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Guidance on airway management during laser surgery of upper airway

*Guide pour assurer la ventilation au cours d'opérations par laser des voies
respiratoires supérieures*



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Contents

	Page
1 Scope	1
2 References	1
3 Terminology	2
4 Ideal properties of tracheal tubes for use with lasers.....	3
4.1 Materials.....	3
4.2 Design.....	3
4.3 Packaging and labelling.....	4
5 Description of current practices which reduce the risk of airway fire.....	4
5.1 Non-intubation techniques.....	4
5.2 Intubation techniques	5
5.3 Management of airway fires.....	10

Tables

1 Combustion properties of conventional tracheal tube materials.....	11
2 Primary emergency management following recognition of airway fire...	11
3 Secondary emergency management following recognition of an airway fire	12

Annex

A Bibliography.....	13
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 11991, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 121, *Anaesthetic and respiratory equipment*, Subcommittee SC 2, *Tracheal tubes and other equipment*.

This document is being issued as a type 3 Technical Report to summarize current methods for airway management during laser surgery of the upper airway to minimize the risk of fire. (See the Introduction.)

Introduction

This guide provides information for clinicians for appropriate selection of airway devices for operations on the upper airway, including the larynx, in which a laser is used. It also provides information for the appropriate selection of intubation and non-intubation techniques. Tracheal tubes are commonly used in patients during general anaesthesia for such operations. These tubes provide effective control of ventilation and oxygenation, protect the airway from aspiration (if cuffed), and allow monitoring of ventilation through capnography and spirometry. A laser is a source of intense light energy which can provide an ignition source, so that a fire is a risk in the operative field. Risk of fire is particularly enhanced in oxidant (O_2 or N_2O) enriched atmospheres. Tracheal tubes assist ventilation and patient monitoring but may be ignited by the laser in these circumstances.

In these procedures, the clinician must be aware of the risk of fire. Fire requires three elements: an ignition source, a combustible material, and an oxygen source. These three are sometimes referred to as "the fire triangle". During laser surgery on the upper airway, all three elements are often present. The laser is an intense light energy which can provide a source of ignition. Tracheal tubes when present are usually made of combustible material. Finally, most patients are treated in an oxidant-enriched atmosphere. Care to minimize these three elements is essential to avoid a fire during laser surgery of the upper airway.

Of the numerous methods available for airway management during laser operations on the upper airway, each has its own risks and advantages. This guide summarizes the current methods and the applications, advantages, and disadvantages of each. The guide serves to assist the anaesthetist and surgeon in their joint decision regarding selection of the most appropriate method to oxygenate and ventilate the patient during laser surgery involving the upper airway. This guide does not recommend any one method of airway management. The test data included in Table 1 of this guide are based upon continuous beam CO_2 Lasers. While this data may not be directly applicable to other wavelengths or beam modes (such as super pulse), the basic principles still apply. Decisions regarding practice methods can only be made by the clinicians caring for the patient, having knowledge of the clinical circumstances, available expertise, and technology, e.g. the properties of the specific laser wavelength planned for the surgery.

Other complications of laser surgery not involving airway management may be found in ANSI Z136.1 (1), and ANSI Z136.3 (2), CAN/CSA Z386 M91 (3).

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1 Scope

At present there is no way to avoid completely the risk of an airway fire when a laser is used in the airway. This guide is intended to help minimize this risk by listing a) those characteristics of a tracheal tube that make it most suitable for laser airway operations, recognizing that it may not be possible in practice to produce a device combining such characteristics; b) several standard practices that reduce the risk of airway fire during laser operations on the airway; c) recommendations for emergency management should an airway fire occur.

This guide represents current knowledge at the time of publication and is subject to review. This guide does not address management of the patient with a tracheostomy. This guide is also intended to assist related groups, such as laser safety committees.

2 References

ISO 5361-1:1988, *Tracheal tubes — Part 1: General requirements*.

ISO 5361-2:1993, *Tracheal tubes — Part 2: Oro-tracheal and naso-tracheal tubes of Magill type (plain and cuffed)*.

ISO 5361-5:1984, *Tracheal tubes — Part 5: Requirements and methods of test for cuffs and tubes*.

ISO 7228:1993, *Tracheal tube connectors*.

ISO 10993-1:—¹⁾, *Biological evaluation of medical devices — Part 1: Evaluation and testing*.

1) To be published. (Revision of ISO 10993-1:1992)