Worcestershire Acute Hospitals NHS Trust

WORCESTERSHIRE ACCUTE HOSPITALS NHS TRUST

LOCAL RULES FOR RADIATION SAFETY

Appendix specific to radioisotope guided Sentinel Lymph Node Biopsy

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APPOINTED OFFICERS

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Key Amendments

Date	Amendment	Approved by
28th Nov 2023	Document extended for 3 months whilst under review	Dr Hutchinson
17th Jan 24	Full review of document undertaken	Dr Hutchinson

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1. INTRODUCTION

Sentinel lymph node surgical biopsy (SLNB) involves the use of very small amounts of radioactivity. The activity will be injected intra-dermally in the Nuclear Medicine Department at Worcestershire Royal Hospital, Worcester on the afternoon prior to surgery.

At the time of surgery the patient will typically contain less than 7MBq of radioactive 99m Technetium (Tc-99m), bound to human albumin nano-particles. This is a very small level of radioactivity in comparison with other diagnostic uses of Tc-99m. Several common examinations involve the injection of 600MBq of radioactivity (i.e. over 40 times as much). Notably Tc-99m has a short lived radionuclide having a half-life of only 6 hours (i.e. the time taken to decay to half its original activity or intensity).

The radioactivity will be injected intra-dermally. The concept of the procedure is that the injected activity will be collected by the lymphatic drainage system and moved via the local lymph duct to the sentinel lymph node (SLN). The activity in the SLN and the excised tumour will depend on when the activity is administered but samples could contain up to 2% in the SLN and 50% in the excised tumour. However it should be noted that specimens are a more significant biohazard than a radiation protection hazard

2. SCOPE OF WORK

These rules apply to the work activity of sentinel lymph node surgical excision. In this procedure, the patient is injected with the radioactivity in the Nuclear Medicine department at Worcestershire Royal hospital and the surgical excision takes place the day after injection

3. PERSONNEL AND RESPONSIBILITIES

The ultimate responsibility for ensuring that these local rules are drawn up and followed lies with the employer

Persons appointed with specific responsibilities are as follows:

The Radiation Protection Advisor (RPA)

Integrated Radiological Services are the appointed RPA to the Trust and must be consulted on a number of matters stipulated in the Ionising Radiation Regulations 2017.

The Radiation Protection Supervisors (RPS)

The principle function of the RPS is to ensure that all reasonable steps are taken to ensure that these local rules are observed.

Custodians of Radioactive Substances

The employer is responsible for ensuring that the records of radioactive waste disposal and the use of both sealed (Co-57 check sources) and unsealed sources (Tc-99m) are kept.

4. DESIGNATION OF AREAS

External dose rates associated with this procedure are so low that it is not considered necessary to designate either control or supervised areas. However local rules are considered necessary.

5. GENERAL RULES FOR STAFF

Normal standards of hygiene universally accepted in operating theatres will protect staff from ingestion of radioactive material.

Because of the low levels of radiation received by staff there is no significant risk to the foetus in pregnancy but it is important that female staff inform their RPS or employer as soon as their pregnancy is declared to ensure that their doses are kept to the minimum practicable levels.

6. INTRA-OPERATIVE PROBE TESTING

Before a SLNB operating session the RPS or their deputy will check the scintillation probe function using the sealed Co57 check source using the standard procedure and record the results. A copy of these results should be sent regularly to David Palmer, the RPS for Nuclear Medicine at Worcestershire Royal Hospital (WRH).

7. MONITORING PROCEDURES

7.1 Personal Dosemeters

Because of the very low personal doses resulting from this work activity, routine personal monitoring is not warranted.

7.2 Contamination Monitor: Mini 900 with type 44A probe

Battery checks, and tests for lack of response should be carried out before using this monitoring equipment to ensure that it is working satisfactorily. The typical background reading for is 5 – 10 counts per second (cps). The monitor should be function tested with a source of radioactivity (Co57 test source).

7.3 Contamination Monitoring

The risk of significant radioactive contamination related to SLNB the day after the injection of radioactivity is very low. It has been agreed with the RPA that monitoring after every surgical case using monitors that would need to be purchased by the operating theatre departments is not necessary. Instead, periodic monitoring (monthly) will be performed using monitors on loan from the Nuclear Medicine department at WRH to demonstrate this. The area (equipment, work surfaces, operating table and floor) will be checked for contamination. The contamination monitor is a sensitive device that responds to low levels of radioactivity. The sensitivity is such that there is always a background reading which should be accounted for in measurements by subtracting this from the actual reading. When surveying for contamination the sensitive area of the probe should be slowly scanned across the area under observation. The maximum reading (background-subtracted) in any area should be recorded.

Contamination monitoring should be carried out after all sources (patient, specimens, and all waste) have been either removed from the room or placed behind shielding, otherwise these sources would interfere with the contamination check.

Any reading > 2x background should be decontaminated. Use a disposable cleaning-wipe, working inwards to avoid spreading contamination. Monitor the site of contamination and the cleaning-wipe (to assess "uplift"); repeat if necessary. Dispose of cleaning materials as "radioactive waste" (section 9). If the level of surface contamination cannot be reduced to safe levels the area should be covered with a plastic sheet which should be taped down. This area should be re-monitored the following day to confirm the contamination has decayed to safe levels.

The RPS will assign responsibilities for this monitoring and will ensure that monitoring is both performed and that adequate records are kept.

8. RECEIPT, STORAGE AND MOVEMENT OF RADIOACTIVE SUBSTANCES.

The Theatre Department possesses a low activity sealed source of Co-57 for function testing of the intra-operative probes. When not in use this source must be kept in the designated locked store. Once per week the RPS should check that the source is present and record the event in the sealed sources register. When a new source is obtained a new entry should be made in the register. When an old source is disposed of, the route of disposal should be recorded in the register and the original disposal confirmation retained indefinitely.

9. RADIOACTIVE WASTE STORAGE AND DISPOSAL

9.1 Solid Waste

All solid potential radioactive waste (e.g. used swabs, blades, probe covers, gauzes and surgical gloves) must be labeled as per the standard operating procedure and decay stored in a secure dedicated storage cabinet for 48 hours. After 48 hours the waste can be disposed as very low level waste (VLLW) under the Medical and Veterinary Exemption Order. Periodic checking as part of the monthly contamination check will be carried out on a sample of the waste to show compliance.

9.2 Surgical Instruments

Surgical instruments used during the procedure should be wiped down with wet gauze at the end of the surgical procedure to remove any 'loose' surface contamination. The instruments should be included in the periodic contamination monitoring. Any levels above background will require further decontamination and repeat monitoring to confirm all surface contamination has been removed. Gauzes and swabs used for decontamination will need to be quarantined and decay stored as described in 9.1.

10. CONTINGENCY PLANS FOR RADIATION INCIDENTS

10.1 Procedure for Dealing with Contamination Incidents

The process is inherently unlikely to give rise to any conceivable contamination incident. The activities are low and should be well contained by the normal isolation and cleanliness procedures of an operating theatre.

10.2 Fire

In the case of a fire within the department any sealed radioactive source should be left in the designated store. After the fire has been safely extinguished and the emergency services have declared the building safe to enter then any radioactive sources should be located and removed if necessary. Any contamination should be dealt with in accordance with these contingency plans.

10.3 Loss or Theft of Radioactive Material

Weekly checks of the sealed radioactive source will be made, by the RPS or their deputy.

If any radioactive material is suspected of being lost or stolen the RPS should be immediately informed, who in turn will inform the RPA as soon as practicable.

An immediate investigation should be mounted to ascertain the whereabouts of the material. If that investigation shows that the material is still unaccounted for, the RPS should then inform the RPA as a matter of urgency.

11. PATHOLOGY

The excised specimens are labeled as per the standard operating procedure in theatre and kept in a dedicated storage cabinet in the operating department until the day after surgery. They are then sent to Histopathology at WRH. A dedicated transport container is used and the Trusts courier service delivers this to the histopathology staff at WRH.

Pathology staff must follow standard operating procedures for handling and preparing specimens, which must include wearing protective gloves.

Any waste generated from handling the specimens can be disposed of as ordinary clinical waste and does not require time delay storage. In addition, the sectioned specimen can be stored and disposed of in the same manner as other specimens.