BMUS

Guidelines for the Administration of Ultrasound Guided Musculoskeletal Injections

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Contents

1 Introduction

Joint and soft tissue injections (JSTI), usually corticosteroids with local anaesthetic, are commonly given to patients with musculoskeletal (MSK) pathology in many healthcare settings. This is an established therapy which has been embedded in standard clinical practice for many years, but the evolving evidence base and improved access to image guidance for targeted injection therapy has changed practice in many areas by improving accuracy[1,2,3]

In addition to image guidance by fluoroscopy or computed tomography, the use of ultrasound to guide injections has become increasingly popular in many MSK services involving a range of professional groups, due to the lack of radiation, relatively low cost and ease of use in experienced hands, and it has superseded the use of fluoroscopic guidance in many instances[4].
However, whilst most agree that image guidance improves accuracy, the evidence on increased efficacy and improved patient outcomes remains a source of discussion, in particular the use of ultrasound guidance[1,5,6].

The intention of this document is to help in the provision of a safe ultrasound guided injection service within Radiology departments but also within other services where it is appropriate for non-medical healthcare professionals to undertake these interventions.

1.1 Background

In 2015 the American Medical Society for Sports Medicine (AMSSM) reviewed the current evidence on the accuracy, efficacy, and cost-effectiveness of ultrasound guided injections (USGI) specifically.[7]

They found high quality evidence that USGI are more accurate than 'blind' injections and 'good' evidence that when corticosteroids are injected using ultrasound, they are more effective in specific large and inflamed joints as well as some soft tissue pathologies. In other studies, there was limited but positive evidence that the use of USGI in other areas has improved outcomes and there is some evidence to say that they are cost effective and better tolerated.[8] However, controversy remains, and most services develop on the basis of local need and the preference of referring clinicians.

Where ultrasound guidance is utilised, services have developed with different service models provided by a range of healthcare professional groups. In order to provide improved patient services and efficient use of healthcare resources, an increasing number of non-medical healthcare professionals have developed skills and competencies in JSTI, and because of clinical demand, some are now trained to give USGI. Services now using USGI include Radiology, Orthopaedics, Physiotherapy, Pain management, Podiatry, Rheumatology and Sports and Exercise Medicine.

Whilst it is a prerequisite to ensure patient safety that the practitioner delivering these interventions is appropriately trained, competent and authorised to undertake USGI, their

scope of practice may vary and a rigid 'one size fits all' training programme would not be suitable. However, general principles apply to all service models.

For example, professions such as physiotherapists, podiatrists and orthopaedic surgeons may be skilled in clinically guided (blind) JSTI, clinical examination, consent and pharmacology but have a knowledge gap in ultrasound physics, instrumentation, technique and ultrasound anatomy/pathology, image capture and storage and the formal reporting of imaging examinations.

Prior to undertaking USGI, radiographer/sonographers may have experience in a wide range of diagnostic ultrasound and resultant imaging findings, image acquisition, interpretation, reporting, the use of ultrasound equipment and a wide range of MSK and non-MSK anatomy and pathology but have a knowledge gap in the delivery of a pharmaceutical drug through the skin to an anatomical target and may not be experienced in the consent process required for USGI.

These variations mean that training routes will differ, but the components will be the same i.e., training and competencies will be required in MSK ultrasound imaging, USGI technique mentorship, injection therapy safety considerations and relating to the administration of drugs.

This guidance has been designed to aid the development of safe and robust services to deliver ultrasound guided injections. The document is intended to be useful to all ultrasound practitioners from a variety of backgrounds.

These guidelines do not cover the management pathways of each condition, specific drugs or techniques used as this would necessitate the inclusion of relevant alternative investigations, examinations/ assessments, exercise, orthotics, and rehabilitation.

The aims of this document are to:

1. Provide guidance for development of an ultrasound guided injection service
2. Provide templates for the ultrasound practitioner to use in an ultrasound guided injection service
3. Suggest training options for those wishing to develop ultrasound guided injection services

It is anticipated that this document will provide a framework for service providers and ultrasound practitioners to amend and apply at a local level.

2 The use of ultrasound to guide injections

2.1 Indications for the use of ultrasound guided injections

In general, the indications for referral for ultrasound guidance of a procedure for patients with MSK pathologies remain the same as those without guidance:

- To obtain samples of joint aspirate for diagnostic purposes
- For relief of pain from localised inflammation of the joint or soft tissue
- To aid mobilisation
- To assist with rehabilitation and improve function

2.1.1 Frequency of injection

There is a widely publicised 'rule' that no more than three corticosteroid injections (CSI) – guided or non-guided - should be given to the same structure over a 12-month period[9]. Again, evidence is poor, opinion amongst clinicians varies and the needs of the patient must be balanced against the risks of injection at every opportunity. CSI certainly shouldn't be used on a regular basis unless all other conservative measures have been tried, or if they don't give significant pain relief. However, there are patients for whom CSI is the only treatment that gives any relief of their symptoms. In dedicated guided injection services such as Radiology, it is important to have good communication with referrers in order to discuss these matters to ensure collaborative patient care.

2.2 Criteria for ultrasound guided injections

The decision to use imaging to guide therapeutic injections to their intended target is a complex one and dependent on many factors including clinical need, but also local funding and imaging service provision[10]. Therefore, it remains the responsibility of the individual clinician, service or clinical pathway lead, to detail the criteria for undertaking guided or blind injections rather than national guidance such as this document. Appendix 1 includes examples of the criteria used for imaging services. Their considerable differences are noted and are an indication of the variations in clinical practice, so it is vital that criteria for referral into imaging services for USGI are agreed locally by all stakeholders involved in the service.

2.3 Contraindications and cautions

Contraindications for joint injections, in particular corticosteroids, are detailed on the checklist (see chapter 7.2) in Appendix 2 and commonly include:

- Current infection (systemic or local)
- Sensitivity to local anaesthetic or corticosteroid
- Prosthesis in the joint to be injected

Cautions for non-medical ultrasound practitioners which may need further clarification from the referrer or medical supervisor often include[11]

- Pregnancy or breastfeeding
- Current anticoagulation
- Diabetes
- Recent or planned surgery, dental work or vaccination

3 Training and competency

The clinical decision to use CSI as a therapy is influenced by many factors which include the clinical and medical history of the patient, relevant pathological appearances on imaging, and evaluation of the risks and benefits of injection. Clinical reasoning is critical to ensure practitioners can justify the interventions' inclusion in the patients' management pathway but is also vital for those providing an USGI service for referring clinicians as not all patient presentations will be straightforward.

All healthcare practitioners involved must have knowledge of the theoretical issues underpinning injection therapy: governance, drug administration, documentation, medicolegal and professional responsibilities as well as the practical competencies involved in this type of procedure.

Professional groups will have their own training pathways and these may differ, but it is recommended that in order to ensure safe and effective use of USGI, the practitioner/service should demonstrate the following:

i) that all practitioners have completed an accredited course in ultrasound imaging that aligns with their defined scope of practice and have been assessed as competent to give the USGI appropriate for that scope
ii) that all practitioners have education in injection therapy that aligns with their defined scope of practice
iii) that all practitioners have appropriate training/authority to administer drugs aligned with their defined scope of practice

It is important that the chosen training route is appropriate and must be transparent and open for review.

Historically, many injection services have developed in-house using the skills of experienced practitioners to teach those wishing to learn new skills. This has been relatively common in Radiology departments where radiologists have provided mentored training for their sonographer colleagues who are proficient in MSK ultrasound but lack injecting skills and knowledge in the use of steroids and local anaesthetics. This route requires significant pre-reading on current pharmacological guidelines, a robust quality and governance framework and supervision from an appropriately trained individual to include:

- Defining the scope of practice
- Arrange shared lists and then side by side lists with experienced colleagues
- Complete a portfolio with reflective work and competencies signed off as they are gained

3.1 Academic routes

Whilst there is no current regulation defining the qualifications needed to perform USGI, obtaining accredited training in ultrasound and injecting skills via higher education institutions (HEIs) is becoming more common and is now often recommended by professional bodies. The solutions below cover most scenarios and provide transferrable documentation to practitioners.

3.1.1 Ultrasound imaging

3.1.1.1 Using ultrasound as an anatomical aid

There are some occasions when injection therapy is indicated on clinical grounds or following prior imaging. These patients will have followed pathways designed to diagnose and treat their musculoskeletal condition and along with extensive clinical work up, they may have undergone imaging, have a working diagnosis and may have been given a clinically guided CSI that was not effective. In these cases, the referring clinician requires that USGI is delivered accurately to a specific site for their patient, but they may not require a pre injection diagnostic scan. Some examples of this would be an injection of steroid into small joints for osteoarthritis (sometimes given using fluoroscopic guidance), injecting glenohumeral joints for 'frozen' shoulder, or the delivery of local anaesthetic to block a nerve either for pain relief or prior to surgery. If these are to be ultrasound guided, it is important that the practitioner is educated and competent in ultrasound imaging and US anatomical presentation to the same level as any other professional performing USGI but it may not be necessary that they have full diagnostic MSK ultrasound training.

Some professions such as anaesthetists have developed their own ultrasound courses specifically for this, but others may choose to use focused ultrasound practice modules which run alongside post graduate ultrasound courses in many universities. These modules are appropriate for those with injecting experience/qualifications but no ultrasound skills, and will cover ultrasound physics and instrumentation, and a practical element of competency to follow a needle to a specific site using ultrasound. As with all practical ultrasound skills training, the 'student' must find their own clinical mentor who is experienced in USGI.

Once competent, it is vital to ensure that patients and referring clinicians using the service are aware that there is no diagnostic component to the use of ultrasound in this way – it is simply being used as an imaging modality in the same way as fluoroscopic injection services.

3.1.1.2 Using ultrasound as a diagnostic aid

In some instances, when there is a clear diagnosis of a particular pathology, it becomes important that the practitioner delivering the USGI, has skills in diagnostic ultrasound in order to identify the pathology to be treated – for example one would need to be skilled in the identification of a Morton's neuroma in order to deliver a steroid injection to treat it.

These practitioners must therefore be educated in the identification of musculoskeletal pathology on ultrasound in the areas appropriate to their scope of practice as well as the delivery of the injection. Training will depend upon the practitioners/service scope of

practice, and many of the UK HEIs delivering Ultrasound programmes include modules covering specific anatomical areas such as upper or lower limb.

In some scenarios, a diagnostic scan is performed and, depending upon the outcome of that scan and following discussion with the patient, an injection may or may not be performed. If the same practitioner is to carry out the diagnostic scan and the injection, it is important that they have extensive ultrasound scanning experience in the appropriate areas as well as well-developed skills in clinical reasoning and injecting. For those working remotely from the referrer, good communications and robust pathways are vital to ensure patient safety.

In recent years, CASE accredited ultrasound guided interventional modules have been developed by some universities which provide the underpinning background knowledge in both diagnostic ultrasound and injecting.[12]

3.1.2 Injection therapy training

Joint and soft tissue injection therapy modules are often delivered at universities providing physiotherapy courses and although they do not cover the use of ultrasound, they will cover clinical reasoning, relevant pharmacology, consent and aseptic, non-touch techniques, as well as specific, clinically guided injection techniques. For those practitioners already having diagnostic ultrasound/needle guiding skills – for example sonographers working in Radiology departments - these modules can supplement the practitioner's ultrasound skills, filling the gaps in their knowledge around the more clinical aspects of injection therapy.

3.2 Practicalities

Gaining competency in the practical technique of injection or aspiration is often the most challenging. An experienced clinical mentor is vital to teach and directly supervise the technique required for each region and then support the practitioner post qualification, until confidence is achieved. The ideal scenario would be to run concurrent lists, where the newly qualified injecting practitioner works independently but has the expertise of the mentor close by, to call upon if necessary.

The speed of acquisition of clinical competence varies between practitioners but most HEI courses recommend a minimum of 10 - 15 supervised injections in each anatomical area. This will give the practitioner the best chance of experiencing differences in patient body habitus or altered anatomy.

It is also important to ensure understanding of the difficulties and pitfalls that may occur in any given region and have the confidence to postpone or even cancel an intervention if it is not appropriate. It may be helpful to use a competency assessment form as a method of highlighting and recording areas of practice that went well and those that require improvement. An example of a competency assessment form is given in Appendix 3.

4 Governance

Before undertaking an extended role, any practitioner should follow the rationale of all safe, effective, robust, evidence-based services by ensuring that they are trained, competent and working within their scope of practice.

In any delegated service, there may be a need for a practitioner to make autonomous decisions in some instances and this applies to USGI for patients referred into to an imaging service by their treating clinician. These decisions can be difficult, especially when ultrasound appearances do not correlate with the clinical history on the request.

In these scenarios, it is important that there are standard pathways, but also appropriate supervision/consultation available for less experienced practitioners. For example, in a Radiology department, a senior experienced practitioner, either medical or non-medical, should be available for advice.

In addition, the following safeguards should be considered:

- The names of all injecting ultrasound practitioners and their relevant qualifications should be recorded and kept in the appropriate department.
- There is an officially agreed mechanism by which the ultrasound practitioner administers the medication (see 5)
- Standard operating procedures must be in place, covering every aspect of the procedure and aftercare
- Non-medical, trained, and registered professionals performing these procedures should be indemnified by their employing Trust, provided the employee has acted in accordance with the relevant policies and procedures. In view of this, it is important that robust policies are in place and are appropriate to the background profession and scope of practice of the ultrasound practitioner

It is recommended that each practitioner ensures that:

- They have current state registration with the appropriate body
- Their professional insuring body is informed of the practitioners' scope of practice
- They have annual competency peer review retained for records
- Their annual resuscitation training is up to date
- They recognise personal limitations and seek advice appropriately
- They act within their Profession Code of Conduct

Time and funding should be available for individuals performing these interventional procedures to receive / provide training and CPD.

4.1 Ongoing competency

The practitioner may perform an ultrasound guided joint injection after completion of competencies and evidence of supervised practice. These competencies must be maintained over time and many departments will hold regular training days, usually annually, to check that competency has been maintained.

It is suggested that evidence of ongoing competency in the form of assessment sheets are kept for future reference and an example of a competency assessment can be found in Appendix 3.

5 Administration of medicines by ultrasound practitioners in the UK

In the UK, Prescription Only Medication (POM) can be prescribed by medical doctors and other healthcare professionals qualified as independent or supplementary prescribers.[13,14,15]

5.1 Independent and supplementary prescribing

Supplementary and independent prescribing are mechanisms by which non-medical regulated healthcare professionals can be trained and responsible for prescribing medication for patients.

Supplementary prescribing is where a management plan for a specific patient is drawn up in partnership with a medical physician. Following appropriate training, the supplementary prescriber then prescribes medicines from the documented list for the named patient. This mechanism is most often used in the management of chronic conditions. Nurses, pharmacists, physiotherapists, chiropodists or podiatrists, radiographers and optometrists may train and register as a supplementary prescriber.

Independent prescribing is where, following appropriate training, non-medical clinicians may prescribe medicines for patients autonomously for conditions that are within their scope of practice. Independent prescribing requires additional qualifications which are currently available to pharmacists, nurses, podiatrists and physiotherapists. Therapeutic radiographers can be trained as independent prescribers but as yet, not diagnostic radiographers though their case has been put before the relevant government department. There are some restrictions about which medications can be prescribed by non-medical prescribers - these are specific to individual professions and mostly relate to controlled opiate medications. Independent prescribers can prescribe off-label, unlicensed medicines and the mixing of medicines.

Therefore, in current practice, the mechanisms by which POM can be administered to patients by healthcare professionals who are not independent prescribers, such as diagnostic radiographers/sonographers are via a Patient Specific Direction (PSD) or a Patient Group Direction (PGD)[16,17]

5.2 Patient Specific Direction (PSD)

This is an instruction from either a doctor or non-medical independent prescriber to supply or administer a medicine to a **named** patient after the prescriber has assessed the patient on an individual basis. The administration can then be carried out by a suitably qualified or supervised healthcare professional. The instruction, which can be written or electronic, should specify the dose and method e.g. via injection.[13,18]

A verbal instruction should be used only in emergency situations and documented clearly.

The prescriber must have enough information to prescribe safely.

Licensed, unlicensed, off-label medications as well as mixing of medications can be prescribed with a PSD.

5.3 Patient Group Direction (PGD)

PGD is a document drawn up by NHS bodies and other Care Quality Commission registered organisations, which allows healthcare professionals who are not independent prescribers, to supply or administer medication to defined patient groups to treat specific conditions.

The patient groups, medications, doses and conditions are explicitly documented in the PGD along with any specific exclusions and precautions.

To make use of a PGD the healthcare professional must be named in the document.

Licensed and off-label medications can be administered under a PGD, but unlicensed including mixing of licensed medications, is not permitted.[19]

5.4 Off-label use of medications and mixing of medicines

When a licensed drug is used in a manner not covered by its licence it is termed 'off-label'. It is common practice for medications to be repurposed over time as clinicians find them to be effective in treating conditions other than those for which they were originally licenced.

Because the licensing process is long and very costly, drug companies do not normally seek licences for these applications and so they are described as off-label.

Clinicians rely on academic literature and the opinion of organisations such as NICE (National Institute for Health and Care Excellence) to determine the appropriateness of these applications. Off-label use of a drug can be incorporated into a PGD.

Diluting a medication with an inert substance such as water is considered an off-label application as it will generally not be covered by the drug licence. This can therefore still be covered in a PGD.

The mixing of two or more medicines, such as Lidocaine and Methylprednisolone prior to injection, constitutes the manufacture of a new unlicensed medicine[20]. This is not permissible under a PGD but can be performed with a PSD.

5.5 Ultrasound practitioners injecting in practice

Ultrasound practitioners who are not independent prescribers, can perform injections by using either a PSD or a PGD.

Using a PSD

Using a PSD allows the prescriber to be specific about the drugs and doses given to patients by the ultrasound practitioner and also allows for mixing of medications prior to injection.

The request for an injection can represent a PSD if it contains enough information including the drugs and doses to be used.

Whilst it may be more practical for the PSD to be added to the referral by the vetting radiologist or independent prescriber, it is important to check with local Trust pharmacy

leads as this process is open to interpretation as the prescriber has not individually assessed the patient.

Using a PGD

A PGD will typically be drawn up and signed by a senior pharmacist and a senior medic within the department. All clinicians who will used the PGD need to be named and have signed the document. It will specify named medications that can be injected to specific patient groups.

This would typically include:

Inclusion criteria - for example patients over 16 with soft tissue or joint conditions

Conditions that they could be treated for – for example joint disorders, entrapments, bursitis

Exclusion criteria – for example drug sensitivities, comorbidities, presence of metalwork

Cautions (may require advice) – for example anticoagulation disorders, diabetes

5.6 PGD versus PSD

The advantage of PGD is that individual requests do not need to be vetted by a physician or an independent prescriber and the injector can choose between a selection of corticosteroids in order to use the one most likely to help with the pathology demonstrated on the scan.

The advantage of PSD is that it allows the mixing of drugs prior to injection. This reduces the complexity of the procedure and therefore the risk to the patient. If two medications need to be administered to a single site such as the subacromial bursa then under a PGD, each drug would need to be administered either by separate injections, using a connecting tube with valves or by swapping syringes during the procedure.

6 Audit

Clinical audit is a quality improvement process that identifies if healthcare is being provided in line with national standards. The aim is to allow quality improvement to take place where it will be most helpful and will improve outcomes for patients. Clinical audit can look at care nationwide (national clinical audits) but local clinical audits can also be performed within trusts, hospitals or GP practices - anywhere healthcare is provided.

In every service, there should be a process which facilitates regular audit. This can be annual, or on a rolling review. Individual healthcare professionals are responsible for maintaining their own continuous audit of cases performed and of complications rates which should be regularly audited.

In injection services, there are several parameters that can be used for audit purposes.

Documentation of:

- Compliance with completion of checklists
- Compliance with consent forms
- Compliance with medication provision – PGD, PSD
- Appropriate post injection report content
- Clinical reasoning where an injection was not performed

And for those who have contact with the patient following the injection

- Post injection complications
- Efficacy of injection (see 6.2)

There may be a process to allow patient feedback following the intervention – a pain diary (see 6.2) that can form part of audit results. This questionnaire can be used continually as a rolling audit, with a logbook of cases or as an annual audit of a selected number of cases.

The results can be compared between practitioners who perform the procedures, to establish that current levels are being maintained, both throughout training and once competency is established. The audit can be reviewed regularly and can also form part of the practitioner's annual appraisal.

6.1 Review of technique

Regular review of the injection technique of each individual injector is important, especially in the first few years of any service. One method is peer review - assessing the whole process of a set number of injections including consent, sterile technique, approach and visualisation of needle during procedure - similar to competency assessments used during training.

6.2 Review of patient outcomes

Follow-up of symptom relief patterns of patients after therapeutic injection can be used as an indication of the effectiveness of the technique although it must be remembered that not all corticosteroid injections will be effective, even when accurately delivered.

In some Radiology departments, pain diaries are used as a guide for service improvement and planning. As well as providing a record of symptom relief, they also allow patients to provide feedback on the injection process including any adverse reactions or effects but again it is important to stress to patients that clinical follow up – repeat injections or other therapeutic interventions - is the responsibility of the referrer, not the Radiology department, unless there have been specific arrangements to the contrary.

An example of a pain diary used in a Radiology department is available in Appendix 4.

7 The injection procedure

7.1 Pre-procedure documentation

7.1.1 Consent

Consent in a healthcare setting, confirms that a patient gives permission before they receive any type of medical treatment, test or examination following appropriate explanation by a clinician. The principle of consent is an important part of medical ethics and international human rights law.

For consent to be valid, it must be voluntary and informed, and the person consenting must have the capacity to make the decision.

During the consent process, the examination should be explained in detail to the patient and must include the risks and potential adverse effects of the procedure and any medicine(s) used. A printed checklist is now commonly used in conjunction with consent, and that can be scanned and stored electronically in case of future issue (see 7.2).

Once fully informed, the patient can then decide if they wish to proceed with the examination and their decision is recorded.

Consent should be given to the healthcare professional responsible for the delivery of the person's treatment. If the referring clinician is also delivering the ultrasound guided injection, responsibilities are clear. However, in some cases, for example when a patient is referred to Radiology for an USGI, both the referring clinician and the ultrasound practitioner delivering the injection may obtain consent following an explanation of the procedure, including benefits and risks using a 'Two stage consent' – see below.

How consent is given

Consent can be given in two ways:

a. **Verbal consent** – the patient saying they agree to have an injection

If obtaining verbal consent, it should be documented on the final report for example:

'Following informed consent including an explanation of risk of infection, effect of corticosteroid and potential risk of injections, I have proceeded to inject the ……..'

b. **Written consent** – the procedure with its risks and benefits are written down and the patient signs to say they agree to proceed. Many departments choose to use the generic 'consent form 3' for this, though others may choose to produce their own specific form. An example of a consent form is given in Appendix 5

Two stage consent - some Trusts require a two-stage consent for any JSTI – the referrer completes the first stage following discussion with the patient at their consultation and the patient signs 'part 1'. Part 2 is completed by the injecting practitioner and signed by the patient at the time of injection.

If obtaining written consent, the signed consent form should be electronically stored, preferably along with the radiology report and safety checklist.

Whichever way consent is set up within the service, it is important that it is agreed and documented in any service policy to ensure it complies with local Trust consent process.

It is always the responsibility of the person delivering the injection to ensure that it is safe to proceed and to obtain appropriate consent.

7.1.2 Checklist

Within most services undertaking invasive medical procedures on patients, some form of checklist is completed during the consent process to ensure that it is safe to proceed. This is relevant to both clinically and ultrasound guided joint and soft tissue injections. The World Health Organisation (WHO) has produced a checklist for invasive procedures, which can be adapted to meet the needs of individual services.

Examples are available through the Royal College of Radiologists (RCR)[21] and these may be adapted to suit local needs. There are several examples of checklists in Appendix 2.

The following headings suggest areas that should be discussed with the patient prior to consenting to the procedure:

Contraindications and cautions

It is recommended that these are included in any checklist used to remind the practitioner about any potential issues (see Appendix 1).

Contraindications commonly include:

- Current infection (systemic or local)
- Sensitivity to local anaesthetic or corticosteroid
- Prosthesis in the joint to be injected – due to the increased risk of infection. If a corticosteroid (CSI) is still appropriate, these procedures are usually carried out in the sterile environment of an operating theatre and certainly require discussion with the referrer

Cautions commonly include:

Anticoagulation

Patients undergoing minor procedures such as JSTI may not require interruption of anticoagulation, but this is the responsibility of the referring clinician or those responsible for their anticoagulation. Please refer to local agreements regarding management of anticoagulation for minor and low-risk procedures.

Anaphylaxis/ Allergic Reaction

Although rare, anaphylaxis/allergic reactions to either the corticosteroid or local anaesthetic (if also administered) can occur. According to the resuscitation council UK website[22] the time course for cardiopulmonary arrest resulting from injected medication predominantly occurs between 2 and 20 minutes post injection and it would seem sensible therefore, that patients are asked to remain on site for the full 20 minutes to ensure emergency assistance should a reaction occur.

Corticosteroid flare

A post-injection, self-limited synovitis can occur in approximately 1 – 10 % of cases following intra articular injection. Symptoms of joint pain and swelling can be observed several hours post injection and generally subsides within 48 hours [23]. It is important to warn patients of this and give them advice about the use of pain relief, however it is also important to warn them that symptoms of 'inflammation' occurring 3 - 5 days following CSI may be actually due to infection of the area – see 'Infection risk'. In addition, post injection induced neuritis may also need to be considered e.g. post carpal tunnel injection.

Infection risk

Local infection is considered a rare complication of joint and soft tissue injection.[24,25] However the consequences can be catastrophic and can result in joint destruction. Rates between 1:3000 and 1:50000 are quoted in the literature.[26,27] However this rate may be higher in immunosuppressed patients i.e., in the region of 1:2000.[27] Local infection following joint injection would not occur immediately following the procedure, but after 3 - 5 days, up to 14 days in rare circumstances with symptoms of pain, swelling, raised temperature. If this was to happen, patients must be advised to seek medical attention immediately to reduce the risks associated with sepsis.

In order to keep risk to a minimum, CSI injection should not be carried out in the presence of active infection in or near joints[28], in prosthetic joints except in exceptional circumstances - under direct orthopaedic control and in a sterile theatre - or in patients with a current systemic infection for example chest or urinary tract infection. If the patient is currently being treated for infection, it is advisable to wait 7 – 10 days after completion of antibiotics before carrying out their CSI in case the infection recurs post antibiotics.

Systemic effect

Systemic effects such as facial flushing have been reported with an incidence of less than 1% while vasovagal reaction can occur due to systemic absorption of the corticosteroid or local anaesthetic or due to patient anxiety to the procedure itself with incidences reported between 0 – 20 % [28].

Cutaneous effect

Corticosteroids may cause dermal/subcutaneous tissue atrophy, hypopigmentation, and fat necrosis, with a reported incidence of less than 1%[28] .

Because of this risk, some corticosteroids are reported to be more appropriate than others for superficial use, especially around the face or hands which would be more visible.

Tendon Rupture (See Rest also)

There have been case reports of tendon rupture following oral or injected corticosteroids [29,30] and local rules may apply, particularly in weight bearing tendons around the ankle. It is always important that corticosteroid injections are given as part of a treatment plan and recognised that their effect is transient – they are not a cure for a biomechanical issue – and that they are given as part of a treatment plan which may include exercise and orthotics

Hyperglycaemia

The use of corticosteroids including those given by injection have been shown to elevate blood sugar in diabetic patients, commencing after a few hours and lasting for several days and occasionally longer[31]. Although these increases in glycaemia are statistically significant, for most patients they are generally not clinically significant[32]. However, it is important that diabetic patients are stable in their disease and should be warned of this effect so that they know how to react to a high reading after corticosteroids.

Rest

Rest following the injection is often advised but the duration of suggested rest may vary between conditions and between clinicians. Reduced 'leakage' of injected substances out of the rested joint compared to non-rested joints, has been demonstrated in inflammatory conditions. The implication, therefore, is that rest will result in a more prolonged therapeutic action of the injected substance. However, in some conditions such as 'trigger' finger or a 'frozen' shoulder, patients may be encouraged to take advantage of the 'window' of symptom relief the steroid gives, in order to regain movement. Good communication with referring clinicians is vital when providing a remote service within Radiology as opinions on this may vary.

COVID 19

Corticosteroids predominantly affect the action of cytokines involved in inflammation. They lead to down regulation of immune function, inhibiting cell-mediated immunity[33]**.**

Theoretically, this may lead to an increased risk of contracting a virus and the possibility of that virus being more symptomatic. This is of obvious current relevance to Covid 19, however guidelines are changing continually and it is important for referring clinicians and ultrasound practitioners delivering CSI to be aware of current policy.

In view of this reduced immunity, it is also current practice in many departments (Oct 2022) for patients not to receive a CSI within 2 weeks of Covid 19 vaccination in order to ensure maximum immunity although this is not yet evidence based.

Miscellaneous

Amongst these, caution is advised when using corticosteroids with other drugs including many anti-retroviral (ritonavir), anti-fungal, calcium-channel blockers (diltiazem), and alterations may be made to the drugs used in line with Trust policies, or the procedure may be delayed. It is vital that clinicians provide detailed and relevant clinical information when referring patients for corticosteroid injections and it is best to seek advice if there are concerns about any drug interactions[5]. Uterine bleeding and nerve damage near site of injection although rare are also potential risks that may also be discussed with the patient.

7.2 Ultrasound guided injection procedure

There are many evidence-based papers and text books available which give detailed instruction on the techniques of USGI. Some of these are listed in the references of these guidelines but it is important for those offering an ultrasound guided injection service to clinical colleagues, that these details are discussed and agreed beforehand, to avoid confusion as there may be many opinions on best practice.

The following general guidelines are commonly used within current services:

Information regarding the procedure including the risks and benefits (Appendix 6) should accompany the appointment letter in line with the Trust/departmental consent process.

The patient must be identified formally, the site confirmed, and consent gained for an initial scan. An initial ultrasound scan should be performed either to identify the relevant joint and optimise the image parameters, or to identify or exclude the specific pathology suspected where appropriate (see chapter 3).

If subsequent injection/aspiration is appropriate:

- The procedure and risks should be explained again verbally
- Assessment of contraindications to a CSI should be made via the pre-procedure checklist (see 7.3)
- Consent must be taken to proceed – this may be verbal or written and should be in line with the Trusts consent process (see 7.10)
- An ultrasound guided injection of an appropriate site will then be performed if deemed appropriate

7.2.1 Aseptic technique

Aseptic technique means using practices and procedures to prevent contamination from pathogens. It involves applying the strictest rules to minimise the risk of infection.

Whilst many injection services suggest that aseptic techniques are used, opinions are wide and evidence for the need for asepsis is sparse which may result in service adopting a slightly less rigorous ‘clean’ technique.

The use of sterile gel has been widely discussed in recent months and it is important that practitioners follow national guidelines and use single use sachets of sterile gel for invasive procedures.[34]

Decisions on the appropriate use of gloves, skin cleaner and transducer covers should be made on a team basis, included in local guidelines, and adhered to by every member of that team.

7.2.2 Injection process

An example of precautions used in an ultrasound guided injection or aspiration is as follows:

- Following initial scan/consent process, ensure the ultrasound system/probe is clean
- Wash hands thoroughly
- Expose area to be scanned
- Prepare skin by cleaning with appropriate skin cleaner/ applicator without touching the skin with your fingers, giving time for the patient's skin to dry
- Check name, strength, and expiry date of corticosteroid and local anaesthetic with another member of staff assisting with the procedure
- Wash hands thoroughly, use sterile gloves and assemble equipment/draw up drugs
- Apply sterile gel both inside and on the outer surface of an appropriate probe cover and identify the relevant structure using ultrasound
- Introduce the needle and follow the needle tip until it reaches the structure. Aspirate, to ensure that the tip is not in a vessel then inject the corticosteroid/LA into the structure – this may need to be adapted if the practitioner working with a PGD as each drug will need to be injected separately (see 5.5). This may involve leaving the needle in position and changing syringes, or using a multi- way tap
- Remove the needle and apply an appropriate dressing

7.3 Patient Monitoring

Due to the minimally invasive nature of the test, no physical observations will be required if the patient remains coherent throughout the procedure. Facilities should be available if the patient's condition changes during or following injection, including oxygen, for the monitoring of the patient e.g., blood pressure, pulse oximetry and an anaphylaxis kit.

7.4 Anaphylaxis and its management

Anaphylaxis is a rare but acute reaction to a foreign substance to which an individual has been previously sensitised.

This is a very unlikely outcome to this type of injection therapy, but its occurrence must be catered for. Therefore, no list can be performed without appropriate measures in place.

Management

- Stop administration of drug
- Summon help immediately – this may be medical cover within the department, or a 999 call
- Use anaphylaxis kit appropriately[35]

7.5 Aftercare

The literature advocates relative rest i.e., restriction of activities that cause symptoms following injection of corticosteroid to the affected area[36] although this may vary between referrers. The time limit given to periods of rest may vary, but many feel that 24 hours is satisfactory. It is also important to:

- Warn patient about possible post-injection pain and risk of infection
- Warn diabetic patients about possible changes to their glycaemic control and extra risk of infection
- Ask patient to remain in the department for 20 mins post injection in case of anaphylaxis
- Discuss where results are to be sent, and time period from injection to results reaching referring clinician

7.6 Discharge and follow-up

The patient will be advised of immediate post injection aftercare, a pain diary provided if appropriate, and then directed to follow the advice and follow up of the referrer. The practitioner may also make any relevant recommendations for follow up in the radiology report.

8 Post injection records

Pre injection images of the site to be injected and if possible, an image with the needle in situ may be stored as they can be useful for audit purposes.

Any written report generated should include:

- the site and side injected
- acknowledgement of verbal or written consent obtained from the patient
- use of aseptic technique
- injection procedure and drugs
- any procedural or post procedural complications

An example of this would be:

Ultrasound guided injection left glenohumeral joint
Verbal consent gained. No contraindications.
Aseptic technique used.
The left glenohumeral joint was visualised and an ultrasound guided injection of 40mg triamcinolone acetonide & 5mls lidocaine 1% was successfully injected into the joint.
There were no immediate complications

More detail, including the batch numbers/expiry dates of drugs may be included if they are not recorded and stored elsewhere – within the check list for example.

8.1 Clinical Incident reporting and management

Any untoward incidents and near misses must be recorded and managed by the appropriate person or team as documented in local protocol.

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BMUS recommendations and guidelines are designed to inform local protocols issued by employers, but are not intended to be inflexible or prescriptive. Therefore, the choice of imaging examination and subsequent management of all patients is ultimately a local decision based on agreed schemes of work, the clinical information provided, and the ultrasound practitioner's professional judgement.