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دانشیار بیهوشی و مراقبت های ویژه دانشگاه علوم پزشکی شهید بهشتی

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نیاز به ثبت نام ندارد

بسم الله الرحمن الرحیم

Anesthesia for head and neck surgery

دانشگاه علوم پزشکی شهید بهشتی

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Spectrum

- Simple procedures

  tonsillectomy

  Precision laryngology

  Neurotologic and image-guided skull-base surgery

- Complex procedures

  Obstructive sleep apnea (OSA) surgery

  Sophisticated transoral robotic surgery (TORS)

  Major H&N cancer surgery with extensive free-flap reconstruction

PREOPERATIVE EVALUATION

- A medical history and anesthesia-directed physical examination should be performed for all patients who undergo anesthesia

- Focus the preoperative evaluation on the airway and on those medical conditions that are associated with complications during these procedures

Assessment of comorbidities

- For patients with
  - uncontrolled hypertension
  - Cerebrovascular disease
  - Coronary artery disease
  - Chronic renal insufficiency
  - Advanced liver disease

Controlled hypotensive techniques should be avoided

Intraoperative hypotension should be treated aggressively

Assessment of comorbidities

- Patients with
  - Lung disease
  - Ventilation/perfusion (V/Q) mismatch

may not be suitable candidates for intraoperative ventilation techniques such as spontaneous ventilation, apneic intermittent ventilation, or jet ventilation

Assessment of comorbidities

- Obstructive sleep apnea (OSA)
  - common among patients who undergo H&N procedures
  - may be undiagnosed
  - more sensitive to sedatives and opioids

- predisposed to airway obstruction during:
  - induction of anesthesia
  - emergence
  - postoperative period

Assessment of comorbidities

- Lower cranial nerve involvement in neurotologic patients
- cranial nerves X, XI, and XII
- Increased risk of

    aspiration or airway obstruction

    complicate difficult airway management

Particular concern

- Most cases of H&N cancer
  - are associated with tobacco and alcohol use
  - predispose patients to cardiopulmonary, liver disease
- Patients with H&N cancers are commonly anemic
- Radiation for H&N cancers can result in
  - Dry mouth, airway swelling, dysphagia, poor oral intake, dehydration
  - Predispose these patients to hypotension
  - Difficult tracheal intubation and mask ventilation
  - Tissue fibrosis, loss of tissue compliance, restricted mouth opening
  - Neck extension, glottic, epiglottic edema

Airway evaluation

- Difficulty with airway management is **more common** for patients who undergo H&N procedures
- Prior anesthesia records should be reviewed
- Comprehensive preoperative airway evaluation

    Assessment of predictors of difficult/impossible mask ventilation

    Difficult direct laryngoscopy (DL)

    Difficult videolaryngoscopy (VL)

Airway evaluation

- A history of difficult tracheal intubation

  one of the most important predictors of difficult airway

- Prior easy intubation does not guarantee subsequent uneventful airway management in H&N patients

  progression of the underlying disease

Incidence of airway difficulty

- Definition

  Three or more attempts at direct laryngoscopy

- May occur in up to 7 to 9 percent of H&N cases

- which is at least two to four times higher than in the mixed surgical population

Predictors of difficult videolaryngoscopy

- Otolaryngologic and cardiac surgery
- Sniffing head positioning
- Abnormal neck anatomy (scar, mass, neck radiation changes)
- Decreased cervical spine motion
- Decreased oral entry (obesity, decreased mouth opening, decreased jaw mobility)
- Restricted oropharyngeal space (edema, bleeding, retrognathia)

Airway examination

- Postradiation changes in the neck
- Decreased mandibular protrusion
- Advanced disease may make a surgical airway difficult or impossible
- Signs and symptoms of airway obstruction
    - Dyspnea at rest or on exertion
    - Dysphagia
    - Stridor
    - Cough
    - Voice changes

Airway examination

- Muffled voice may indicate

  supraglottic disease

- Coarse, scratchy voice

  glottic lesions

- Physical findings may include:

  hoarseness

  agitation

  intercostal, suprasternal, supraclavicular retraction

Airway examination

- Pharyngeal restriction

  Drooling, Dysphagia, Expiratory snoring

- Most worrisome sign

  Inspiratory stridor at rest

  Suggesting a reduction in airway diameter

  At the supraglottic, periglottic, or glottic level

  At least 50 percent

Airway examination

- Airway compromise in H&N patients may also involve the lower airways

- Tracheal or tracheobronchial narrowing

  expiratory stridor

- Obstructive subglottic disease

  biphasic inspiratory-expiratory stridor

Difficult mask ventilation

- Mallampati grade 3 to 4
- Decreased mandibular protrusion
- Presence of beard
- Obesity (BMI ≥30)
- Age >57 years
- Lack of teeth
- History of snoring

Impossible mask ventilation

- Mallampati grade 3 to 4
- Male sex
- Presence of beard
- OSA
- Neck radiation changes

Predictors of combined difficulty with mask ventilation and direct laryngoscopy

Predictors of difficult/impossible mask ventilation	*Modified and additional predictors*
Mallampati grade 3 to 4	*Age ≥46 years*
Decreased mandibular protrusion	*Presence of teeth*
Presence of beard	*Neck radiation changes or a neck mass*
Obesity (BMI ≥30)	*Thick or obese neck*
Male sex	*Unstable neck or decreased neck extension*
OSA	*Decreased thyromental distance*

Preoperative endoscopic airway evaluation (PEAE)

- routinely performed by the H&N surgeon
- can be performed by the anesthesiologist when necessary
- upper airway and laryngeal anatomy
- upper airway dynamics
- determine the feasibility of supraglottic airway (SGA) placement

Components of the preoperative airway physical examination

Airway examination component	Nonreassuring findings
Length of upper incisors	Relatively long
Relationship of maxillary and mandibular incisors during normal jaw closure	Prominent "overbite" (maxillary incisors anterior to mandibular incisors)
Relationship of maxillary and mandibular incisors during voluntary protrusion of mandible	Patient cannot bring mandibular incisors anterior to (in front of) maxillary incisors
Interincisor distance	Less than 3 cm
Visibility of uvula	Not visible when tongue is protruded with patient in sitting position (eg, Mallampati class >2)
Shape of palate	Highly arched or very narrow
Compliance of mandibular space	Stiff, indurated, occupied by mass, or non-resilient
Thyromental distance	Less than three ordinary finger-breadths
Length of neck	Short
Thickness of neck	Thick
Range of motion of head and neck	Patient cannot touch tip of chin to chest or cannot extend neck

Airway management strategy

- Strategy for airway management should be formulated with the surgeon
- Review of preoperative imaging studies and endoscopy
- Selection of airway management device
- Route for tracheal intubation
- Use of jet ventilation
- Backup strategies

  Preparation for a surgical airway in selected cases

Shared airway

- During oral and intranasal surgery
- Airway must be protected from blood, debris, and irrigation fluid
- Placement of a throat pack

- Endotracheal tubes (ETTs) must be appropriately sized and adequately secured to avoid extubation or displacement causing a leak of anesthetic gases or oxygen (O_2) out of the airway

The size and type of ETT

- Should be discussed with the surgeon
- For intraoral surgery

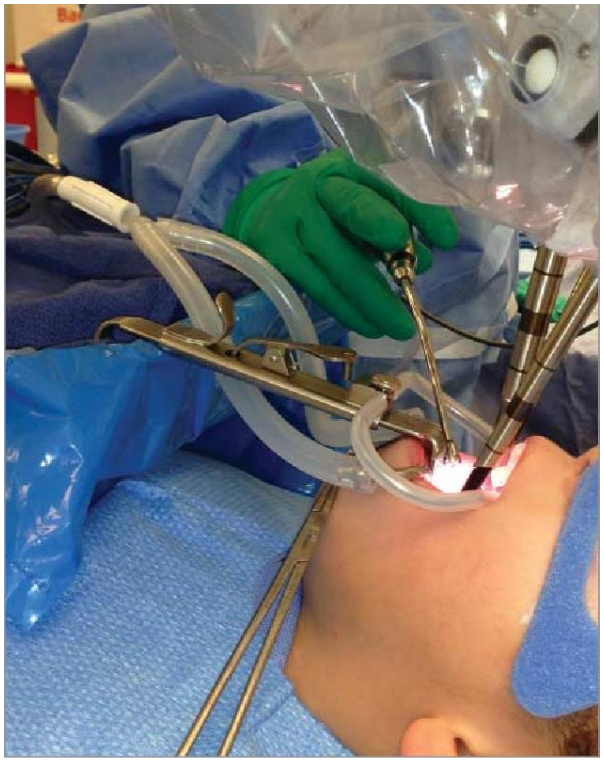
  6-mm internal diameter (ID)

  Wire-reinforced flexible ETT

Nasal intubation

- Base Of The Tongue (BOT) surgery
- Transoral Robotic Surgery (TORS)
- Orthognathic surgery
- Maxillomandibular Advancement (MMA) for obstructive sleep apnea (OSA)
- may be requested by the surgeon for parotidectomy and some dental procedures

Transoral Robotic Surgery (TORS)



Nasal ETT

- Adequate depth of tracheal placement to avoid circuit leak
- Properly secured to prevent pressure against the nasal ala
- A 6-mm ID microlaryngeal tube (MLT) is frequently required to facilitate surgical access for TORS


paediatric
tube
microlaryngeal
tube
how equipment works .com

Microlaryngeal surgery

- Small-sized ETT (eg, a 5-mm ID MLT) is routinely used
- ETT should be moved to the left corner of the patient's mouth

  to facilitate introduction of surgical instruments
- Securely taped to the lower jaw to avoid outward displacement

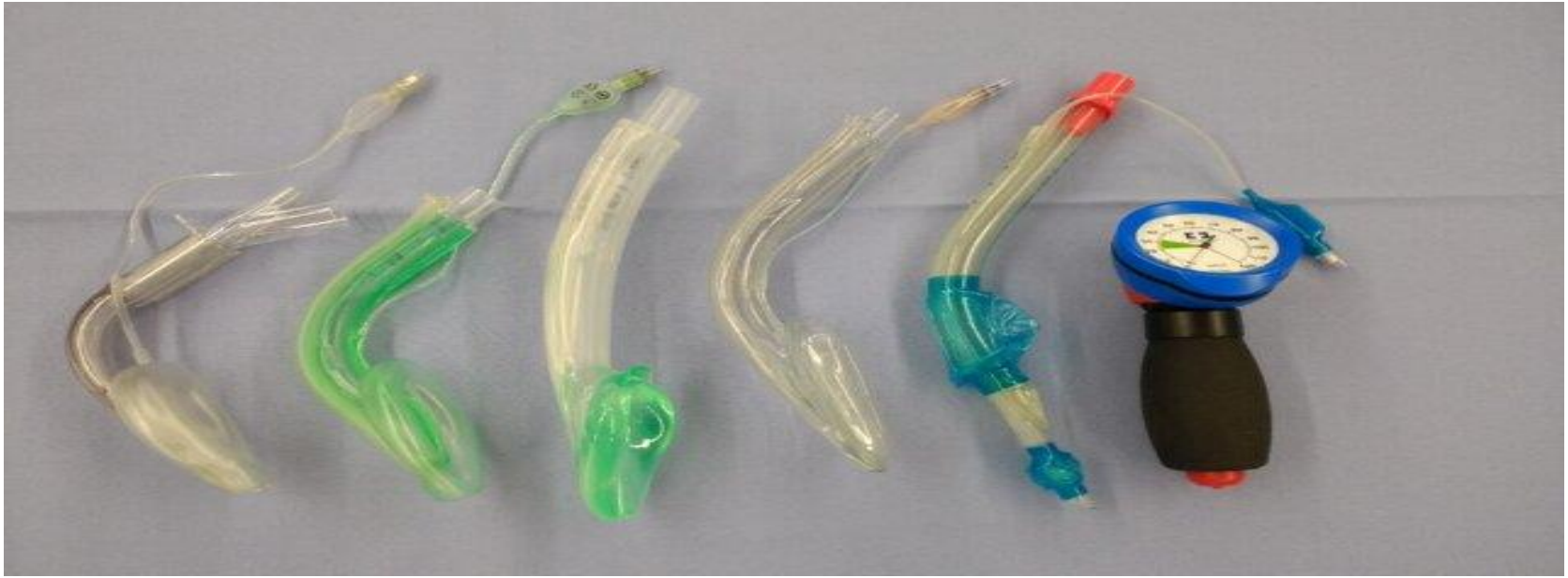
  when the mouth is opened and the neck is extended for

  laryngeal suspension

Microlaryngeal surgery with THRIVE

Supraglottic airways (SGAs)

- May be preferred instead of ETTs
- Facilitate smooth emergence from anesthesia



Anesthesia breathing circuit

- Should be configured to allow unrestricted surgical access

- As an example, the breathing circuit should connect to the ETT

  from the head of the operating table

  over the top of the patient's head

  TORS, Orthognathic, MMA surgery

  allow unrestricted surgical access

Still surgical field

- Surgeries:

  Otologic and Neurotologic surgery

  Laser otolaryngologic surgery

  Functional endoscopic and cranial-base surgery

  TORS

- Avoid:

  Patient movement

  Motion associated with monitoring devices (eg, blood pressure [BP] cuff inflation)

  Accidental OR table movements must be avoided

Still surgical field

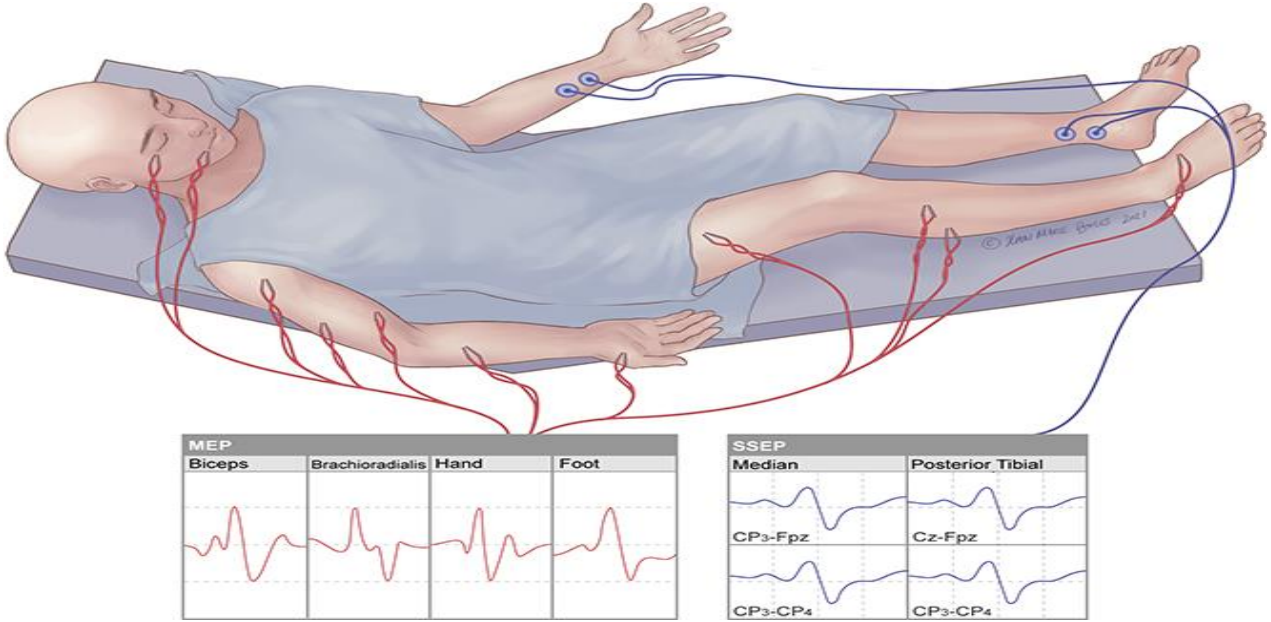
- The surgeon should be notified before any action
- For precision endoscopic procedures (eg, middle ear surgery)

  Place the BP cuff on the patient's side opposite the surgeon

  Avoid iatrogenic tremor-induced interference with microdissection

Neuromonitoring

- May be used during H&N procedures
- Preclude the administration of neuromuscular blocking agents (NMBAs)



Fire Risk

- Should be explicitly discussed with the

  surgeon and operating room nurses preoperatively

- Oxidizing agent (eg, oxygen [O_2] or nitrous oxide [N_2O])
- Fuel source (eg, prep solution, endotracheal tube)
- Ignition source (eg, laser, electrocautery)

Anesthesia Management

Choice of Anesthetic Technique

- For most H&N procedures, general anesthesia is the preferred technique
- General anesthesia

    Protects the patient's airway

    Assures adequate gas exchange

    Abolishes patient movement

    Reliably provides amnesia

    Avoids distracting the surgeon

Choice of Anesthetic Technique

- MAC may be performed for selected H&N procedures

- Laryngeal framework surgery may require spontaneous ventilation and a responsive patient

- MAC without immediate access to the patient's airway

  may be challenging

  fluctuating level of surgical stimulation

Monitoring

- **Standard American Society of Anesthesiologists (ASA) monitors:**

  blood pressure [BP], electrocardiography, O_2 saturation, capnography

  usually sufficient during H&N surgery

  even when controlled hypotension is used

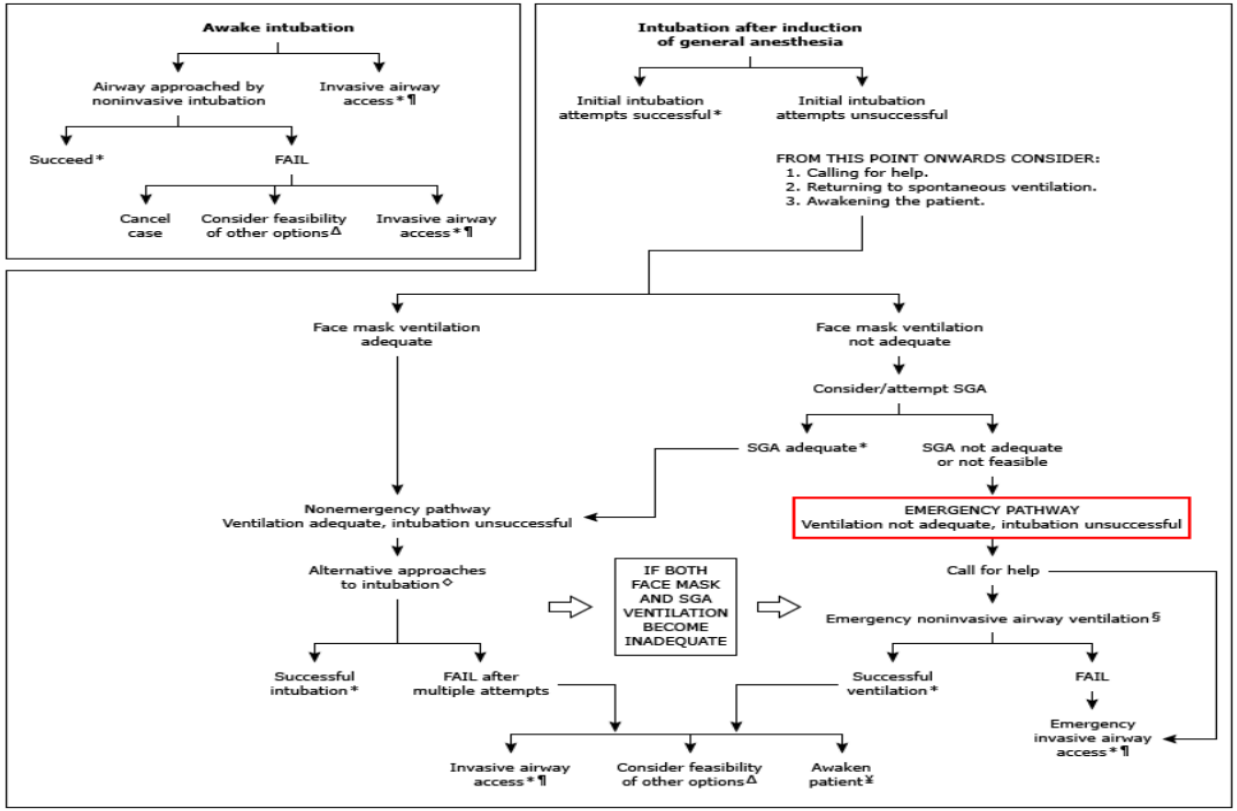
- **Additional monitors** may be added:

  Continuous arterial blood pressure monitoring

  Central venous catheter

  Processed electroencephalogram

Airway management strategy



Laryngoscopy technique

- If DL is chosen as a primary approach to tracheal intubation

  multiple attempts should be avoided

  to avert total airway obstruction

- Videolaryngoscopy (VL) should be strongly considered

  as the primary intubation technique for H&N patients

  predicted difficult DL

  increase the chance of first-attempt success

Endotracheal intubation by the surgeon

- If DL or VL fails

  Surgeon may be able to intubate

  using the operating laryngoscope or rigid bronchoscope

- The surgeon can also use a rigid bronchoscope

  Ventilation after failed intubation

  Acute airway obstruction resulting from

    foreign bodies

    hemoptysis

    tumors

Flexible scope intubation

- Both awake and asleep
- High failure rates in patients with H&N pathology
- Reported failure rates between 9 and 60 percent
- The most common reasons for failure of flexible scope intubation:

    inability to identify the glottis

    difficulty passing the scope

    bleeding

    airway obstruction

Combined intubation techniques

- The combined use of VL with a flexible scope or optical stylet is increasingly common in complex airway management

- VL provides an enlarged view of the glottis and facilitates manipulation of the flexible scope or optical stylet in patients with distorted anatomy or airway tumors

- The combined technique allows continuous visualization of the intubation procedure and less chance of tumor disturbance

Optical stylets

- Optical intubation stylets

  Bonfils, Shikani, SensaScope, Clarus Video System

- May offer an advantage over flexible scopes

  May bypass mobile supraglottic and glottic masses

  Situations when a flexible scope will not pass

Supraglottic airways

- May be difficult to insert or seat in patients with
  - H&N pathology
  - History of neck radiation
  - limited mouth opening

- Difficulty with SGA ventilation
  - Glottic pathology
  - Hypopharyngeal pathology
  - Subglottic pathology

Laryngeal Mask Airways (LMAs)

- A second-generation SGA is preferred over a first-generation

  improve ventilation and reduce the risk of aspiration

- Second-generation devices may include additional features

  bite blocks

  cuffs designed to improve the seal

  esophageal vents that allow orogastric tube placement

  cuff pressure monitors

  lumen that allows passage of an upper gastrointestinal endoscope

Laryngeal Mask Airways (LMAs)

- Bougie introducer-assisted insertion technique

  For most second-generation SGAs

  Specifically for the LMA ProSeal

  Maximize the first-pass success rate

  Assure optimal esophageal and laryngeal seals

Tubular SGAs

- Combitube
- laryngeal tubes (LTs)
- Especially useful in H&N patients
    - limited mouth opening
    - significant upper airway bleeding or regurgitation
    - when rapid control of the airway is necessary
- commonly used in
    - Prehospital emergency airway management
    - Emergency department (ED)

SGAs

	Laryngeal mask airways	King Laryngeal Tube (King LT)	CombiTube
Device			
Type	Supraglottic	Retroglottic	Retroglottic
Characteristics	Most require air to inflate the cuff. Usually have a port for a gastric tube, allowing for less gastric distension, which faciliatates more effective BVM ventilation. Some are designed for an ET tube to be passed into the trachea.	Single inflation port inflates both upper and lower balloons. Recent models have a port for a gastric tube, allowing for less gastric distension. which faciliatates more effective BVM ventilation.	Two separate ports for inflation of the balloons and separate attachments for the BVM. Providers must assess if the distal end is in the stomach or trachea prior to using the BVM. (This is difficult and increases the chance of error.)
Sizes	Usually come in pediatric and neonate sizes.	Comes in pediatric and neonate sizes.	Smaller-size 37F is available to use in patients ≥ 4 feet. (No sizes available for patients < 4 feet.)

Choice of size

Weight, kg	LMA size	Max cuff volume, mL
<5	1	4
5-10	1.5	7
10-20	2	10
20-30	2.5	14
30-50	3	20
50-70	4	30
70-100	5	40
>100	6	50

Use of the SGA as a primary ventilatory device

- Advantages:

  decreased incidence of upper airway trauma

  decreased adverse respiratory events

  eliminating the need for the use of NMBAs

  improved maintenance of a stable plane of anesthesia

  controlled hypotension

  smoother and faster emergence from anesthesia

- For the otologic surgery, we prefer to use a second generation SGA, most commonly LMA-Proseal or LMA-Supreme, to assure proper SGA positioning and function

Oxygenation strategies

- High flow nasal oxygen

  (transnasal humidified rapid insufflation ventilatory exchange)

  [THRIVE]

- Arndt cricothyroidotomy catheter

  3-mm internal diameter (ID) lumen

  allows ventilation using a low-pressure gas source

  such as an anesthesia breathing circuit or Ambu bag

Surgical airway

- Awake Tracheostomy

  should be performed under local anesthesia

  without sedation

- An alternative is an Awake Dilator Cricothyroidotomy

Emergency Airway Management

- Surgical cricothyroidotomy

  strongly preferred over

  percutaneous access through the cricothyroid membrane

- Emergency transcutaneous cannula cricothyroidotomy

  failed in 60 percent of H&N patients

Positioning

- Areas that should be padded to prevent skin pressure and nerve injury

  Pressure points

  Plastic connectors

  IV tubing

  Monitoring devices

Positioning

- The head of the operating table is usually away from the anesthesiologist
- Preventing immediate access to the airway
- The ETT should be effectively secured

  accidental extubation

  ETT pullback

- The breathing circuit should be firmly attached to the ETT and supported to prevent disconnection.

Positioning

- The patient's eyes

  should be adequately protected

  cover with occlusive dressing to keep the lids closed

  prevent skin preparation solution from entering the eyes

- Protective goggles

  should be placed for surgeries involving heavy instrumentation

  around the patient's face (eg, during transoral robotic surgery)

Positioning

- The operating table

  may be placed in a steep lateral position

  during otologic and neurotologic surgery

- Apply three straps

  chest

  pelvis

  legs

to prevent patient shifting on the operating table

Opioids during maintenance of anesthesia

- Continuous opioid infusion or Intermittent boluses ?
  - Decrease the total dose of opioid administered
  - Improve hemodynamic stability

- Remifentanil
  - ultrashort-acting opioid
  - can be administered at high doses
  - profound intraoperative analgesia
  - no postoperative residual effects
  - hemodynamic stability
  - faster recovery from anesthesia

Controlled Hypotension

- Systolic Blood Pressure [SBP] below 100 mmHg
- Mean Arterial Pressure [MAP] of 60 to 70 mmHg

- Controlled hypotension should be avoided in patients with:

  uncontrolled hypertension

  cerebrovascular disease

  significant coronary artery disease

  chronic renal insufficiency

  advanced liver disease

Postoperative pain control

- Multimodal approach

  minimize the use of postoperative opioids

- May include perioperative use of:

  Acetaminophen

  Gabapentin

  Nonsteroidal Anti-inflammatory Drugs (NSAIDs)

- Local anesthetic infiltration
- Peripheral nerve blocks

Extubation plan

- Laryngospasm
- Postextubation airway edema
- Postoperative airway obstruction
- Need for reintubation

- One-third of adverse events occurred during

  emergence and recovery from anesthesia

DAS Extubation Guidelines: 'At risk' algorithm

Step 1
Plan extubation

Plan
Assess airway and general risk factors

'At risk' extubation
Ability to oxygenate uncertain
Reintubation potentially difficult and/or general risk factors present

Step 2
Prepare for extubation

Prepare
Optimise patient and other factors

Optimise patient factors
Cardiovascular
Respiratory
Metabolic / temperature
Neuromuscular

Optimise other factors
Location
Skilled help / assistance
Monitoring
Equipment

Key question: is it safe to remove the tube?

Step 3
Perform extubation

Yes

- **Awake extubation**
- **Advanced Techniques***
  1 Laryngeal mask exchange
  2 Remifentanil technique
  3 Airway Exchange Catheter

No

- Postpone extubation
- Tracheostomy

Step 4
Postextubation care

Recovery / HDU / ICU

Safe transfer
Handover / communication
O_2 and airway management
Observation and monitoring
Analgesia
Staffing
Equipment
Documentation
General medical and surgical management

*Advanced techniques: require training and experience

Extubation plan

- The plan for extubation:

✓ should be formulated with the surgeon

✓ consider the difficulty of initial intubation

✓ extent and duration of surgery

✓ potential for postoperative swelling or bleeding

✓ patient's current and preoperative medical status

Extubation plan

- Extubation may be delayed for patients who are:

  predicted to be at high risk of failed extubation

- These patients should be transported to an intensive care unit (ICU)

- If a trial of extubation is considered for high-risk patients

  all necessary equipment and personnel should be available

  for potential reintubation or establishment of a surgical airway

  extubate over an airway exchange catheter

Smooth extubation strategy

- Extubation should occur

  when airway protective reflexes have returned

  preventing coughing

- SGA as a primary ventilatory device, in lieu of ETT
- Bailey maneuver
- Remifentanil
- Antihypertensives

POSTOPERATIVE CARE

- Multimodal strategies for postoperative pain control
- Postoperative nausea and vomiting (PONV) prophylaxis
- Postdischarge nausea and vomiting (PDNV) prophylaxis
- Recovery room versus Intensive Care Unit [ICU]

THANK YOU