FIT Board Review Corner – August 2017

Welcome to the FIT Board Review Corner, prepared by Tammy Peng, MD, and Amar Dixit, MD, senior and junior representatives of ACAAI's Fellows-In-Training (FITs) to the Board of Regents. The FIT Board Review Corner is an opportunity to help hone your Board preparedness.

Review Questions

Allergy and Immunology Review Corner: Middleton’s Allergy Principles and Practice, 8th Edition
N. Franklin Adkinson Jr., MD, Bruce S Bochner, MD, A Wesley Burks, MD, William W Busse, MD, Stephen T Holgate, MD, DSc, FMedSci, Robert F Lemanske, Jr., MD and Robyn E O’Hehir, FRACP, PhD, FRCPath

Chapter 40 (pages 640-651): The Nose and Control of Nasal Airflow
Prepared by: Dr. Kristen Dazy

1. The growth of the nasal airway is formed from which primal embryonic germ layer?
   a. Ectoderm
   b. Mesoderm
   c. Endoderm
   d. Neural crest

2. Which gas is produced in high concentration by human paranasal sinuses and is responsible for antimicrobial and vasodilatory activity in the nasal airway?
   a. Oxygen
   b. Carbon dioxide
   c. Nitric oxide
   d. Helium

3. What type of epithelium can be found in the nasal vestibule and nasopharynx?
   a. Olfactory epithelium
   b. Simple squamous epithelium
   c. Stratified squamous epithelium
   d. Pseudostratified ciliated columnar epithelium

4. Which cranial nerve is responsible for nasal sensation of airflow?
   a. Olfactory nerve (CN I)
   b. Trigeminal nerve (CN V)
   c. Facial nerve (CN VII)
   d. Vestibulocochlear nerve (CN VIII)
5. Which of the following is the primary regulator of nasal airway resistance?
   a. Nasal vestibule
   b. Nasal valve
   c. Nasal septum
   d. Inferior turbinate

6. Nasal resistance is highest at which point in time?
   a. Age 0-12 months
   b. Age 3-12 years
   c. Age 13-25 years
   d. Age 26-75 years

7. The spontaneous and often reciprocal changes in unilateral nasal airflow, commonly referred to as the nasal cycle, is associated with which of the following?
   a. Parasympathetic nervous system
   b. Nasal chemosensors
   c. Airway humidification
   d. Nasal venous sinuses

8. Which of the following would be expected to decrease nasal resistance to airflow?
   a. Movement from an erect to supine position
   b. Movement to a lateral recumbent position
   c. Exercise
   d. Hyperventilation

9. Which histamine receptor(s) mediate the effects of histamine on the human nose?
   a. H1 receptor
   b. H2 receptor
   c. H3 receptor
   d. Both A & B

10. Which of the following treatments would be most effective in reducing nasal airway resistance associated with nasal challenge in grass pollen allergic patients?
    a. H1 antihistamine (oral)
    b. H1 antihistamine (topical)
    c. Intranasal corticosteroids
    d. Bradykinin antagonist
Answers

   The growth of the nasal airway is preceded by the formation of an olfactory placode from ectoderm in the 5-mm embryo.

   Nitric oxide (NO) is produced continuously by an inducible NO synthase expressed in healthy sinus epithelium. High levels of NO in the sinuses can defend against infection whereas reduced NO production can increase susceptibility to sinus infections. NO is inhaled with every breath and acts as an “aerocrine” hormone to enhance pulmonary oxygen uptake and reduce pulmonary vascular resistance.

   The nasal vestibule and nasopharynx is lined with a stratified squamous epithelium similar to that of the facial skin. Posterior to the nasal vestibule, the skin gradually changes into a ciliated respiratory epithelium. The typical respiratory epithelium is a pseudostratified ciliated columnar type that rests on a continuous basement membrane. Specialized olfactory epithelium with ciliated receptor cells is found in the olfactory area.

   Sensory innervation to the nose is supplied mainly by the olfactory and trigeminal nerves. Olfactory nerves enter the nose through the cribriform plate and form a distinct olfactory area. The majority of the sensory nerves to the nasal epithelium and nasal vestibule are supplied by two branches of the trigeminal nerve, the ophthalmic and maxillary nerves. The trigeminal nerves provide the sensations of touch, pain, hot, cold, and itch, as well as the sensation of nasal airflow which is perceived as a cool sensation upon inspiration.

5. B, page 645, Figure 40-3.
   Nasal airway resistance is regulated at the level of the nasal valve (also the narrowest point of the nasal passageway). The nasal valve is a dynamic structure and is controlled by swelling and construction of the venous sinuses of the inferior turbinate and nasal septum. Overall, nasal airway resistance has 4 components: the nasal vestibule, the bony entrance of the nasal cavum, the erectile tissue of the inferior turbinate, and the nasal septum.
6. A, page 646.
Nasal resistance is at a maximum during infancy. Many infants are described to be “obligatory nasal breathers” during the first few months of life, and therefore nasal obstruction in infancy can cause distress and may also disturb suckling and growth. In general, nasal resistance declines to the adult value by 16-18 years of age and then shows a slow decline with increasing age.

The term nasal cycle describes the spontaneous and often reciprocal changes in unilateral nasal airflow that are associated with congestion and decongestion of the nasal venous sinuses which are under the influence of the sympathetic nervous system. Nasal chemosensors and airway humidification are general functions of the nose, but do not directly influence the direction of nasal airflow (pages 644-645).

Exercise causes a generalized increase in sympathetic nervous activity with an increase in heart rate, bronchodilation and decreased nasal resistance to airflow. Answer choices A, B, and D all result in increased nasal airway resistance.

Histamine is a potent vasodilator which influences nasal airflow by causing congestion of the nasal venous sinuses. The effects of histamine are mediated by H1 and H2 receptors. Both are involved in the dilation of the venous sinuses, but only the H1 receptors are involved in sneezing, itching and hypersecretion. Thus, this may explain why H1 antihistamines are relatively ineffective in treating nasal congestion associated with nasal allergy and histamine challenge.

Unlike the H1 antihistamines which have a small effect on nasal congestion, intranasal corticosteroids are thought to provide relief of the symptom of nasal congestion associated with allergic rhinitis and has been shown to be effective in reducing the increased airway resistance that is associated with nasal challenge using grass pollen in allergic patients. Although bradykinin would also have an effect on nasal blood vessels and sensory nerves, no suitable antagonist has yet to be discovered.