

SPECT-TECHNETIUM 99M CERETEC - ADMINISTRATION, HANDLING AND CARE - SCH

PRACTICE GUIDELINE [®]

DOCUMENT SUMMARY/KEY POINTS

- This procedure is permitted under special arrangement with a Nuclear Medicine Physician holding a Radiation License.
 - All staff involved with formulation, drawing up and administration of ^{99m}Tc-Ceretec for ICTAL brain imaging MUST be given a copy of this document.
 - This procedure must only be performed by a Registered Nurse who has received radiation safety training and who has been granted a special written exemption from licensing for handling radioactive substances from Dr Walter Haindl (Staff Specialist, Nuclear Medicine Department).
 - The reconstitution and injection of ^{99m}Tc-Ceretec must be carried out when the patient is having a seizure. The radiotracer component (Technetium-99m, supplied in a sodium chloride 0.9% solution in a syringe) is used to reconstitute the Ceretec (supplied as a lyophilised powder inside a vial). The resulting radiopharmaceutical is known as ^{99m}Tc-Ceretec.
 - The ^{99m}Tc radiotracer MUST NOT be injected to the patient without reconstituting the ^{99m}Tc-Ceretec radiopharmaceutical.
 - The radiopharmaceutical (^{99m}Tc-Ceretec) must be used as soon as it is reconstituted.
 - At all times, the procedures outlined by this document are carried out with reference to Radiation Safety information supplied in the Table 1.
 - This policy should be read in conjunction with the following documents:
 - [VideoEEG Telemetry Seizure Management Plan](#)
 - [Seizures Acute Management](#)
 - [Procedural Sedation \(Paediatric Ward, Clinic and Imaging Areas\)](#)

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st October 2019	Review Period: 3 years
Team Leader:	Scientific Officer	Area/Dept: Neurology

CHANGE SUMMARY

- Due for mandatory review.

READ ACKNOWLEDGEMENT

- Training/Assessment Required –Accredited Registered Nurses who will be injecting the ^{99m}Tc-Ceretec.
- Read Acknowledge Only –Ward C2South Nurses, Neurology Medical Officers, Scientific Officer for Video-EEG telemetry, Nuclear Medicine Physician, Nuclear Medicine Chief technologist, Nuclear Medicine Nurse Unit Manager, Nuclear Medicine Chief Physicist.

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Introduction

The Ceretec (exametazime) intravenous injection used for ICTAL brain imaging consists of two substances: Ceretec agent and the radiotracer called Technetium-99m (^{99m}Tc) (Michael D. Devous, 1998). The useful life time of the reconstituted injection is limited to several minutes. The complex formed after 30 minutes of reconstituted pharmaceutical is unable to cross the blood-brain-barrier. Therefore, the Ceretec must be reconstituted with ^{99m}Tc just prior to patient injection. It is essential to follow the directions carefully and adhere to strict aseptic procedures during preparation of the radiopharmaceutical. ^{99m}Tc must be handled with care and appropriate safety measures must be applied to minimize radiation exposure to hospital staff (GE-Healthcare, 2013).

Standard

The procedure may only be performed by a Registered Nurse who has received radiation safety training and who has been accredited by the Department of Nuclear Medicine in the handling of radioactive materials.

Indication

Technetium (^{99m}Tc) exametazime scintigraphy: ^{99m}Tc -Ceretec is a radiopharmaceutical that is indicated for the scintigraphic localisation of seizure foci in patients with intractable epilepsy. (La Fougère, 2009)

Procedure

Dosage and Prescription

A vial of exametazime (Ceretec) and a 5 millilitre luer-lock syringe containing Technetium-99m (^{99m}Tc) are delivered from the Nuclear Medicine Department in a shielded box.

A medical officer from the neurology team prescribes ^{99m}Tc -Ceretec dose and fourth hourly sodium chloride 0.9% flushes for the intravenous cannula, on a medication chart. The ictal SPECT is also ordered on eMR. An assessment should be made at this time as to whether the child will require sedation for scanning. If sedation is appropriate it is prescribed according to the SCHN Procedural Sedation Guidelines. If a patient is pregnant, the clinical need of the SPECT should be considered on an individual basis, and nuclear medicine advised of this information.

An interictal SPECT may be performed at least 48 hours after the ictal SPECT to determine brain blood perfusion when the patient is not seizing, which can be compared to the ictal SPECT. If it is thought an interictal SPECT will be required, please consider ordering on eMR at the time of ordering the ictal SPECT.

Patient Preparation

The patient and their family are informed of the sequencing of events during the procedure and their rationale by the admitting nurse and medical team. Families should be given a copy of the SPECT information sheet. Prior to the commencement of the study, an intravenous cannula is inserted, preferably 22 gauge or larger. Seizure semiology should be considered when deciding a site for insertion which allows for easy accessibility during a seizure. The cannula should be flushed four-six hourly. There should be no tenderness, oedema or resistance to flush. If there is any doubt as to the patency of the cannula at any time during the study period, it should be resited immediately. Consideration should be given to seizure semiology when deciding a suitable site for the cannula. A 10 millilitre luer lock syringe containing sodium chloride 0.9% is connected to the flush line with a 3-way tap, and secured to the forearm with tape.

The shielded (lead lined) box and delivery of ^{99m}Tc

Radiation safety guidelines must be adhered to at all times (Refer to [Appendix 1](#)).

^{99m}Tc radiotracer in a shielded (lead lined) box is delivered to the ward by the Nuclear Medicine Department. On arrival of radiotracer Registered Nurse (RN) trained in radiation safety and one other staff member in the ward must check the preparation date and time of the delivered ^{99}Tc and the expiry date of the Ceretec provided in a vial. After checking the details, both RN and the staff member must sign the paper strip attached to the syringe. A copy of the check list must also be completed.

Reconstitution and Administration

Note to the Registered Nurse:

- For radiation protection, dose preparation is carried out using the syringe and Ceretec vial inside the lead lined box. The sides and the lid of the lead lined box acts as a radiation shield when storing and drawing up the dose. The Ceretec vial should remain in the box at all times.
 - If the patient has not fitted prior to 6:00 pm, the procedure is cancelled for that day.
1. Upon noticing a seizure, the parent/ carer will alert staff using a brass bell.
 2. A Registered Nurse (RN) and the accredited RN will immediately respond. If the seizure is confirmed as being 'typical' by the parent/ carer, the accredited RN will prepare the ^{99m}Tc -Ceretec dose as soon as possible.
 3. Dose preparation
 - a) RN will don gloves
 - b) Swab the Ceretec bung with an alcohol swab
 - c) 5mL of ^{99m}Tc is injected into the Ceretec vial within the lead lined box. The vial is shaken to reconstitute ^{99m}Tc -Ceretec
 - d) Due to radioactive decay, the appropriate volume of the Tc99m-Ceretec dose increases with elapsed time of the ^{99m}Tc . The accredited RN will refer to the

time / volume dose chart ([Appendix 2](#)) to ascertain the correct volume to withdraw into the syringe for the patient dose.

4. The RN will check the cannula site and ensure it is patent by flushing with 5 millilitres of sodium chloride 0.9% to prevent extravasation of isotope.
5. Place an absorbent cloth under the injection site.
6. The RN will remove the syringe from the lead box, remove the needle from the syringe, attach the syringe to the cannula, and inject the ^{99m}Tc-Ceretec.
7. The cannula is then flushed with 5-10 millilitres of sodium chloride 0.9%.
8. The syringes, gloves and any absorbent cloths used are returned to the lead box.

Documentation

Ceretec Brain Scan form must be completed by the RN, showing times of seizure onset, cessation and time of injection. The video recording should be reviewed to determine these times.

Scanning

The Nuclear Medicine Department scanning room technologist must be immediately advised of the injection time. Nuclear Medicine will then give a time for the scan. (Usually 1-2 hours after injection of Ceretec).

Transportation

The child is transported to the Nuclear Medicine department by a porter on a trolley containing portovac with suction, emergency resuscitation equipment and pulse oximeter. The child is accompanied by a Registered Nurse. All medical records, medication charts, request forms and the Ceretec Brain Scan form are to accompany the patient. During Nuclear Medicine's normal hours the porter and trolley is provided by Nuclear Medicine, after-hours the child is transported on their ward bed by the after-hours porter.

Seizure Management

Every child should have a clear emergency seizure management plan and any medication prescribed charted with clear indications for administration.

In case of a seizure during transport or at Nuclear Medicine the child should be placed in the recovery position for their safety. Airway, breathing and circulation should be assessed and oxygen therapy administered as required. A Code Blue should be initiated by calling 2222 if the event is prolonged (>5mins) or immediately life threatening.

Sedation and Anaesthesia

The scanning process requires the child to lie in the scanner with their head perfectly still for a period of up to 30 minutes. If the child will be unable to comply with this, they will need to have sedation prescribed according to the SCHN Procedural Sedation Practice Guidelines. The neurology medical team will prescribe chloral hydrate, and a 50% top up dose that may be used if the first dose is not effective. The chloral hydrate will be administered by the Nuclear Medicine Department staff during their usual business hours. Afterhours the sedation will be initiated on C2South.

A Neurology fellow will accompany any child who requires sedation during transport and the scanning process, along with the Registered Nurse. The duty anaesthetist will be called for any child who is not adequately sedated after the prescribed sedation has been administered. Consideration should be given to any seizure rescue medication the child may receive concurrently with the sedation.

After-Hours Scanning

In some cases the SPECT scanning may be done outside of Nuclear Medicine's usual business hours. On these occasions the only staff present during the scan will be the on-call Nuclear Medicine Physician, Nuclear Medicine Technologist, Video-EEG Telemetry Registered Nurse and Neurology Fellow. Special consideration to safety should be made in this instance, including maintaining access to the Nuclear Medicine Resuscitation Trolley and seizure rescue medications.

Emergency anticonvulsant agents should be checked and signed out of the C2South Scheduled Drug Safe by the Video-EEG Telemetry RN and another RN, prior to the patient leaving C2South. If drugs are administered during transport or at Nuclear Medicine they should be checked by the Video-EEG Telemetry RN and Neurology Fellow or Nuclear Medicine Physician. Upon return to C2South the unused drugs should be checked and signed back into the C2South Scheduled Drug Safe by the Video-EEG Telemetry RN and another RN.

Care of the Patient after SPECT Injection

No specific precautions are required when caring for a patient after receiving a SPECT injection, however it is preferable that prolonged close contact with the patient by others is avoided within the first few hours. Radiation the child receives is mainly excreted through urine and faeces. Parents/carers changing nappies should wear gloves and dispose contents in a general waste bin. It is important to maintain adequate hand hygiene at all times when handling excreta after a SPECT injection.

Reference

1. GE-Healthcare. (2013, August). *CERETEC*. Retrieved from [www.accessdata.fda.gov: https://www.accessdata.fda.gov/drugsatfda_docs/label/2013/019829s026lbl.pdf](http://www.accessdata.fda.gov/https://www.accessdata.fda.gov/drugsatfda_docs/label/2013/019829s026lbl.pdf)
2. La Fougère, C. R. (2009). PET and SPECT in epilepsy: a critical review. *Epilepsy & Behavior*, 15(1), 50-55.
3. Michael D. Devous, S. R. (1998). SPECT Brain Imaging in Epilepsy: A Meta-Analysis. *The Journal of Nuclear Medicine*, 39:285-293.

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Appendix 1: Radiation Safety

It is important when handling any radioactive material to observe these main rules	
TIME	The dose received by the nurse is directly proportional to the length of time exposed to the radiation. Therefore it is important that the procedure must be carried out within a reasonable time frame.
DISTANCE	Radiation exposure decreases with increasing distance from the radiation source according to the Inverse Square Law. If you double your distance from the source, the exposure falls by a factor of 4; triple the distance, the factor is 9 etc.
SHIELDING	Keeping the Ceretec in the lead lined box will reduce the amount of radiation received. The lid of the leadlined box acts as a shield for the registered nurse when drawing up the dose.
SAFE HANDLING	Examination gloves should ALWAYS be worn to reduce the possibility of personal contamination when preparing and administering ^{99m} Tc-Ceretec.
SPILLAGE	If a radioactive spill occurs, it is important to confine the area of contamination by placing an absorbent cloth (such as an incontinence cloth) over the area. Disposable gloves should be worn. The cloth should then be placed in a plastic bag along with the gloves for disposal by Nuclear Medicine staff. If the spillage is substantial, such as the contents of the vial or syringe, then the area should be covered as described and the Nuclear Medicine Department contacted immediately. The area should be marked as contaminated. Nuclear Medicine staff will monitor the area for radiation levels and will advise when the area may be reused. As ^{99m} Tc has only a 6 hour half-life, this will probably be 24 hours at most.
DECONTAMINATION OF PERSONS	If the spill is onto a person, hands should be washed with water and soap, eyes should be irrigated with sodium chloride 0.9% or water. Contaminated clothing or dressing to cannula site should be removed and placed in a plastic bag for assessment by Nuclear Medicine. The Nuclear Medicine Department should be contacted immediately.

Appendix 2: Time/ Volume Chart

First Elution

Time	Dose
8:30	2.5mL
9:00	2.6mL
9:30	2.8mL
10:00	3.0mL
10:30	3.1mL
11:00	3.3mL
11:30	3.5mL
12:00	3.7mL
12:30	4.0mL
13:00	4.2mL
13:30	4.4mL
14:00	4.7mL
14:30	5.0mL

Second Elution

Time	Dose
14:00	2.5mL
14:30	2.6mL
15:00	2.8mL
15:30	3.0mL
16:00	3.1mL
16:30	3.3mL
17:00	3.5mL
17:30	4.0mL
18:00	4.2mL