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Erwin R. Thal

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创伤外科实用图谱

SECOND EDITION

Operative Trauma Management

AN ATLAS



人民卫生出版社

OPERATIVE TRAUMA MANAGEMENT

An Atlas

SECOND EDITION

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The authors wish to dedicate this edition of *Operative Trauma Management: An Atlas* to our surgical heritage. Specifically we will be forever indebted to our mentors, teachers, colleagues, house officers, students, and patients, from whom we continue to learn as we practice the art and science of surgery.

To our parents and specifically our spouses, Carolyn, Dorina, and Sue, we owe our most sincere gratitude for their love, support, and companionship that have allowed us to pursue our intellectual curiosities as well as share our time with those in need.

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Preface

The management of injured patients requires many different skills. While increasing emphasis is placed on non-operative approaches, many patients sustain injuries that require surgical repair. Operative skills are best learned and practiced in the operative theater, but preparation for these experiences begins long before the operating room is entered. This preparation begins with anatomic study, continues throughout a surgeon's professional life, and is augmented by illustrations of operative procedures. Until recently, the surgeon performing operations on patients with acute injuries depended on general surgical or other surgical specialty texts and atlases to review these operative procedures. Many acute operative procedures are similar to elective procedures with the only difference being the time of day or urgency with which the patient must undergo the procedure. However, some injuries require more expeditious exposure and control of the blood supply, and a few procedures are unique to the trauma patient. Thus, selecting the optimal procedure for a given injury may be a challenge.

Operative Trauma Management: An Atlas addresses two needs. One is the need for illustrations of common procedures that are required to treat patients who have been injured. Some of these procedures are not very different from elective procedures, whereas others emphasize the differences that occur when treating a trauma patient. The second need is a result of the diminishing numbers of operative interventions for injuries. Although this is good for patient care, training young surgeons and maintaining operative skills will increasingly require excellent illustrations to communicate the salient points of operative care.

The chapter authors were asked to describe their experience in the operative management of the injured patient with emphasis on anatomic exposure and the individual steps of the procedure leading to definitive repair.

The editors and the artist worked with sketches from each of these authors to illustrate injuries, which would require a specific operative procedure and to mold the book into a useful document for the young surgical trainee and the accomplished practicing surgeon. Emphasis was also placed on identifying the operative skills a general surgeon who cares for an injured patient might need. Every attempt was made to provide clear and accurate illustrations of the procedure and short written descriptions to make the contents of this atlas easy to review and use.

In this second edition the editors have attempted to update some of the concepts outlined in the original rendition. Additions have been added to six of the original chapters to make them more complete and emphasize new knowledge. Nine new chapters have been added which will give a more complete portrayal of injuries to the chest, musculoskeletal system, male and female genitourinary system, and procedures common to the intensive care unit.

The real strength of the book rests on the talents of Rebekah Dodson, who not only is a superb artist but, more importantly, has the unique ability to convey concepts in her drawings. She has brought a degree of professionalism to this project that is unparalleled. Her dedication and enthusiasm are both contagious and sincerely appreciated.

The editors also wish to acknowledge the support and untiring efforts of our administrative assistant Diane Wynne, without whose talent this project could not have been completed.

It is our hope that *Operative Trauma Management: An Atlas* will become a valuable addition to any surgeon's library.

Erwin R. Thal, MD, FACS
John A. Weigelt, DVM, MD, FACS
C. James Carrico, MD, FACS

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OPERATIVE TRAUMA MANAGEMENT

An Atlas

Airway Management

David S. Mulder

Hypoxemia is an important contributor to morbidity and mortality in patients sustaining injury. Effective airway control, coupled with effective ventilation, is imperative in the resuscitation of the injured patient. The trauma patient presents unique challenges in terms of recognizing problems and managing the airway.

Patients sustaining multiple injuries, especially by a blunt mechanism, require airway management techniques that consistently secure the airway while protecting the cervical spine and spinal cord. This is best accomplished by maintaining the neck in a neutral position by in-line stabilization.

The oropharynx and nasopharynx are frequently involved in severe maxillofacial trauma. Obstruction may occur as a result of deformity, hemorrhage, or a foreign body. Fractures of the mandible may compromise the oropharynx by allowing the tongue to fall posterior and occlude the airway. Blunt or penetrating injuries to the neck can cause large hematomas that may progress to partial or complete obstruction of the airway. Hemorrhage may obscure normal landmarks, making orotracheal or nasotracheal intubation difficult or impossible. These conditions may require a surgical airway.

Patients with altered mental status with or without head injury may require intubation to prevent gross aspiration and provide adequate oxygenation and ventilation.

ENDOTRACHEAL INTUBATION

The cornerstone of airway management in the emergency situation is endotracheal intubation. This must always be carried out with concern for a potential cervical spine injury. Time permitting, a lateral cervical spine x-ray is a useful screening adjunct. Successful endotracheal intubation

requires appropriate equipment. A minimum checklist is given here.

Equipment Checklist

1. Mask one-way valve and bag (Ambu)
2. Oropharyngeal and nasopharyngeal airways
3. Endotracheal tubes—range of sizes and lengths with stylets
4. Tube adapters for ventilator support
5. Laryngoscope with curved and straight blades
6. Suction devices for mouth and pharynx
7. Analgesic, amnestic, and paralytic drugs

Technique. The most commonly used anesthesia for intubation is a short acting sedative and short acting paralytic such as etomidate and succinylcholine. Local anesthesia is of little value for oral endotracheal intubation. Suctioning of the mouth and pharynx is essential prior to any attempt at airway control. Pre-oxygenation is accomplished with 100% oxygen if possible. If a nasogastric tube has been placed, it should be attached to suction.

FIGURES 1-1 AND 1-2

The goal of oral intubation is to create a direct path from the incisor teeth to the vocal cords with the aid of a curved laryngoscope blade in the adult and a straight blade in a child. This pathway has three axes: oral, pharyngeal, and laryngeal. The laryngoscope blade is used to lift the jaw superiorly, creating an axis that exposes the vocal cords.

FIGURES 1-3 AND 1-4

A curved laryngoscope blade is placed in front of the epiglottis while a straight blade is placed over the epiglottis when exposing the vocal cords.

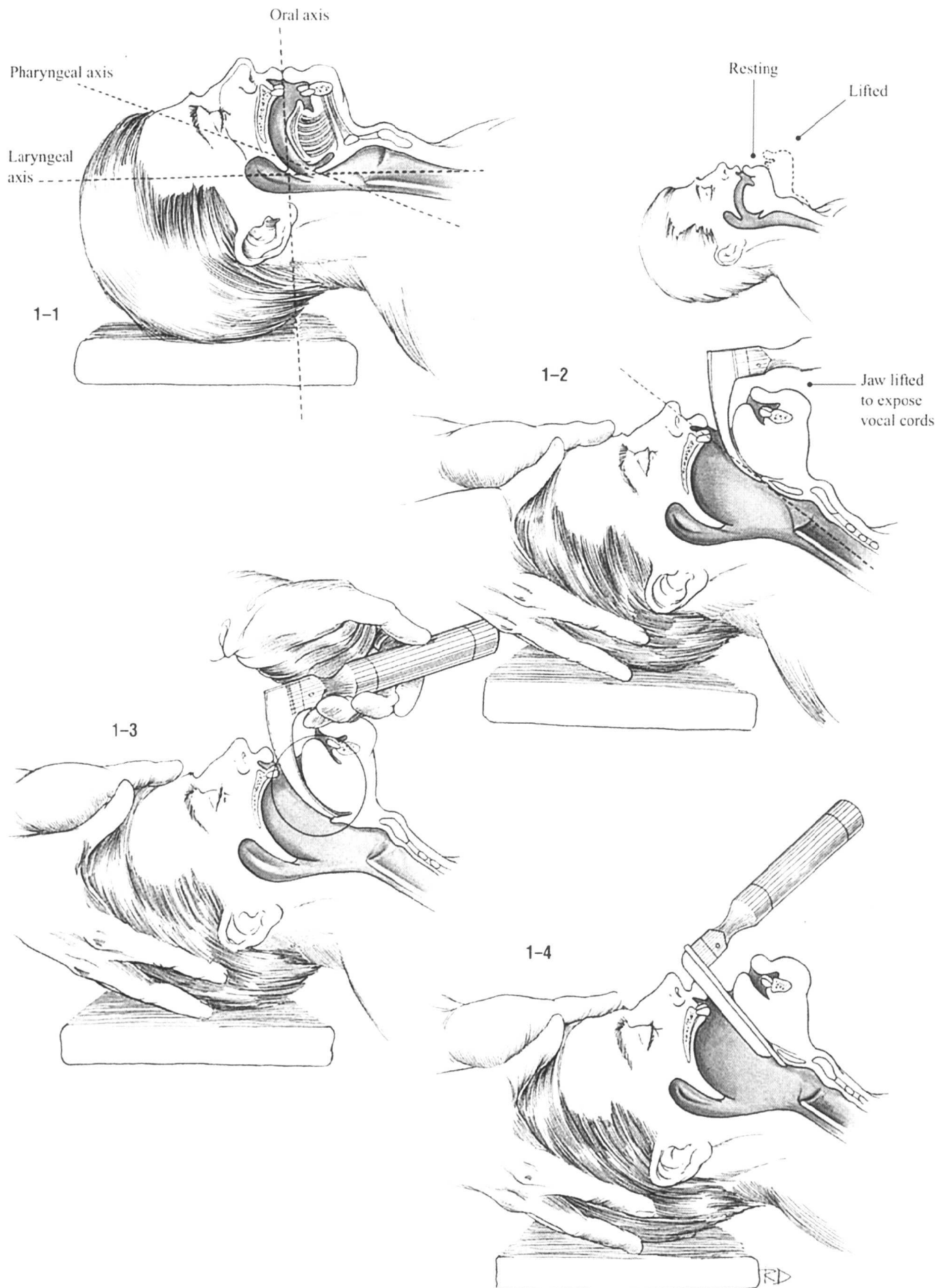


FIGURE 1-5

The necessity to protect the cervical spine in the injured patient makes virtually every intubation a two-person task. The person intubating is at the head of the patient. The assistant can stand at the side, stabilizing the neck in a neutral position. The head of the patient should be at the level of the xiphoid of the person intubating. The laryngoscope is held in the left hand. After opening the mouth, the curved blade is passed on the right side of the tongue, moving it anteriorly and laterally. The blade is advanced slowly toward the vallecula until the epiglottis is visualized. The blade is then lifted upward and toward the feet until the cords are visualized. When the neck is stabilized correctly, the apex of the cords will not be seen (Fig. 1-5a).

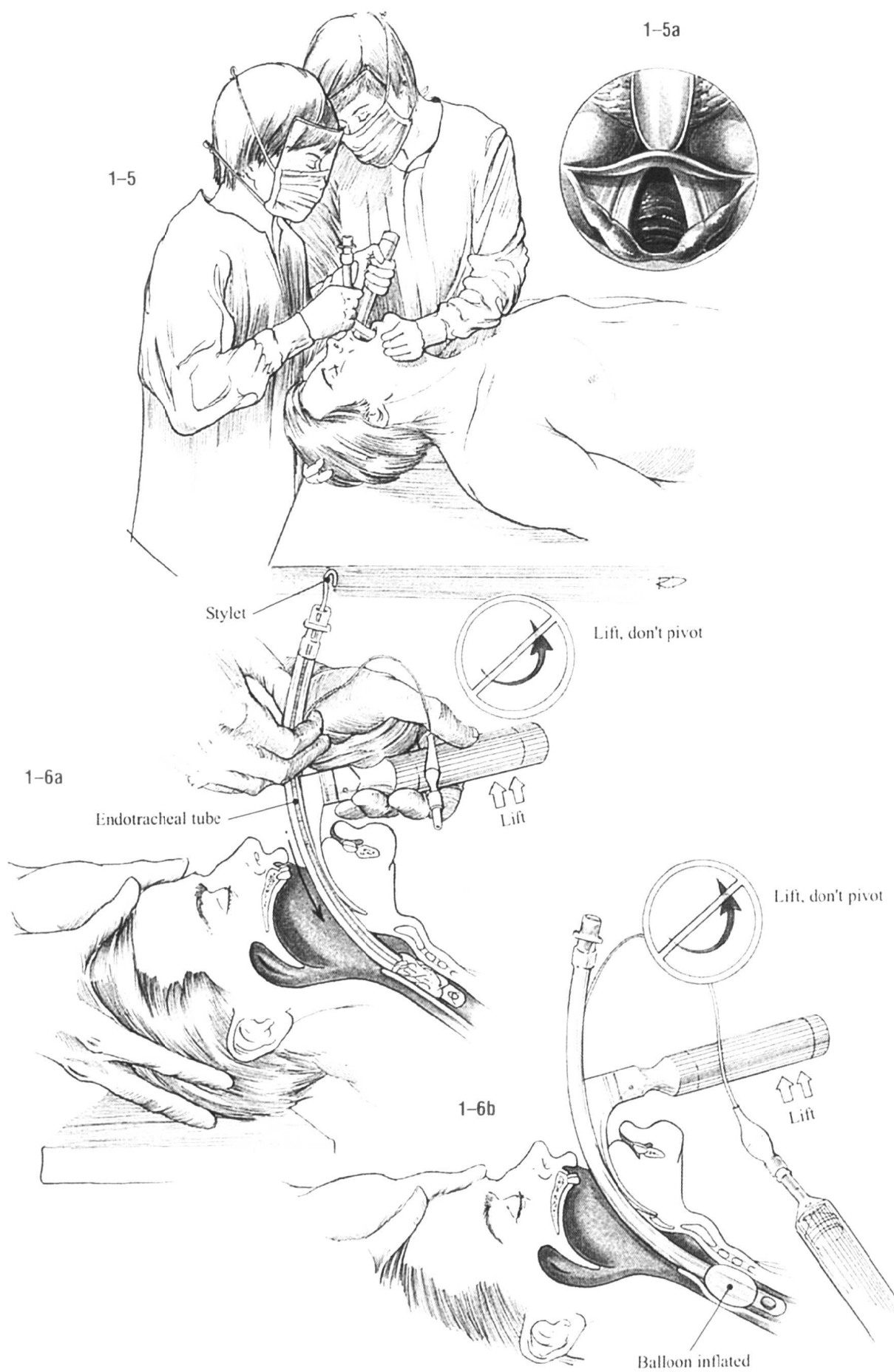
FIGURE 1-6

Once the cords are visualized, a preselected endotracheal tube (size 6.5 to 8 for a woman and 7 to 8.5 for a man) is

passed between the cords with the right hand. The use of a stylet is helpful to manipulate the direction of the endotracheal tube. The tube is advanced under direct vision until the balloon cuff is clearly through the vocal cords. Proper insertion is usually achieved when the 22- to 24-cm mark on the tube is at the level of the incisors. The cuff is gently inflated until no air leak can be heard with positive pressure ventilation. The tube is then carefully fixed with tape.

It is important to remember that the laryngoscope blade lifts the jaw and should not pivot or lever on the teeth.

Position of the endotracheal tube is confirmed by auscultation of the chest, noting breath sounds on both sides. Endotracheal CO₂ tension measurement is a useful adjunct. Absence of end-tidal CO₂ suggests esophageal or pharyngeal positioning of the tube. A chest x-ray is a reliable method of documenting the level of the endotracheal tube.



NASOTRACHEAL INTUBATION

Nasotracheal intubation is a useful technique in the patient with a cervical spine injury who is breathing spontaneously. Nasotracheal intubation is contraindicated in the apneic patient and in patients with severe midface or basilar skull fractures.

An awake "blind" procedure is begun by determining which nostril is most widely patent. This can be assessed by history or by having the patient sniff vigorously while occluding the opposite nostril. In-line stabilization by a second person is essential when a cervical spine injury may be present. Anesthesia of the nasal passage is accomplished by a combination of 1% neosynephrine and viscous lidocaine. The oral and nasal pharynx are sprayed with 4% lidocaine.

FIGURE 1-7

The endotracheal tube selected is one size smaller than would be used for oral intubation of the same patient.

The tube is lubricated with viscous lidocaine and passed via the nostril straight backward on the floor of the nasal passage to the posterior pharynx (Fig. 1-7a). Rotation of the tube will move the tip from right to left and position it above the cords (Fig. 1-7b). Listening for breath sounds at the origin of the tube will help guide its passage into the trachea. Once the trachea is entered, the tube passes anteriorly and it is helpful to rotate it 180 degrees. This directs the tube posteriorly and avoids hitting the anterior larynx (Fig. 1-7c). After securing the tube, documentation of end-tidal CO₂ and auscultation of both lungs should be performed.

FIGURE 1-8

Failure to accomplish a blind intubation necessitates the use of a laryngoscope (curved blade) passed over the right side of the tongue, which allows the tip of the tube in the pharynx to be visualized. The tube is grasped with a pair of Magill forceps and advanced through the vocal cords under direct vision.