Respiratory system

function — transport air into lungs and to facilitate diffusion of oxygen into blood stream; phonation; thermoregulation

division

1/ upper respiratory tract
- nasal sinuses
- nasal cavity
- pharynx (part of digestive system, functionally inserted in respiratory system)

2/ lower respiratory tract
- larynx
- trachea
- bronchi

3/ proper respiratory organs
- lungs

Paranasal sinuses

1/ maxillary sinus
2/ frontal sinus
3/ ethmoidal sinuses:
- anterior air cells
- middle air cells
- posterior air cells

4/ sphenoidal sinus

External nose

pyramid-shaped

outer features — root of nose, dorsum of nose, tip of nose (apex nasi), wings of nose, nares (nostrils)

bony framework — piriform aperture:
- nasal bones
- frontal processes of maxillae
- nasal notches of bodies of maxillae

cartilages — lateral nasal cartilages
- major alar cartilages – medial and lateral crura
- minor alar cartilages
- accessory nasal cartilages
- vomeronasal cartilage

Nasal cavity

is divided into two halves by nasal septum

parts
1/ nasal vestibule
2/ proper nasal cavity
limen nasi – border between them

inner features
1/ superior nasal concha – part of ethmoidal bone
superior nasal meatus – sphenoethmoidal recess
here is opening of: posterior air cells
sphenoidal sinus
2/ middle nasal concha – part of ethmoidal bone
middle nasal meatus – ethmoidal bulla, semilunar hiatus, frontoethmoidal infundibulum

here is opening of: maxillary sinus
frontal sinus
anterior air cells
middle air cells

3/ inferior nasal concha – separate bone
inferior nasal meatus – opening of nasolacrimal duct

common nasal meatus – along nasal septum
interconnects superior, middle, and inferior nasal meatus
nasopharyngeal meatus – behind nasal conchae
common opening of superior, middle, and inferior nasal meatus

Nasal septum
parts

1/ bony part – vomer and perpendicular plate of ethmoidal bone
2/ cartilaginous part – septal nasal cartilage
3/ membranous part – fibrous tissue
cutaneous part – skin

Pharynx
parts

extends from base of cranium to level of cricoid cartilage (C6 vertebra)
1/ nasal part of pharynx (nasopharynx)
functionally is inserted in respiratory system
at level of C1 - C2 vertebrae
opens into nasal cavity through choanae
structures: pharyngobasilar fascia, fornix of pharynx – pharyngeal tonsil (adenoids), pharyngeal recess, pharyngeal opening of auditory (Eustachian) tube, torus tubarius – tubal tonsil, torus levatorius, salpingopharyngeal fold, salpingopalatine fold

2/ oral part of pharynx (oropharynx)
functionally is inserted in respiratory and digestive systems
at level of C2 - C4 vertebrae
opens into oral cavity through isthmus of fauces
structures: isthmus of fauces (oropharyngeal isthmus), median and lateral glossoepiglottic folds, epiglottic valleculae

3/ laryngeal part (laryngopharynx)
at level of C4 - C6 vertebrae
opens into larynx through laryngeal inlet
structures: laryngeal inlet – epiglottis, aryepiglottic folds, cuneiform tubercles, corniculate tubercles, interarytenoid notch

Larynx
Cartilages

1/ unpaired cartilages:
thyroid cartilage – laryngeal prominence, left and right lamina, superior and inferior thyroid notches, superior and inferior horns, oblique line
cricoid cartilage – arch, lamina (arytenoid and thyroid articular facets)
epiglottis – lamina, petiolus

2/ paired cartilages:
arytenoid cartilage – apex, base (muscular and vocal processes),
corniculate cartilage
cuneiform cartilage
triticeal cartilage – in lateral thyrohyoid lig.

Connections

1/ fibrous joints (syndesmoses)
- extrinsic ligaments:
  - thyrohyoid membrane – reinforced by median and lateral thyrohyoid ligg.
  - cricothyroid lig. – continues laterally as conus elasticus
  - cricotracheal lig.
- intrinsic ligaments:
  - vestibular ligg. – false vocal cords, covered by mucosa form vestibular folds
  - vocal ligg. – true vocal cords, medially covered by mucosa, laterally are surrounded by vocalis m., form vocal folds,
  - fibroelastic membrane of larynx – membrane from dense elastic fibernet which lies below mucous membrane of larynx
    - 2 parts:
    - quadrangular membrane – upper part, between laryngeal inlet and vestibular ligg.
    - conus elasticus – lower part, below vocal ligg. lateral continuation of cricothyroid lig.

2/ synovial joints
- cricothyroid joint
- cricoarytenoid joint

Laryngeal cavity

parts:
1/ vestibule of larynx – between laryngeal inlet and vestibular folds
2/ ventricle of larynx – slit between vestibular and vocal folds
3/ infraglottic cavity – between vocal folds and cricoid cartilage

Muscles of larynx

1/ ventral group: cricothyroid m. – straight and oblique parts
- stretches vocal cord, innervation: superior laryngeal n.

2/ dorsal group:
- posterior cricoarytaenoid m. (posticus m.) – widens rima glottidis
- arytenoid m. – assists in constricting of rima glottidis
- aryepiglottic m. – assists in narrowing of laryngel inlet

3/ lateral group:
- lateral cricoarytaenoid m. – narrows rima glottidis
- thyroarytenoid m. – narrows rima glottidis
- thyroepiglottic m. – widens laryngeal inlet

dorsal and lateral groups are innervated by recurrent laryngeal n.

Glottis

from rima vestibuli (which is between vestibular folds)
to rima glottidis (which is between vocal folds)

Trachea

extends from C6 to Th4-Th5 vertebrae
at level of Th4 -Th5 – bifurcation of trachea (inside: carina of trachea)
15-20 tracheal cartilages – connected by annular ligg.
dorsal wall of trachea is membranous = membranaceous wall

parts

1/ cervical part
2/ thoracic part – in superior mediastinum

around bifurcation of trachea:
right and left superior tracheobronchial lnn.
inferior tracheobronchial lnn.

Bronchi

1. right principal (main, primary) bronchus – shorter, wider and more vertical than left principal bronchus
   division:
   1/ superior lobar bronchus – divided into 3 segmental bronchi
   2/ middle lobar bronchus – divided into 2 segmental bronchi
   3/ inferior lobar bronchus – divided into 5 segmental bronchi

2. left principal (main, primary) bronchus – longer, narrower, and more horizontal than right principal bronchus
   division:
   1/ superior lobar bronchus – divided into 5 segmental bronchi
   2/ inferior lobar bronchus – divided into 5 segmental bronchi

Lungs

external features

common features of right and left lungs:
apex, base
costal, diaphragmatic, medial surface (mediastinal and vertebral)
anterior, inferior, posterior margins
root of lung, hilum of lung,
pulmonary lig. (fused sheet of parietal and visceral pleura)
oblique fissure
interlobar surfaces

differences between right and left lung:
1/ right lung
3 lobes: upper, middle, lower lobes
horizontal fissure – between upper and middle lobes
in right hilum: right principal bronchus (epiarterial)
right pulmonary a. – caudally
right pulmonary vv. – ventrocaudally

2/ left lung
2 lobes: upper and lower lobes
cardiac notch – anterior margin
lingula of left lung – upper lobe
in left hilum: left pulmonary a. – superiorly
left principal bronchus (hyparterial)
left pulmonary vv. – ventrocaudally

impressions

1/ right lung
impression for 1st rib
cardiac impression
sulcus for superior v. cava
sulcus for subclavian a.
sulcus for esophagus
sulcus for azygos v.

2/ left lung:
impression for 1st rib
cardiac impression
impression for esophagus
sulcus for left brachiocephalic v.
sulcus for subclavian a.
sulcus for aorta

Blood circulations

1/ functional – respiratory gas exchange
pulmonary aa. and pulmonary vv.

2/ nutritive – for lung tissue and bronchi
bronchial br. from: thoracic aorta, aortic arch,
3rd and 4th right posterior intercostal aa.
bronchial vv. to azygos and hemiazygos vv.

Pleura

1/ parietal pleura
covers internal surface of thoracic wall
costal, mediastinal, and diaphragmatic
pleural cupula = dome –5 cm above superior thoracic aperture
costodiaphragmatic and costomediastinal recesses
sensitive innervation by intercostal and phrenic nn.

2/ visceral pleura
forms tight cover over lungs
autonomic innervation by vagus n. and sympathetic trunk

Between parietal and visceral pleura is pleural cavity filled by pleural liquor.