<JLO 18792; supplementary material>

Supplementary material 1



**Title: Laser Safety Checklist Simulation**

**Duration:** 15 minute scenario + 15 minute debrief

**Objectives:** At the end of the session candidates should:

1. Have an awareness of potential safety issues with laser use
2. Have developed a structured approach to ensuring safety of the patient and staff
3. Have learned the importance of applying relevant laser safety checklists
4. Be able to anticipate critical events and complications, and pre-plan accordingly

**Candidate brief**:

You have been asked to assist Mr Smith (consultant ENT surgeon) in performing a microlaryngoscopy and laser procedure on Mr Joe Bloggs, a 76-year-old male. He has a T1a left vocal fold squamous cell carcinoma (SCC), with a multidisciplinary team (MDT) plan for a type 1 left laser cordectomy. The patient has been consented and is being intubated by the anaesthetist.

You are expected to:

* Lead the surgical team in setting up the laryngoscope and microscope for laser use
* Carry out safety checklist inspections and address human errors imbedded into the scenario prior to safe use of the laser

**Scenario**:

*A 76-year-old male, T1a left fold cord SCC, MDT plan for type 1 left laser cordectomy. Patient arrives into main theatre anaesthetised and intubated, and is transferred to the table.*

Past medical history: Hypertension, type 2 diabetes mellitus, rheumatoid arthritis and chronic obstructive pulmonary disease (COPD)

Medication history: Amlodipine, ramipril, salbutamol, metformin

Social history: Smoker – 20 cigarettes/day, moderate alcohol intake. Lives alone, independent of ADL

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| **Vital signs** | | | | | | | | | |
| **Rhythm** | Sinus | **HR** | 105 | **SBP** | 157 | **DBP** | 89 | **CVP** |  |
| **Resp rate** | Ventilated | **SaO2** | 90% | **ETCO2** |  | **Temp** | 37 | **Other** |  |
| **AVPU** |  | **GCS** | 15 | **Pupils** |  | **ICP** |  | **NIRS** |  |

**Sequence**:

* Candidate arrives before the patient
* The consultant:
  + Informs the trainee that the laser has been checked and is working well
  + Asks the trainee to perform cordectomy using the laser on 3 W pulsed mode
  + Leaves the room
* Patient is brought in
* Surgical pause is carried out
* Patient is instrumented safely
* Suspension microlaryngoscopy is established
* Patient should be draped appropriately, with damp swabs covering exposed areas
* Laser is brought in attached to scope, and pedal is given to trainee
* *The patient is clinically unstable with low oxygen saturations, anaesthetist is busy ventilating the patient*

Trainee is expected to complete **a safety checklist and identify safety errors:**

1. Patient protection measures: laser-safe endotracheal tube, saline-soaked drapes, airway fire precautions (saline and syringe) prepared

**Safety error A**:

* *Anaesthetist distracted due to difficult intubation. The patient is intubated with a* ***standard ETT*** *as opposed to a laser-safe ETT*
  + Ensures patient has correct ETT, identifies error and asks the anaesthetist to change the tube

**Safety error B**:

* *A* ***dry*** *sponge is placed under the tube potentially exposed to the laser beam*
  + Ensures all swabs and drapes in contact with the patient are wet

1. Environmental protection: Fire extinguisher, locked theatre doors, laser shutters are in use, ‘Laser in Use’ lights are illuminated

**Safety error C**:

* *The ‘laser in use’ door lights are* ***not illuminated*** *and a staff member walks in*
  + Ensures all lights and shutters are compliant

1. Staff protection: Protective eyewear and clothing

**Safety error D**:

* The anaesthetist is distracted by the patient’s ventilator difficulties and forgets to wear protective eyewear
  + Ensures all staff have correct eye wear in place, prior to use of laser

The scenario ends when the checklist is complete and the laser is taken off standby and made ready.

**Equipment requirements**:

1. SimMan
2. Standard ETT and a laser-safe ETT
3. Anaesthetic machine (inactive)/bag-valve and ETT connector
4. Laryngoscope, suspension kit
5. Surgical laser (inactive) and guiding beam
6. Standard microscope
7. Swabs and sponges
8. Surgical drapes
9. Galley pots and syringes
10. Notes, surgical admission documents, consent form

**Staff required:**

1. Anaesthetist
2. ENT consultant
3. Scrub nurse
4. Operating department practitioner (ODP)

Supplementary material 2



**Title: Airway Fire Simulation**

**Duration:** 15 minute scenario + 15 minute debrief

**Objectives:** At the end of the session candidates should:

1. Be aware of possible complications and critical events associated with laser use
2. Recognise causes of airway fires
3. Respond quickly and efficiently to an airway fire and communicate with the team
4. Use correct material in extinguishing the fire and ensuring patient safety

**Candidate brief**:

You have been asked to assist Miss Jones (consultant ENT surgeon) in performing a laser debulking of a glottic tumour on a 65-year-old female patient, Ms Jane Bloggs, with a T3 laryngeal squamous cell carcinoma (SCC). The patient has been consented and is being anaesthetised. The consultant has already performed suspension microlaryngoscopy and prepared the patient for laser debulking.

You are expected to:

* Complete a safety check
* Initiate the task safely and respond appropriately to any situations that arise

**Scenario**:

*A 65-year-old female, with T3 glottic SCC for laser debulking. Patient is anaesthetised, intubated and suspension microlaryngoscopy is in place. Patient’s face is covered with wet gauze. An airway fire starts after the first beam of (fake) laser is fired.*

Past medical history: Type 2 diabetes mellitus, chronic obstructive pulmonary disease (COPD)

Medication history: Salbutamol, metformin

Social history: Ex-smoker, excess alcohol consumption

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Vital signs** | | | | | | | | | |
| **Rhythm** | Sinus | **HR** | 190 | **SBP** | 160 | **DBP** | 89 | **CVP** |  |
| **Resp rate** | Ventilated | **SaO2** | 94% | **ETCO2** |  | **Temp** | 37 | **Other** |  |
| **AVPU** |  | **GCS** | 15 | **Pupils** |  | **ICP** |  | **NIRS** |  |

**Sequence**:

* Candidate arrives in theatre
* Consultant is present and tells candidate that:
  + She has performed suspension laryngoscopy
  + Laser has been tested and guiding beam accuracy has been confirmed
  + She asks the candidate to start debulking the tumour
  + She is called away urgently to another theatre
* Suspension microlaryngoscopy in place
* Patient is draped appropriately with damp swabs
* Laser is brought in and attached to microscope, and pedal is given to candidate
* Candidate should complete safety checklist
* Then laser is taken off standby, and candidate is asked to begin

Immediately the scrub nurse will draw the candidate’s attention to an airway fire that has developed.

**Trainee is expected to**:

* Stop the procedure
* Place laser on standby
* Communicate findings to the anaesthetics team
* Request that the inspired oxygen be temporarily turned off
* Request appropriate material to extinguish the fire
* Ensure plans are in place for intensive care admission

The scenario ends when the scrub nurse informs the candidate that the airway fire is extinguished.

**Equipment requirements**:

1. SimMan
2. Standard endotracheal tube (ETT) and a laser-safe ETT
3. Anaesthetic machine (inactive)/bag-valve and ETT connector
4. Laryngoscope, suspension kit
5. Surgical laser (inactive) and guiding beam
6. Standard microscope
7. Swabs and sponges
8. Surgical drapes
9. Galley pots and syringes
10. Notes, surgical admission documents, consent form

**Staff required:**

1. Anaesthetist
2. ENT consultant
3. Scrub nurse
4. Operating department practitioner (ODP)