures OR risk assessment OR security”, and their respective synonyms in MeSH and free terms, and excluding other viral infections (hepatitis, CMV, papillomavirus). We also searched for information on websites for recommendations or guidelines from the main national and international Scientific Societies of Radiology and Ultrasound on mode of action and safety during the COVID-19 pandemic, as well as the recommendations of the main commercial ultrasound companies on the use and maintenance of the ultrasound scanner and its elements to avoid transmitting infections without damaging the equipment.

- Distribution of the results of the narrative literature search among the panel members, working in pairs, who were assigned a section of the project content.

The sections were as follows: (A) Overarching principles; (B) Indication for rheumatological ultrasound during the COVID-19

Table 1
Overarching principles and safety recommendations on the use of ultrasound in rheumatology during the COVID-19 pandemic.

| | Overarching principles | Level of agreement |
|----------------|---|--------------------|
| 1. | Ultrasound is the imaging technique with the greatest interaction between doctor and patient, which is an additional risk factor for COVID-19 infection regardless of the symptomatic or asymptomatic status of either. | 92.9% |
| <i>Comment</i> | <i>One of the main advantages of ultrasound over other imaging techniques is the possibility of close interaction between doctor and patient, which allows continuous dialogue and real-time scanning. However, during the COVID-19 pandemic, this positive care aspect of ultrasound has become a potential risk factor for the transmission of infection, as an optimal examination does not allow an adequate safety distance between doctor and patient.</i> | |
| 2. | All the safety measures for ultrasound imaging during the COVID-19 pandemic fundamentally seek to minimise the risk of infection for both patient and doctor, without reducing the quality of the examination. | 100% |
| <i>Comment</i> | <i>Ultrasound is a very useful technique to optimise the diagnostic and therapeutic process of many rheumatic diseases and, therefore may be essential to maintain quality of care even during the COVID-19 pandemic. For this reason, the fundamental objective of all safety measures when performing the technique must be to minimise the risk of contagion for both patient and examiner, without compromising the quality of the examination.</i> | |
| 3. | During the COVID-19 pandemic, all patients must be considered potential transmitters and recipients of the disease. Therefore, all ultrasound examinations carry a risk of contagion for both patient and doctor, which makes it essential that safety measures are adopted for both. | 92.9% |
| <i>Comment</i> | <i>During the COVID-19 pandemic, there are multiple clinical-epidemiological scenarios depending on symptoms and/or epidemiological contact of the doctor and patient. However, given the characteristics of SARS-CoV-2 infection, which has a variable incubation period and/or may be asymptomatic, any examination carries a risk of contagion which requires the implementation of additional safety measures for both patient and doctor.</i> | |
| 4. | The risk of COVID-19 infection may vary according to the characteristics of the ultrasound examination and therefore, the safety measures required may be different. | 92.9% |
| <i>Comment</i> | <i>Ultrasound in rheumatology includes a wide range of examinations and/or interventions. Scans that require a longer examination time, greater contact with the patient and/or ultrasound-guided interventions may involve a greater risk of contagion and therefore require additional safety measures.</i> | |
| 5. | The implementation of safety measures for ultrasound during the COVID-19 pandemic should not be limited to the period that the patient is examined but should extend from the time the ultrasound is requested until they leave the healthcare centre. | 100% |
| <i>Comment</i> | <i>Safety measures for ultrasound during the COVID-19 pandemic should be implemented from the moment the ultrasound is indicated by screening the indication for the request, from the patient's arrival at the care centre (hand hygiene, use of mask and cleaning of the ultrasound room) and performing the ultrasound (protection of patient and physician, cleaning and disinfection of ultrasound equipment and probe), until they leave the healthcare centre (hand washing).</i> | |
| | Recommendations | Level of agreement |
| | Indication for rheumatological ultrasound during the COVID-19 pandemic | |
| 1. | During the COVID-19 pandemic, rheumatological ultrasound should be restricted to those patients for whom the result will have considerable impact on the diagnostic process or therapeutic approach. | 92.9% |
| <i>Comment</i> | <i>The added value to the clinic and the impact on diagnosis and therapeutic decisions of ultrasound in the main rheumatological diseases (chronic immune-mediated arthritis, microcrystalline arthropathies, osteoarthritis, regional pain syndromes) has been widely analysed and described in the scientific literature. The yield of ultrasound and consequent benefit is determined by the quality of the assessment of each patient's clinical scenario.</i> | |
| 2. | In patients with confirmed active COVID-19 infection, rheumatological ultrasound should be postponed until symptoms have resolved and viral PCR is negative, unless the ultrasound is strictly essential for the management of the patient. | 100% |
| <i>Comment</i> | <i>The essential argument for this recommendation is isolation of the patient with active COVID-19 infection, whether at home or in hospital, with the primary aim of containing the pandemic.</i> | |
| 3. | To minimise exposure time to potential contagion, rheumatological ultrasound should be strictly guided by the reason for consultation and the clinical evaluation. The examination can be reduced to the minimum number of anatomical areas and sites that will provide sufficient, quality information to shorten the examination time. The ultrasound could be performed on the same day as the clinic visit to reduce the patient's visits to the healthcare centre. | 100% |
| <i>Comment</i> | <i>Evaluations of a small number of target joints for diagnostic or follow-up purposes in patients with early arthritis, established chronic arthritis or microcrystalline arthropathies are validated in the scientific literature. Furthermore, limiting ultrasound to the most yielding anatomical areas of each joint region according to the patient's disease/pathological process/clinical complaint minimises scanning time without a substantial decrease in the quality of the results.</i> | |
| | Screening, patient referral and patient flow | |
| 4. | Rheumatological ultrasound requests should be reviewed for prioritisation, rescheduling or temporary cancellation, depending on the reason for them, their clinical urgency and the patient's COVID-19 infection status. | 85.7% |
| 5. | In the days prior to the appointment, patients scheduled for ultrasound should be contacted, by the means established in each centre, to cancel their appointment if they have a temperature or any other symptoms consistent with COVID-19 infection or if they have had recent contact with a person with COVID-19 infection. | 78.6% |
| 6. | All patients should be screened for COVID-19 infection (temperature, symptom survey, contacts) on arrival at the health centre or, failing this, on entering the ultrasound examination room. | 100% |
| 7. | Sufficient time should be allocated for each ultrasound examination, considering its duration and the added possibility of ultrasound-guided intervention, and the need to clean and disinfect equipment and examination room between patients. | 100% |
| 8. | In the exceptional event that a patient with suspected or confirmed COVID-19 infection requires outpatient examination, the patient should be seen at the end of the consultation day, and the entire contents of the room should then be thoroughly disinfected. | 100% |
| | Patient reception and preparation | |
| 9. | The patient should arrive punctually for the appointment. Patients should enter the examination room only when requested. The rules on prevention that apply in the examination room should be visible at its entrance. | 100% |
| <i>Comment</i> | <i>It should always be the examiner who opens and closes the examination room door.</i> | |
| 10. | The patient's history should be reviewed before the patient enters the examination room to minimise exposure time in the room. Oral communication with the patient should focus on the essentials of the indication for ultrasound. | 92.9% |

Table 1 (Continued)

| | Overarching principles | Level of agreement |
|----------------|---|--------------------|
| 11. | The number of people entering the examination room should be limited to the patient and the examiner (except for an accompanying person in the case of children or dependent adults). | 100% |
| 12. | The patient should wear a surgical mask, correctly positioned to cover the nose and mouth, from the moment he/she enters the examination room and throughout the ultrasound examination. | 100% |
| <i>Comment</i> | <i>There should be masks available in the ultrasound room in case the patient comes without one or it has been damaged or worn for longer than recommended by the manufacturers. If the patient is wearing a mask with a valve, a surgical mask should be placed over the first mask.</i> | |
| 13. | If the patient needs to remove clothing, he/she should leave their clothes on the same chair where he/she was sitting, if possible, at least 1–2 metres away from the examiner. The chair or its cover should be disinfected with the appropriate product after each patient. | 100% |
| 14. | If the ultrasound examination is performed lying down, the patient should remove their shoes and place them under the examination couch. | 92.9% |
| <i>Comment</i> | <i>A moist pad with 1% sodium hypochlorite may be placed on the floor at the entrance to the ultrasound room to disinfect the soles of shoes.</i> | |
| | Performance of the ultrasound and protective measures for patients and healthcare professionals | |
| 15. | Appropriate personal protective equipment and protective equipment for the ultrasound equipment and consultation room should be used to maximise the safety of the patient and the rheumatologist sonographer while the ultrasound is being performed. | 100% |
| <i>Comment</i> | <i>The protective equipment will adapt to the available resources but must always comply with minimum standards to ensure the safety of both patient and examiner.</i> | |
| 16. | The consultation room should have natural ventilation (window) or ventilation systems, avoiding closed-circuit air conditioning if possible (unless there is equipment with high-efficiency particulate air filters, which is rarely available). If adequate ventilation of the ultrasound room is not possible, the door may be kept open, with a screen to ensure the patient's privacy. | 92.9% |
| 17. | The patient will be instructed to keep their mask on throughout their time in the consultation room and if possible, to avoid touching the ultrasound machine, the consultation room, or the scanner with their hands. The patient should clean their hands and the area to be examined with a hydroalcoholic solution prior to the examination. | 100% |
| 18. | The maximum possible distance that the examination allows should be maintained between patient and examiner. | 100% |
| <i>Comment</i> | <i>Whenever possible, the patient's face should be positioned away from the examiner's face (opposite side of the examination couch).</i> | |
| 19. | The rheumatologist sonographer must wear personal protective equipment consisting of a mask (at least a surgical mask, preferably FFP2, and the latter must be used whenever ultrasound-guided interventions are performed), protective gloves (preferably double), and it is advisable (mandatory if ultrasound-guided interventions are performed) to wear goggles or a face shield and a disposable gown. Clothing other than street clothes should be worn, preferably scrubs and hospital footwear. Hand hygiene should be carried out with soap or hydroalcoholic solution before putting on personal protective equipment. | 92.9% |
| <i>Comment</i> | <i>As additional useful measures: hair should be neatly tied back, and it is advisable to remove or cover a beard/moustache with the mask. Goggles or a face shield are useful to avoid splashes of respiratory droplets or traces of gel on mucous membranes. Try to keep the left hand for the ultrasound keyboard/controls and the right hand for the ultrasound probe.</i> | |
| 20. | The probe/ultrasound equipment should be thoroughly cleaned and disinfected before the first examination and after each examination performed. To minimise contact and to facilitate cleaning of the equipment, a disposable probe cover (or protective glove) and disposable paper drape should be used. Special care should be taken to avoid transmission of infection when removing the protective elements from the probe and ultrasound machine, as well as when cleaning the patient and the stretcher. Gel residues should be removed from the equipment first, followed by thorough disinfection of the equipment with appropriate recommended solutions. Hand hygiene should be performed after cleaning and removing protective equipment. | 100% |
| <i>Comment</i> | <i>The patient shall be provided with disposable paper towelling for cleaning the gel at the end of the examination. Disposable materials from all patients and the examiner should be collected in a bag which should be sealed at the end of the examination and removed by the appropriate person, in accordance with the centre's regulations.</i> | |
| 21. | The written report (computerised or handwritten) of the ultrasound evaluation should be made after the patient leaves the ultrasound examination room. Oral communication with the patient should focus on the substance of the ultrasound evaluation findings. | 92.9% |
| 22. | Rotating residents in the ultrasound examination room should be limited to one only, provided it is essential in their rotation schedule or they have an ultrasound care responsibility. The presence of external students or interns should not be allowed. | 85.7% |
| | Protection, cleaning, and disinfection of ultrasound equipment | |
| 23. | The ultrasound equipment should first be cleaned (to remove dirt) and then disinfected (to kill germs). | 100% |
| <i>Comment</i> | <i>If possible, the keyboard, monitor and probe holder should be protected by a "protective film" type system to facilitate cleaning. It is advisable to reduce the number of probes connected to the equipment to a minimum, storing the rest individually to extract them again only if necessary. Do not forget to put ultrasound gel between the probe and the protective cover before inserting the latter.</i> | |
| 24. | The supplier should be consulted on the optimal cleaning and disinfection products for the ultrasound equipment. | 100% |
| <i>Comment</i> | <i>It is recommended to consult the manufacturer's disinfection manual or the system's user manual for the appropriate disinfectants. The use of an inappropriate substance may damage the probe or other parts of the equipment such as control panel, monitor, etc. The manufacturers are not responsible for damage caused during cleaning/disinfection if non-recommended products and times are used.</i> | |
| 25. | The probe should be disinfected from its base, using disinfectant wipes or wipes soaked in disinfectant liquid or foam. Screens, both the OLED/LED display and the control screen, must be cleaned with a microfibre cloth specifically for screens. | 100% |
| <i>Comment</i> | <i>Respect the exposure and drying times of the disinfectant product indicated by the manufacturer. The use of any type of brush is not recommended as the bristles could damage the surface of the probe.</i> | |
| | Ultrasound-guided interventions | |
| 26. | Invasive ultrasound-guided percutaneous diagnostic or therapeutic procedures during the COVID-19 pandemic should be limited to those indications, locations, and structures for which there is evidence of greater accuracy, efficacy, and safety than traditional procedures using external anatomical landmarks. | 92.9% |

Table 1 (Continued)

| | Overarching principles | Level of agreement |
|---------|--|--------------------|
| Comment | <i>Diagnostic ultrasound-guided procedures include arthrocentesis, aspiration of cysts, bursae, synovial sheaths and musculoskeletal tissue biopsy, and therapeutic procedures include perilesional/intralesional infiltrations, tenotomies and percutaneous irrigation of calcifications. These procedures generally increase exposure time and, consequently, may increase the risk of contagion. Therefore, the recommendation is to perform an ultrasound-guided procedure only when a greater benefit can be obtained than with procedures using external anatomical landmarks.</i> | |
| 27. | The rheumatologist must be an expert in ultrasound-guided interventional imaging. He/she should be assisted by a healthcare assistant familiar with the procedure only when necessary, to minimise the number of people in the room. To minimise extravasation of body fluids, it may be appropriate to use a threaded cone syringe (Luer Lock type) to aspirate fluids or to safely inject therapeutic substances. | 78.6% |
| 28. | For the care of inpatients with COVID-19 requiring ultrasound-guided intervention, ultrasound should be performed in the patient's room and, whenever possible, with an ultrasound machine reserved for use in patients with COVID-19 infection. | 92.9% |

pandemic; (C) Screening, patient referral and patient flow; (D) Patient reception and preparation; (E) Performance of ultrasound and protective measures for patients and healthcare professionals; (F) Protection, cleaning, and disinfection of ultrasound equipment; (G) Ultrasound-guided interventions.

- Development of the preliminary recommendations by the panel.
- Supervision of the preliminary recommendations by the scientific and methodological coordinators.
- Proposal for agreement of the resulting recommendations to all panel members using the Delphi method, applied telematically, with the necessary rounds to reach consensus of the group, after reformulating or reconsidering each recommendation in the event of disagreement. Panel consensus was considered when 75% of the panel members scored their agreement with each recommendation ≥ 4 on a Likert scale of 1–5 (1. strongly disagree; 2. strongly disagree; 3. neither agree nor disagree; 4. strongly agree; 5. strongly agree).
- Drafting of final document.

Results

Literature review

There are no publications to date that establish specific safety recommendations for the use of ultrasound in rheumatology during the COVID-19 pandemic. Therefore, information related to this field was extracted from recommendations of national or international societies of ultrasound and radiology, for the most part.

We analysed 30 references that fully or partially met the objectives of the review, as well as their literature citations. With the results obtained^{3,6–25} a narrative document on safety in the use of ultrasound was drafted and presented to the expert panel for discussion and consensus.

Overarching principles and recommendations

All the panel members answered the two rounds of the Delphi questionnaire. Five overarching principles and 28 recommendations were developed and agreed upon by the panel, as shown in the respective tables in Table 1. Panel consensus was achieved with only one Delphi round. However, there was strong disagreement on two recommendations by some members of the panel, which were therefore reformulated and resubmitted for agreement, together with those originally agreed by the group using a Likert scale of 1–5 and a simple vote between the two, in a second Delphi round; the versions of the two recommendations that were agreed by the panel and, if both alternatives were agreed, the version that received the most votes from the panel members, were chosen as the final recommendations.

Discussion

These recommendations refer to preventive measures during the COVID-19 pandemic when using ultrasound, a technique widely used in rheumatology practice. However, they could apply to other rheumatological techniques where there is close contact with the patient and a vehicle of transmission (gel or oil) is used, as in the case of capillaroscopy or where there is the possibility of contact with biological fluids (arthrocentesis or infiltrations, not necessarily ultrasound guided). These recommendations should be adaptable and dynamic depending on the circumstances of the setting and course of the pandemic, prioritising the maximum protection of patient and professional to ensure the optimum quality of the test. Each health service and teaching department could consider adapting their ultrasound teaching, which is so important for our rheumatological society and necessarily affected in the interest of safety, to the epidemiological circumstances of the pandemic.

Conclusions

This document provides useful information on preventive measures in rheumatology ultrasound practice during the COVID-19 pandemic based on the experience and literature available to date. The COVID-19 pandemic poses a challenge in our routine rheumatological ultrasound practice. With a high level of agreement, the panel of experts proposed recommendations that, adapted to the availability of resources, will help in the safe planning and performing of necessary ultrasound examinations for patients and professionals, and minimise the risk of transmission of infection without undermining the diagnostic quality of the test.

Conflict of interests

The authors have no conflict of interests to declare.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.reuma.2020.10.010>.

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