Local Anesthesia of the Airway

Background

Procedures on the upper airway in an awake patient are challenging because of local factors such as excessive salivation, presence of gag reflex, and activation of cough reflex, as well as because of the systemic hemodynamic response caused by the stimulation of autonomic nervous system.

Anesthesia of the airway is needed for attempts to access a difficult airway or for procedures performed through the airway in awake patients. In patients with recognized difficult airway, intubation under general anesthesia might lead to the risk of loss of control on the airway. Elective awake intubation is a safer option in these patients and is facilitated by abolishing airway reflexes by local anesthetic techniques. Local anesthesia of the airway is complicated due to the multiple nerves that are to be blocked. A thorough knowledge of the anatomy is essential for a successful procedure.

Indications

These blocks are mainly performed to abolish reflexes and provide patient comfort during manipulation and instrumentation of the airways in an awake patient during the following:

- Direct laryngoscopy
- Bronchoscopy
- Nasal intubation
- Fiber optic intubation[1]
- Some procedures on the head and neck

Most of these procedures are frequently done in patients with compromised airway before establishing endotracheal intubation for the induction and maintenance of anesthesia.

Contraindications

Absolute contraindications

Patient refusal is an absolute contraindication.

Relative contraindications

A patient on anticoagulation is a relative contraindication, as is distorted anatomy that interferes with the proper identification of structures to perform the block due to the following:

- Tumors
- Surgical deformities or reconstruction
- Arteriovenous malformations

Outcomes

If the structures are identified properly and knowledge of the anatomy is good, these blocks can be performed easily and with a high rate of success with the least amount of complications.

Patient Education & Consent

Elements of Informed Consent

Preparing a patient for awake airway instrumentation and manipulation requires proper planning. The patient is explained the procedure in adequate detail and should know what to expect. He should be aware of the reasons for performing the procedure awake. The patient is informed that he or she will be awake while the endotracheal tube or bronchoscope is inserted into his or her mouth or nose. He needs to be reassured that

the discomfort can be largely mitigated by placing needles or inserting cotton into his nostril or any other local anesthetic technique that is suitable for performing the procedure on the airway. This is mostly a safe technique with not many complications. Temporary hoarseness or weakness of voice or coughing might occur in the postprocedure period.

Equipment

- Antimicrobial solution for skin preparation (Betadine or chlorhexidine.)
- Short bevelled needles of 22-gauge to 25-gauge sizes
- 2 mL and 5 mL syringes
- Nebulizer or atomizer
- Tongue depressor
- Right-angled forceps
- Oxygen source and face mask
- Suction catheter and apparatus
- Monitors
- Routine monitoring devices like pulse oximeter, noninvasive blood pressure measurement, and ECG

Patient Preparation

Alleviation of anxiety

Sedation can be given after assessing the level of anxiety of the patient. Agents with a short duration of action that are titratable and reversible are preferred. They should also not depress the spontaneous respiration of the patient.

- Midazolam: 0.5-3 mg
- Fentanyl : 20-100 micrograms
- Alfentanil : 100-1000 micrograms

Oral secretions can interfere with visualization and performance of the airway procedure. Hence it should be decreased by administering antisialagogues intravenously or intramuscularly at least half an hour before the procedure, such as the following:

- Atropine: 0.5-1 mg
- Glycopyrrolate: 0.2-0.4mg

To reduce the risk of aspiration, keep the patient nil by mouth for at least 6 hours. Ranitidine and metoclopramide can be given 2 hours before the procedure.

If a procedure on the nose is planned, administering vasoconstrictor drops in the nostrils can help reduce the epistaxis due to trauma.

The following are administered half an hour before surgery and given after ruling out drug contraindications (ex, uncontrolled hypertension).

- 1% phenyl ephedrine spray
- Ephedrine drops

The patient is brought to the operating theater or any other place predetermined to perform the block with all facilities to provide the block safely and to manage any adverse events.

An intravenous cannula is started and all other monitors are connected to the patient.

Anesthesia

Various preparations of local anesthetics include the following:

- 1%, 2% , 4%,10% lidocaine (lignocaine) solutions
- 10% lidocaine (lignocaine) spray
- Lidocaine (lignocaine) 2-4% jelly
- Viscous lidocaine (lignocaine) 2%[2]
- Cetacaine spray (a pressurized solution containing a mixture of 14% benzocaine and 2% tetracaine

Monitoring & Follow-up

Complications

General

Because multiple nerve blocks have to be performed to abolish all airway reflexes, large volumes of local anesthetic might be needed. This could lead to the dose exceeding the toxic limits. Calculating the total dose that is allowed for the individual patient and drawing up only that amount and keeping it in a cup so that only contents of this cup will be put to use is a good practice.

The protective reflexes of the airway are lost. Therefore, chances of aspiration are high. This can be reduced by keeping the patient nil by mouth for a period of 6 hours and prescribing antiaspiration prophylaxis.

Mucosal trauma epistaxis is a complication involving the nasal cavity.

Glossopharyngeal nerve block

- Intraoral approach: Intravascular injection and hematoma formation due to close proximity to internal carotid artery.
- Peristyloid approach: Intravascular injection into the internal jugular vein and external carotid artery and hematoma formation.

Superior laryngeal nerve block

This block might rarely injure and cause intravascular injection into the superior laryngeal artery or vein as they lie in proximity to the nerve on the thyrohyoid membrane.

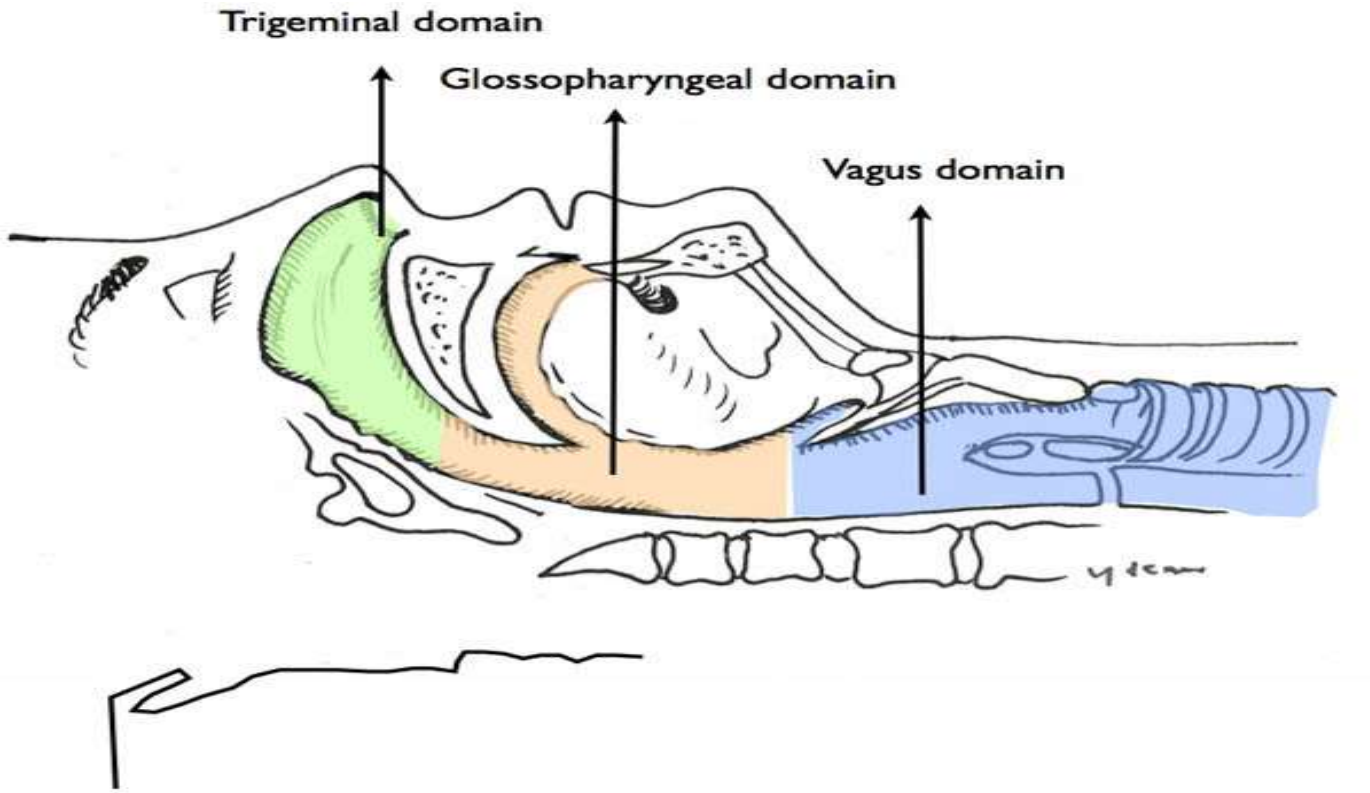
Loss of protective airway reflexes can cause complications like aspiration.

Transtracheal block

The patient might cough during injection of the drug. Trauma to the laryngeal mucosa can occur. Using the intravenous cannula and rapid injection of the drug once the airway is entered can minimize this risk

Approach Considerations

Depending on the nerve supply and the region, the upper airway is divided into 3 regions (see image below).



The upper airway is divided into three regions depending on its major sensory innervations

Nasal cavity

The sensory supply is as follows:

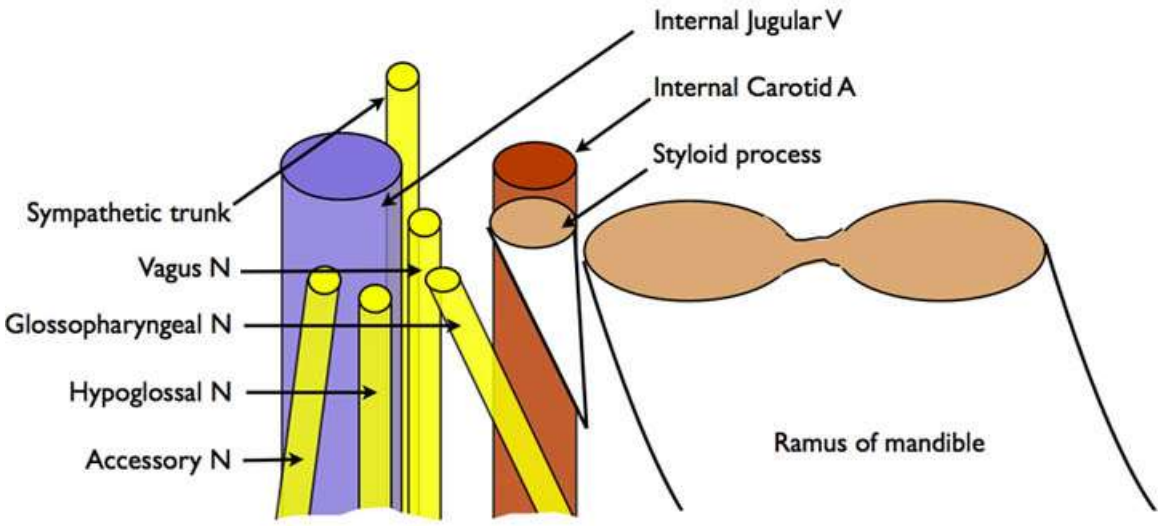
- From the olfactory cranial nerve (CN 1): The anterior ethmoidal nerve supplies the nares and the anterior one third of the nasal septum.
- From the pterygopalatine ganglion via the maxillary division of the trigeminal nerve (CN 5): The greater palatine nerve and lesser palatine nerves. This ganglion lies posterior to the middle turbinate and the branches innervate the posterior two thirds of the nasal septum and the turbinates.

Base of tongue and oropharynx

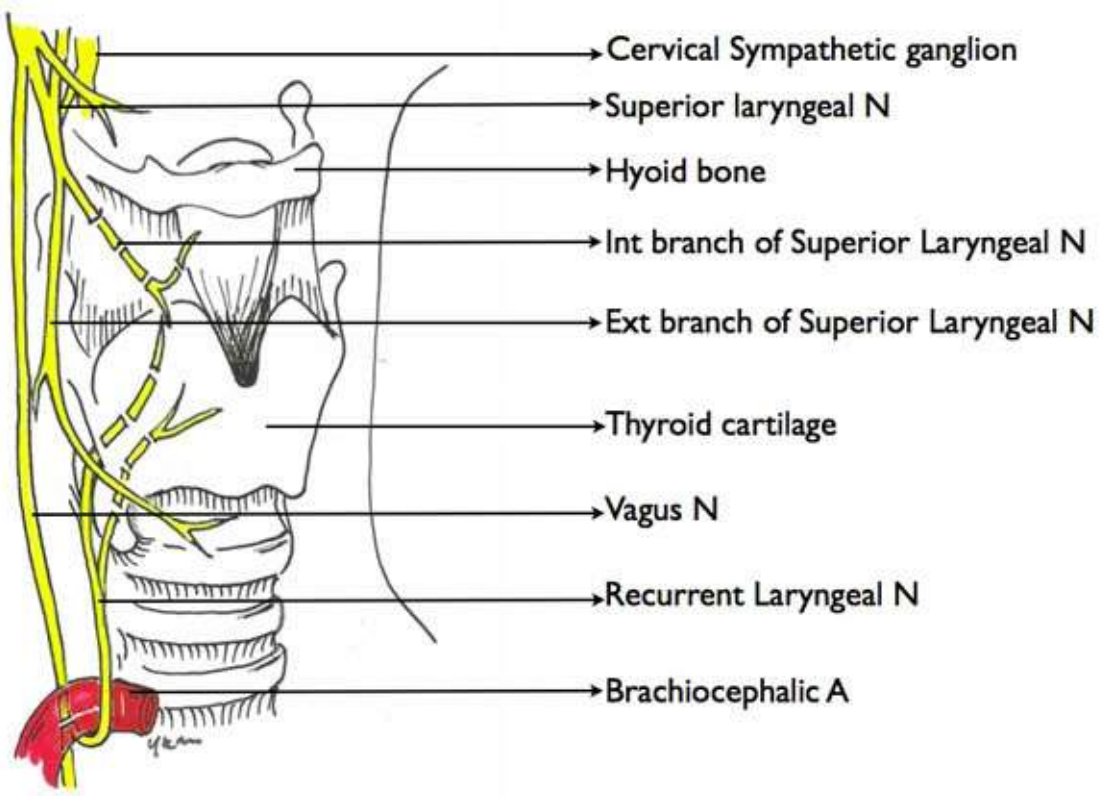
The glossopharyngeal nerve travels anteriorly from the jugular foramen along the lateral aspect of the pharynx in close proximity to the structures in the carotid sheath and the styloid process and in the neck lies between the internal and external carotid arteries. Its branches provide sensation to the following structures:

- Lingual branch - Innervates the posterior one third of the tongue, vallecula, and anterior surface of epiglottis
- Pharyngeal branch - Innervates the lateral and posterior walls of the pharynx
- Tonsillar branch - Innervates the tonsillar pillars and soft palate

These branches lie immediately posterior to the palatine tonsils (see the images below).



The anatomical relationship of the glossopharyngeal nerve



Anatomy of the larynx showing the innervations from the branches of the vagus

Hypopharynx, larynx, and trachea

From the vagus nerve come the following nerves:

- Superior laryngeal nerve: This nerve is a branch of the vagus nerve. It courses medially in the neck and divides into the internal and external laryngeal branch lateral to the greater cornu of the hyoid bone and travels inferiorly to pierce the thyrohyoid membrane and travels under the pyriform fossa. The ascending branch supplies the epiglottis, aryepiglottic fold, and arytenoids. The descending branch supplies the laryngeal mucosa just above the vocal cords. The external laryngeal branch supplies the cricothyroid muscle.
- Recurrent laryngeal nerve: The recurrent laryngeal nerve arises from the vagus at the level of the ligamentum arteriosum and loops around the arch of aorta on the left side and under the right subclavian artery on the right side to ascend up into the tracheoesophageal groove. It provides sensory innervations

below the vocal cords and trachea and motor supply to all the intrinsic laryngeal muscles except cricothyroid.

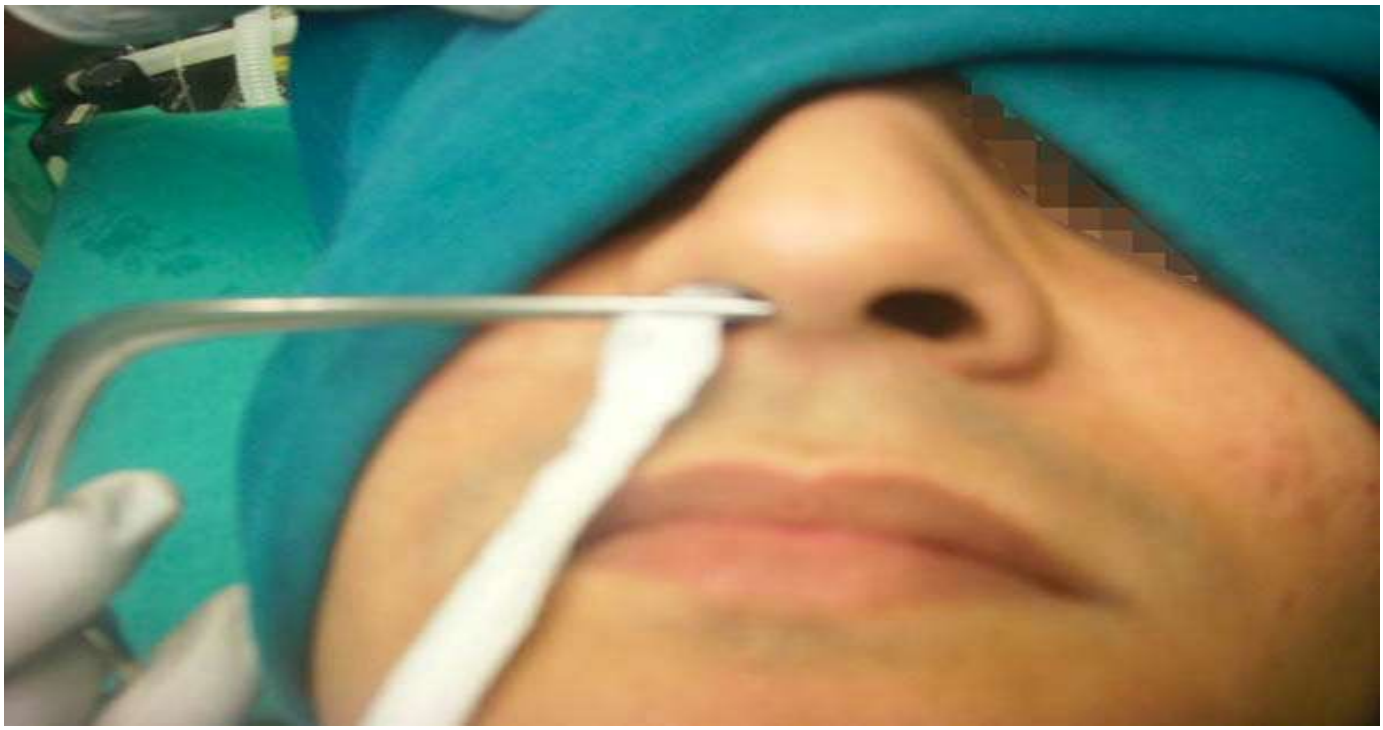
To summarize, for anesthetizing the nasal cavity, the maxillary branches from the trigeminal nerve must be blocked. Manipulations involve the pharynx and posterior third of the tongue require blocking of the glossopharyngeal nerve. Vagal nerve block is needed for structures beyond epiglottis.

Blocking the Nasal Cavity

Nasal cavity may be blocked either by the use of cotton pledgets or by an inhalational technique. The 2 techniques are described below.

By placing cotton pledgets soaked in local anesthetic solution

- Drugs: 4% lidocaine (lignocaine)
- Position: Patient lies supine with head end elevation by 30°
- Three wide cotton pledgets soaked in local anesthetic solution are applied along the 3 walls of the cavity.
- One pledget is placed along the inferior turbinate extending to the posterior pharyngeal wall.
- Second pledget is placed along the middle turbinate in a cephalad angulation to block the pterygopalatine ganglion under the sphenoid bone.
- A third pledget is placed along the superior turbinate close to the cribriform plate and posterior nasopharyngeal wall. This blocks the anterior ethmoidal nerves.
- The above procedure should be performed bilaterally to have a bilateral block.
- The pledgets are left in place for at least 5-15 minutes (see image below).Nasal packing is done with cotton pledgets



Nasal packing is done with cotton pledgets

Inhalation of aerosolized local anesthetic

4% lidocaine (lignocaine) can be added to a standard nebulizer or atomizer and kept on the patient's face. The patient is asked to breathe in deeply for about 15-30 minutes.

Advantages of this technique are that it very simple and easy to perform, it is the least invasive, and, if performed properly, it can anesthetize the upper airway to the trachea. Knowledge of the anatomy of the

airways is also not needed. It can be especially useful in patients in whom blocks are contraindicated or not feasible. The plasma levels of the local anesthetic are also not high.

The disadvantages of this technique are that the block may be uneven and less dense and may occasionally cause CNS depression. Additionally, the technique requires the patient to inhale deeply which may not be easy for all.

Blocking the Mouth and Oropharynx

Anesthesia of the oral cavity and oropharynx can be achieved by topical techniques or by directly blocking the glossopharyngeal nerve.

Topical application

- Lidocaine (lignocaine) gel 2- 5% can be applied to the posterior third of the tongue.
- Lidocaine (lignocaine) spray 10% can be sprayed on the posterior third of the tongue and posterior pharyngeal wall after depressing the tongue with a tongue depressor.
- Cetacaine spray (a pressurized solution containing a mixture of 14% benzocaine and 2% tetracaine) can be used to spray the posterior third of the tongue and posterior pharyngeal wall.
- Viscous lignocaine 2% around 2-4 mL can be gargled for 30 seconds.
- Lidocaine (lignocaine 4%; 4mL) can be nebulized.
- Alternatively, a 10-mL syringe with 4% lidocaine (lignocaine) can be sprayed through a small bored needle

Caution: The toxic dose of the drugs should not be exceeded while using large quantities of the local anesthetics.[3]

Glossopharyngeal nerve block

Glossopharyngeal nerve can be blocked either by an intraoral technique or by a peristyloid technique.

Indication: A nerve block is attempted if the topical techniques are not effective in abolishing the gag reflexes.

Intraoral approach

- Position: patient lies supine
- The mouth of the patient is opened wide.
- The posterior pillar of the tonsillar fossa is identified after displacing the tongue to the opposite side with a tongue depressor.
- A 25-gauge spinal needle is inserted into the fold near the base of the tongue and advanced slightly.
- A syringe is attached and aspiration is done.
- If air is aspirated, the needle is advanced further.
- If blood is aspirated, the needle is redirected more medially.
- 2mL of 1% lignocaine is injected into the caudad portion of the posterior pillar./li>

Peristyloid approach

- Patient is positioned supine.
- A line is drawn between the angle of mandible and mastoid process.
- Styloid process is felt on this line just behind the angle of mandible.
- After preparing the skin with Betadine, a 22-gauge short bevelled needle is inserted at this spot and advanced medially.
- Once the bone is contacted, the needle is withdrawn slightly and directed slightly posterior.
- After negative aspiration, 5-7 mL of 1% lignocaine is administered.

Blocking the Hypopharynx, Pharynx, and Trachea

This can be performed by either mucosal saturation of local anesthetic by the inhalational method or by performing nerve blocks. Complete anesthesia requires blockade of the superior laryngeal nerve as well as

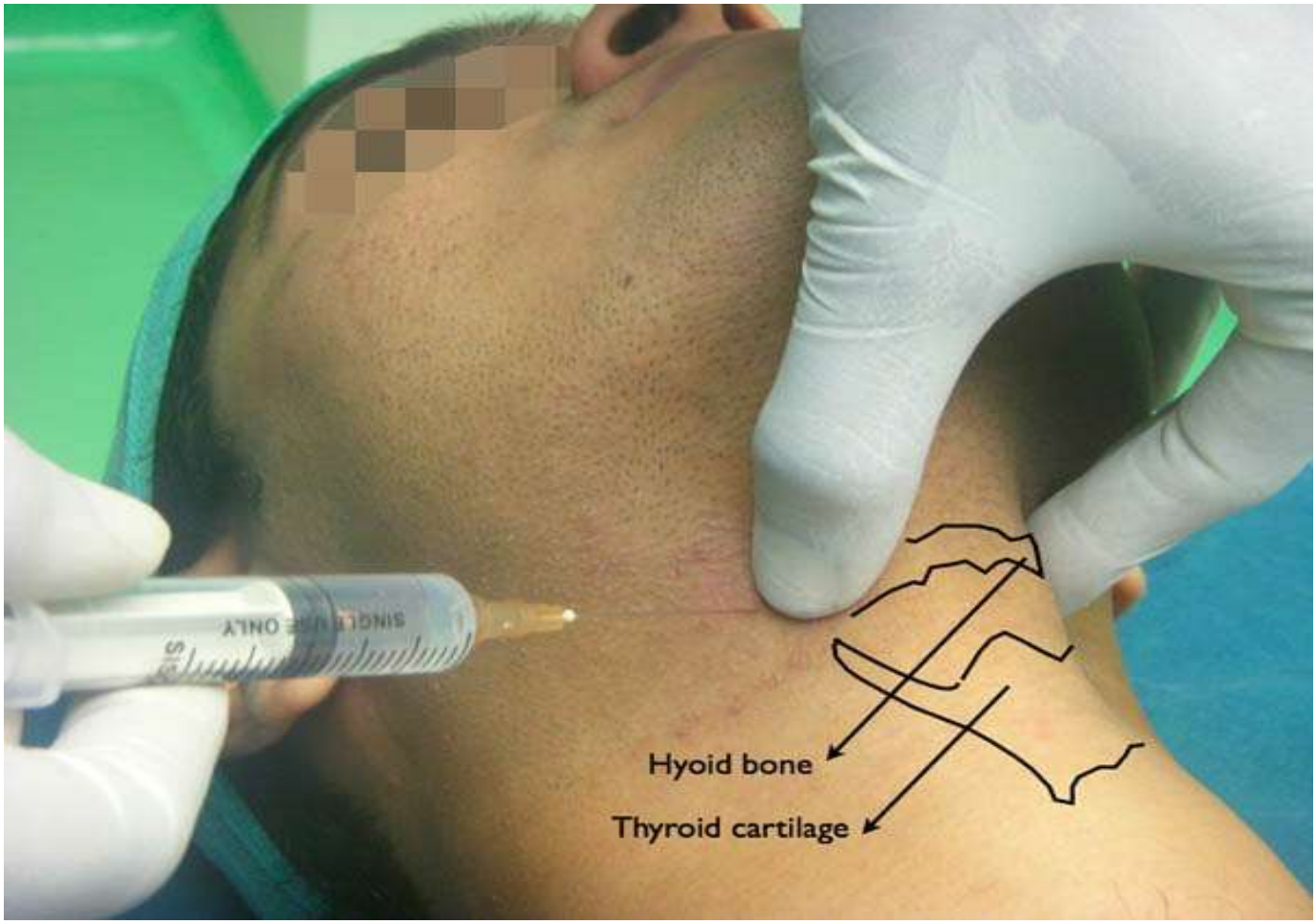
the recurrent laryngeal nerve. Remember, however, that complete anesthesia, especially of the recurrent laryngeal nerve, poses the danger of a blocked airway.

Superior Laryngeal Nerve Block

This nerve can be blocked directly or by topicalization.

Nerve block

- Patient position is supine with neck extended.
- The skin on the neck is prepared with an antimicrobial agent.
- The greater cornu of the hyoid bone is palpated. This is identified just below the angle of the mandible and by tracing upwards from the posterolateral surface of the thyroid cartilage.
- The hyoid bone is held between the index and thumb fingers of the operator and firm pressure is applied to displace it toward the side to be blocked.
- A 25-gauge needle is inserted to contact the greater cornu of the hyoid. The needle is then walked below this bone.
- The needle is advanced by 2-3 mm to enter the thyrohyoid membrane. In this position, the needle lies just outside the laryngeal mucosa (see image below). After negative aspiration for air and blood, 2 -3 mL of 1% lignocaine is injected. Presence of air indicates entry into larynx, and the needle should be withdrawn slightly. Presence of blood indicates entry into superior laryngeal vessels.



- The block has to be performed bilaterally.Superior laryngeal nerve block. The hyoid bone is held by the thumb and index fingers of the operator and displaced towards the side to be blocked

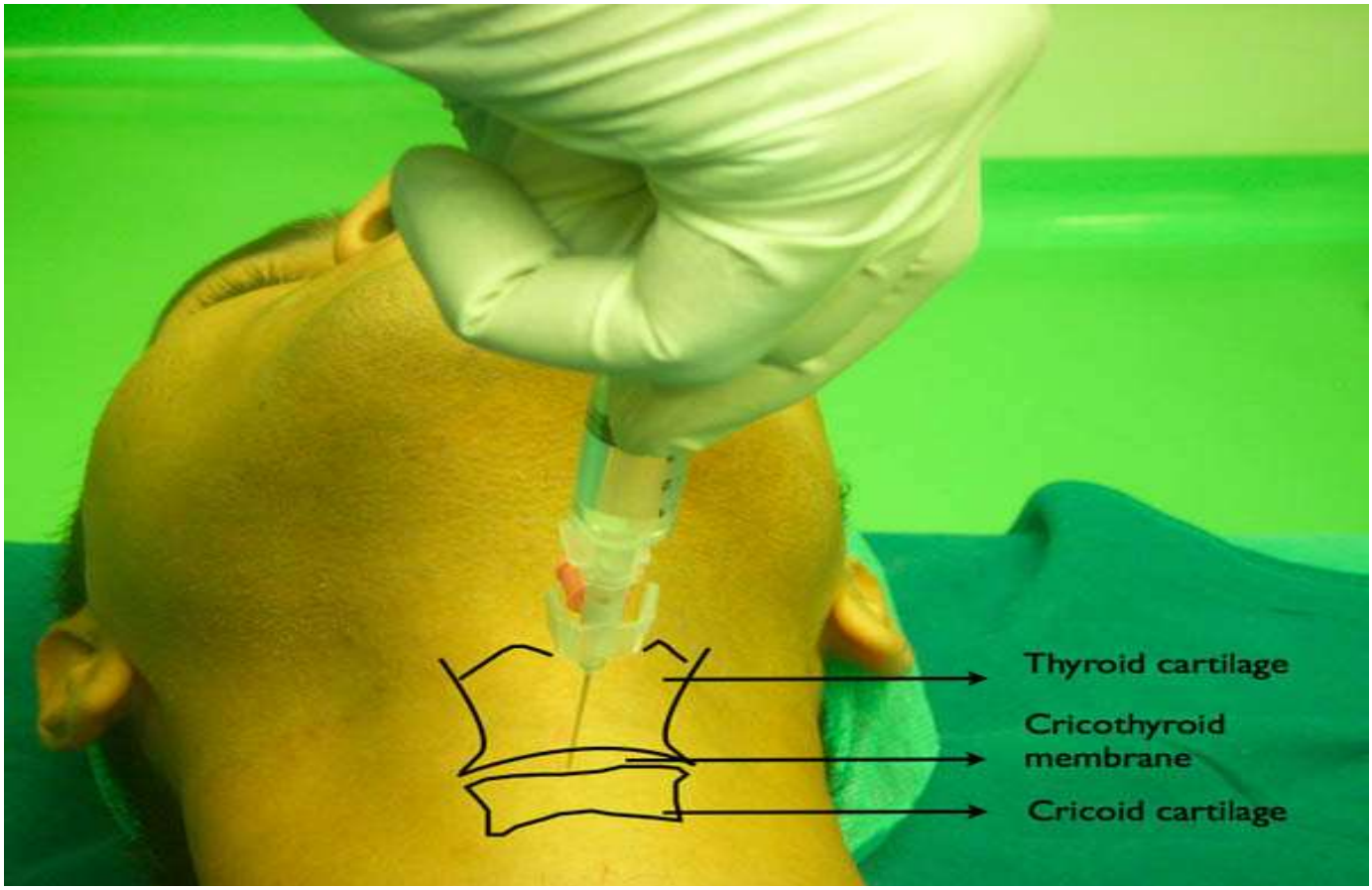
Topicalization

This is performed only when the external approach (described above) is not feasible or has failed.

- Inhalation of aerosolized local anesthetic (as described above)
- Local application: After topicalization of the tongue, patient is asked to protrude the tongue, which is grasped with a piece of gauze. Pledgets soaked in 4% lignocaine are inserted bilaterally using a pair of right angled forceps into the pyriform fossa and left there for 5-15 minutes.

Recurrent Laryngeal Nerve Block

The 2 methods for this block include the following inhalational of aerosolized local anesthetic (as described above) and the transtracheal block (see the image below).



Trans tracheal block. An intravenous cannula is inserted at the cricothyroid membrane

- Position: The patient is placed supine with neck extended.
- In the mid line, the thyroid prominence and the cricoid cartilage below it are identified.
- The cricothyroid membrane can be felt in the mid line between these 2 structures.
- After sterile preparation of the skin overlying the membrane and skin infiltration with local anesthetic, a 22-gauge intravenous cannula with needle is inserted through the membrane until resistance is lost and the needle has entered the larynx.
- The needle is removed, the cannula left in place, and a 5-mL syringe with 4 mL of 1 % lignocaine is attached.
- Aspiration is done, and, when air is aspirated, the local anesthetic is injected.
- During injection, the patient might cough. Care should be taken to avoid mucosal injury during this time.

Since the recurrent laryngeal nerve supplies all the intrinsic muscles of the larynx, except the cricothyroid, direct blockade, especially bilaterally is contraindicated. This could lead to complete obstruction of the airway.

Medication Summary

The aims of premedication are to reduce morbidity, prevent complications, and minimize myocardial oxygen demands by reducing heart rate and systemic arterial pressure.

Anxiolytics, Benzodiazepines

Class Summary

Administration of intravenous midazolam in the operating room can reduce anxiety, tachycardia, and hypertension.

View full drug information

Midazolam

Midazolam is a short-acting benzodiazepine with a rapid onset of action. It depresses all levels of the CNS (eg, limbic and reticular formation), possibly by increasing activity of GABA.

Opioid Analgesics

Class Summary

Induction of anesthesia is accomplished by using high doses of opioid (usually fentanyl or alfentanil) to maximize cardiovascular stability.

View full drug information

Fentanyl citrate (Duragesic, Abstral, Actiq, Fentora, Onsolis)

Fentanyl citrate is a synthetic opioid that has 75-200 times more potency and a much shorter half-life than morphine sulfate. It has fewer hypotensive effects than morphine and is safer in patients with hyperactive airway disease because of minimal or no associated histamine release. By itself, fentanyl citrate causes little cardiovascular compromise, although the addition of benzodiazepines or other sedatives may result in decreased cardiac output and blood pressure.

Fentanyl citrate is highly lipophilic and protein-bound. Prolonged exposure to it leads to accumulation of the drug in fat and delays the weaning process. Consider continuous infusion because of the medication's short half-life.

View full drug information

Alfentanil (Alfenta)

Ultra short acting analgesic that inhibits ascending pain pathways, increases pain threshold, and alters pain perception.

Anticholinergics, Respiratory

Class Summary

Anticholinergic agents can inhibit salivation and excessive secretions of the respiratory tract before surgery. These agents also control upper airway secretions.

View full drug information

Glycopyrrolate (Robinul, Cuvposa)

Glycopyrrolate acts in smooth muscle, the central nervous system (CNS), and secretory glands, where it blocks the action of ACh at parasympathetic sites.

View full drug information

Atropine (AtroPen)

Atropine is an antimuscarinic agent that inhibits the action of acetylcholine at parasympathetic sites in smooth muscle, the CNS and secretory glands.

Prokinetic Agents

Class Summary

Prokinetics are promotility agents, proposed for use with severe constipation-predominant symptoms.

View full drug information

Metoclopramide (Reglan, Metozolv)

Metoclopramide is characterized by remarkable stimulation of gastric emptying without stimulating gastric, pancreatic, or biliary secretions. Increases lower esophageal sphincter tone. Metoclopramide can be given two hours before the procedure.

Histamine H2 Antagonists

Class Summary

H2 blockers are reversible competitive blockers of histamine at H2 receptors, particularly those in the gastric parietal cells (where they inhibit acid secretion). The H2 antagonists are highly selective, they do not affect the H1 receptors, and they are not anticholinergic agents.

Histamine 2 (H2)–receptor antagonists should be administered preoperatively to prevent increase in gastric secretion during the procedure.

View full drug information

Ranitidine (Zantac)

This agent inhibits histamine stimulation of H2 receptors in gastric parietal cells, which reduces gastric acid secretion, gastric volume, and hydrogen ion concentrations. Histamine 2 (H2)–receptor antagonists should be administered preoperatively to prevent increase in gastric secretion during the procedure.

View full drug information

Famotidine (Pepcid)

Famotidine competitively inhibits histamine at the H2 receptors in gastric parietal cells, reducing gastric acid secretion, gastric volume, and hydrogen concentrations. Histamine 2 (H2)–receptor antagonists should be administered preoperatively to prevent increase in gastric secretion during the procedure.

View full drug information

Nizatidine (Axid, Axid AR)

This agent competitively inhibits histamine at the H2 receptor of the gastric parietal cells, resulting in reduced gastric acid secretion, gastric volume, and reduced hydrogen concentrations. Histamine 2 (H2)–receptor antagonists should be administered preoperatively to prevent increase in gastric secretion during the procedure.

View full drug information

Cimetidine (Tagamet HB 200)

This agent inhibits histamine at H2 receptors of gastric parietal cells, which results in reduced gastric acid secretion, gastric volume, and hydrogen concentrations. Histamine 2 (H2)–receptor antagonists should be administered preoperatively to prevent increase in gastric secretion during the procedure.

Alpha/Beta Adrenergic Agonists

Class Summary

These agents may be used to treat nasal congestion.

View full drug information

Ephedrine

Ephedrine releases tissue stores of norepinephrine, which when applied nasally produces local vasoconstriction resulting in nasal decongestion.

Local Anesthetics, Amides

Class Summary

Local anesthetics are used for local pain relief.

View full drug information

Lidocaine (Xylocaine with epinephrine)

Lidocaine 1-2% with or without epinephrine (1:100,000 or 1:200,000 concentration) is used. Lidocaine is an amide local anesthetic used in 1-2% concentration. The 1% preparation contains 10 mg of lidocaine for each 1 mL of solution; the 2% preparation contains 20 mg of lidocaine for each 1 mL of solution. Lidocaine inhibits depolarization of type C sensory neurons by blocking sodium channels. Epinephrine prolongs the duration of the anesthetic effects from lidocaine by causing vasoconstriction of the blood vessels surrounding the nerve axons.

View full drug information

Benzocaine, butamben, and tetracaine (Cetacaine)

These agents inhibit the conduction of nerve impulses by decreasing the neuronal membrane's permeability to sodium ions.

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Further Reading

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Usually, we don't mind if you include a simple link from your website to one of our Professional Sites. However, you must first ask our permission if you intend to frame one of our websites or incorporate portions or one of our websites into a different site or product in such a way that is not clear to our users that we are the source of the content. You are not allowed to link to us if you engage in the publication or promotion of illegal, obscene, or offensive content, or if the link in any way negatively impact on our reputation.

Member Conduct when Using Community and Communication Services

If you use a community and communication feature of the Services, such as Medscape Mail, Medscape Connect, blog or discussion service (each, a "Community and Communication Service"), you are responsible for all communications, information, data, text, music, sound, graphics, messages and other material ("Content") that you upload, post, transmit, email or otherwise distribute through a Community and Communication Service. Neither we nor our licensors are responsible for the consequences of the Content posted by you or any other party through a Community and Communication Service, and as such, do not guarantee the accuracy, integrity or quality of such Content. You understand that by using a Community and Communication Service, you may be exposed to Content that is offensive or objectionable. In no event will we be liable in any way for any Content or for any loss or damage of any kind incurred as a result of the use of any Content uploaded, posted, transmitted, emailed or otherwise made available through a Community and Communication Service. In cases where you feel threatened or believe someone else is in danger, you should contact your local law enforcement agency immediately. If you think you may have a medical emergency, call your doctor or 911 immediately.

When you use a Community and Communication Service, you agree not to:

1. Violate local, state, national, or international laws;
2. Post, upload, email, transmit or otherwise distribute any Content that infringes on the intellectual property rights of others or on the privacy or publicity rights of others;
3. Post, upload, email, transmit or otherwise distribute any Content that is unlawful, harmful, obscene, defamatory, threatening, harassing, abusive, slanderous, hateful, or embarrassing to any other person or entity as we may determine in our sole discretion;
4. Harm minors in any way;
5. Post advertisements or solicitations of business;
6. Forge headers or otherwise manipulate identifiers in order to disguise the origin of any Content transmitted through a Community and Communication Service;
7. Post, upload, email, transmit or otherwise distribute chain letters, pyramid schemes, unsolicited or unauthorized advertising or spam;
8. Impersonate another person or business entity or stalk or otherwise harass another person;
9. Post, upload, email, transmit or otherwise distribute viruses or other harmful computer code designed to interrupt, destroy or limit the use of any computer software or hardware;
10. Harvest or otherwise collect information about others, including email addresses;
11. Allow any other person or entity to use your identification for posting or viewing comments;
12. Interfere with or disrupt a Community and Communication Service or computers, networks or other hardware connected to a Community and Communication Service, or disregard any requirements or policies of networks connected to a Community and Communication Service;

13. Engage in any other conduct that restricts or inhibits any other person from using or enjoying a Community and Communication Service, or which, in our sole judgment, exposes us or our customers or suppliers to any liability or detriment of any type;
14. Fail to respect other users' privacy. This includes revealing another user's password, phone number, address, instant messenger I.D. or address or any other personally identifiable information;
15. Create member names, or post solicit or send messages, text or photographs that are sexually explicit, that denigrate, threaten, abuse or harm others in any way; or

We may (but are not obligated) do any or all of the following without notice:

1. Record or pre-screen the dialogue in a public chat room;
2. Investigate an allegation that a communication does not conform to the terms of this section and determine in our sole discretion to remove or request the removal of the Content;
3. Remove Content which is abusive, objectionable, illegal, or disruptive, or that otherwise fails to conform with these Terms of Use;
4. Terminate your access to any or all Community and Communication Services upon our determination that you have violated these Terms of Use; or
5. Edit Content.

You agree that you must evaluate, and bear all risks associated with, the use of any Content, including any reliance on the accuracy, completeness, or usefulness of such Content. You acknowledge, consent and agree that we may investigate your use of a Community and Communication Service in order to determine whether a violation of the Terms of Use has occurred or to comply with any applicable law, regulation, governmental request or legal process.

You agree and acknowledge that the processing and transmission of a Community and Communication Service, including your Content, may involve transmissions over various networks and devices and necessary modifications as required for such transmissions.

Information that You Provide to the Services

When you submit information to areas of the Services that are publicly available, you give us an irrevocable, perpetual license to use, reproduce, modify, adapt, publicly perform and publicly display that information in connection with the Services. For example, if you post a comment to Medscape Connect, you grant us the right to display that comment through the Services for as long as we want. We will consider requests to remove information that you make publicly available through the Services on an individual basis (contact us at the email address we provide at the end of this document). For information that you submit to areas of the Services that are not publicly available, please see our Privacy Policy for an explanation of how we use that information and your rights to change or delete it. We provide the link to our privacy policy later in this document. We ask that you not post any messages with misleading, false, or inappropriate language or statements. We reserve the right to remove any content that we deem offensive or fraudulent at any time without your consent, as further described below. We cannot and do not assume any responsibility or liability for any information you submit in connection with the Services, or your or third parties' use or misuse of information transmitted or received using the Services.

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Your correspondence or business dealings with, or participation in promotions of, advertisers found on or through the Services, including requests for and delivery of goods or services, and any other terms, conditions, warranties or representations associated with such dealings, are solely between you and such advertiser. You agree that we shall not be responsible or liable for any loss or damage of any sort incurred as the result of any such dealings or as the result of the presence of such advertisers on the Services.

Privacy Policy

The purpose of our privacy policy is to identify the information we may collect about you when you use the Professional Sites and related Services and describe the uses we may make of such information, the security measures we take to protect it, and your options for controlling such information. You can review our privacy policy at http://www.medscape.com/public/privacy.

Laws that Govern this Agreement

We control those components of the Services made available through our respective websites from our offices within the state of New York in the United States of America. The Services can be accessed from any of the United States and from other countries worldwide. Since the laws of each State or country able to access the Services may differ, by accessing the Services, you agree that the statutes and laws of the state of New York, without regard to choice of laws principles, will apply to all matters relating to use of the Services. No waiver of any of these Terms and Conditions shall be deemed a further or continuing waiver of such term or condition or any other term or condition. We make no representation that materials made available through the Services are appropriate or available for use in other locations, and accessing them from territories where their contents are illegal is prohibited. If you access the Services from outside the United States, you are responsible for compliance with the laws of your jurisdiction.

The following provisions survive the expiration or termination of these Terms of Use for any reason whatsoever: Liability, Member Conduct, Proprietary Rights, Indemnity, Laws that Govern this agreement and Consequences.

Consequences

We may also take any legal action we think is appropriate. If your violation of these Terms of Use causes harm to others, you agree to hold us and our affiliates harmless against any liability for that harm. If there is any dispute between us concerning these Terms of Use or your use of the Services, you agree to submit the dispute to non-binding mediation, followed by binding arbitration. Both

the mediation and the arbitration will be governed under the rules of the American Arbitration Association, and the venue for the arbitration will be New York.

Termination and Modification

You agree that we may, *under certain circumstances and without prior notice*, discontinue, temporarily or permanently, the Services (or any part thereof) or eliminate your account, any associated email address, and remove any information you uploaded or provided to the Services with or without notice. Cause for termination shall include, but not be limited to, (a) breaches or violations of these Terms of Use or other incorporated agreements or guidelines, (b) requests by law enforcement or other government agencies, (c) a request by you (self-initiated account deletions), (d) discontinuance or material modification to the Services (or any part thereof), (e) unexpected technical or security issues or problems, (f) extended periods of inactivity, and/or (g) your engagement in fraudulent or illegal activities. You agree that all terminations for cause shall be made at our sole discretion, and we shall not be liable to you or any third party for any termination of your account, any associated email address, or access to the Services or any portion thereof.

Liability

Your use of the Services is at your own risk. The Services and information included therein are provided on an "as is" basis. WE AND OUR LICENSORS AND SUPPLIERS, TO THE FULLEST EXTENT PERMITTED BY LAW, DISCLAIM ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT OF THIRD PARTIES' RIGHTS, AND FITNESS FOR PARTICULAR PURPOSE. Without limiting the foregoing, we, our licensors, and our suppliers make no representations or warranties about the following:

1. The accuracy, reliability, completeness, currentness, or timeliness of the Services or information contained therein.
2. The satisfaction of any government regulations requiring disclosure of information on prescription drug products or the approval or compliance of any software tools available through the Services.

In no event will we, our licensors, our suppliers, or any third parties mentioned on any Professional Site be liable for any damages (including, without limitation, incidental and consequential damages, personal injury/wrongful death, lost profits, or damages resulting from lost data or business interruption) resulting from the use of or inability to use the Services or information contained therein, whether based on warranty, contract, tort, or any other legal theory, and whether or not we, our licensors, ours suppliers, or any third parties mentioned with the Services are advised of the possibility of such damages. We, our licensors, our suppliers, or any third parties mentioned within the Services shall be liable only to the extent of actual damages incurred by you, not to exceed U.S. $1000. We, our licensors, our suppliers, or any third parties mentioned within the Services are not liable for any personal injury, including death, caused by your use or misuse of the Services or any information contained therein. Any claims arising in connection with your use of the Services must be brought within one (1) year of the date of the event giving rise to such action occurred. Remedies under these Terms of Use are exclusive and are limited to those expressly provided for in these Terms of Use.

Indemnity

You agree to defend, indemnify, and hold each of us and our respective officers, directors, employees, agents, licensors, and suppliers, harmless from and against any claims, actions or demands, liabilities and settlements including without limitation, reasonable legal and accounting fees, resulting from, or alleged to result from, your violation of these Terms of Use.

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If you believe any materials accessible on or from the Services infringe your copyright, you may request removal of those materials (or access thereto) from the Services by contacting Medscape Customer Support at MedscapeCustomerSupport@webmd.net and providing the following information:

1. Identification of the copyrighted work that you believe to be infringed. Please describe the work, and where possible include a copy or the location (e.g., URL) of an authorized version of the work.
2. Identification of the material that you believe to be infringing and its location. Please describe the material, and provide us with its URL or any other pertinent information that will allow us to locate the material.
3. Your name, address, telephone number and (if available) e-mail address.
4. A statement that you have a good faith belief that the complained of use of the materials is not authorized by the copyright owner, its agent, or the law.
5. A statement that the information that you have supplied is accurate, and indicating that "under penalty of perjury," you are the copyright owner or are authorized to act on the copyright owner's behalf.
6. A signature or the electronic equivalent from the copyright holder or authorized representative.

In an effort to protect the rights of copyright owners, we maintain a policy for the termination, in appropriate circumstances, of subscribers and account holders who are repeat infringers.

Complete Agreement

Except as expressly provided in a particular "legal notice" on the website, these Terms of Use constitutes the entire agreement between you, WebMD and Medscape with respect to your use (and prior use) of the Services.

Questions or Concerns about Our Terms of Use

For questions or concerns about these terms of use, please send an email to MedscapeCustomerSupport@webmd.net