Development of Head and Neck

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Content

I. Origin and development of the pharyngeal (branchial) apparatus

II. Development of the face

III. Development of the palate

IV. Development of the tongue

V. Development of the thyroid gland

Summary
1. Origin of the Pharyngeal Apparatus
1. Origin of the Pharyngeal Apparatus

Origin and development

Neural crest cells
1. Origin of the Pharyngeal Apparatus

Appears:
4-5\textsuperscript{th} week

Disappears:
by the end of
6\textsuperscript{th} week.
1. Origin of the Pharyngeal Apparatus

- Arches
- Grooves
- Pouches
- Membranes
the Pharyngeal Apparatus include:

1) pharyngeal arches
2) pharyngeal grooves
3) pharyngeal membranes
4) pharyngeal pouches
2. Development of the Pharyngeal Apparatus

1) Fate of pharyngeal arches

① 1st arch

- maxillary process (prominence)
- mandibular process (prominence)

→ Face

(remains of the mandibular arch)
(2) 2\textsuperscript{nd} arch: hyoid arch $\rightarrow$ Neck
i Derivatives of the pharyngeal arch cartilages
Derivatives of the pharyngeal arch muscles

1st arch → mastication  2nd arch → facial expression
iii The cranial nerves supplying the pharyngeal arches

1st: CN V
2nd: CN VII
3rd: CN IX
4th: CN X
2) Fate of pharyngeal grooves and membrane

① 1st groove → the external auditory meatus
1st membrane → tympanic membrane
2) Fate of pharyngeal grooves

2\text{nd}, 3\text{rd}, 4\text{th} groove $\rightarrow$ cervical sinus $\rightarrow$ degeneration

2\text{nd}, 3\text{rd}, 4\text{th} membrane $\rightarrow$ degeneration
Branchial sinuses, cysts & fistula

**Cause:** Failure of closure of cervical sinus, may connect to surface and/or pharynx;

**Sites:** Cyst or orifice on lateral side of neck along anterior border of sternocleidomastoid muscle.
Congenital Abnormalities

- Branchial cyst
Congenital Abnormalities

- Branchial sinus
Congenital Abnormalities

- Branchial fistula
First arch syndrome

**Cause:** abnormal development of the first arch
3) Fate of pharyngeal pouches

① 1st pouch → tubotympanic recess

- distal portion
- proximal portion

- primitive tympanic cavity
- auditory tube
Origin and development

② 2nd pouch → palatine tonsil
Origin and development

3rd pouch

- dorsal portion
  - inferior parathyroid gland
- ventral portion
  - thymus
Origin and development

4th pouch
- dorsal portion
- ventral portion
  - superior parathyroid gland
  - ultimobranchial body

5th pouch
- parafollicular cells
DiGeorge syndrome
congenital thymus aplasia
absence of parathyroid gland
Ectopic parathyroid gland
Time: 4-8W

1. Primordia: 5 prominences around stomodeum

- Single frontonasal prominence
- Paired maxillary prominences
- Paired mandibular prominences
2. Development:

1) Mandibular prominences → lower jaw and lip

2) Maxillary prominence → cheek and lateral upper lip

3) Frontonasal prominence
   ① upper part → forehead
   ② lower part → nasal placode →
      \{ medial nasal prominence
      nasal pits
      lateral nasal prominence \}

- 28 days
- 40 days
- 14 weeks
Development of the face

a. medial nasal prominences → fuse → nasal septum & apex
   → philtrum

maxillary prominence
   → fuse

b. lateral nasal prominence → alae, lateral wall of nose
   → nasolacrimal groove
   → nasolacrimal duct

c. nasal pit → nasal cavity
Development of the face

4) Stomodeum → oral cavity
   nasal sac → nasal cavity
Cleft lip
division of lip, unilateral or bilateral
- failure of maxillary prominence to fuse with medial nasal prominence on the affected side
Congenital Abnormalities

➢ Cleft lip
Congenital Abnormalities

- Oblique facial cleft division extending from the upper lip to medial margin of orbit
  - failure of maxillary prominence to fuse with lateral nasal prominence on the same side.
Congenital Abnormalities
Primordia: ~ 5-12W

medial nasal prominences →

intermaxillary segment →

1 median palatine process

(primary palate)

(anterior to the incisive fossa)

nasal septum
Development of the palate

Primordia: ~ 5-12W

maxillary prominence

2 lateral palatine processes

(secondary palate)

(posterior to the incisive fossa)
Development of the palate

Primordia: ~ 5-12W

1 median palatine process (primary palate) (anterior to the incisive fossa)
2 lateral palatine processes (secondary palate) (posterior to the incisive fossa)

medial nasal prominences → intermaxillary segment → maxillary prominence

fuse → palate
Development of the palate

- Developing gum
- Developing upper lip
- Site of future fusion
- Labiogingival lamina
- Lateral palatine process
- Nasal septum
- Labiogingival groove
- Median palatine process
- Lateral palatine process
- Nasal septum
- Philtrum
- Gum
- Primary palate
- Secondary palate
- Lateral palatine process
- Frenulum of lip
- Incisive papilla
- Hard palate
- Upper lip
- Gum
- Palatine raphe
- Soft palate
- Uvula
Development of the palate

C
- Olfactory nerves
- Eye
- Nasal septum
- Maxillary prominence
- Tongue
- Mandibular prominence
- Lateral palatine process

E
- Nasal conchae
- Oral cavity
- Nasal cavity
- Mandible
- Meckel cartilage
- Nasal septum
- Bone developing in maxillary prominence
- Lateral palatine process

G
- Nasal septum
- Bone developing in maxilla
- Fused lateral palatine processes
- Tongue
Cleft palate
unilateral or bilateral, complete or incomplete, with or without cleft lip.
- failure of lateral palatine process to fuse with each other or with median palatine process.
Primordium: \( \sim 4W \)

1\(^{st}\) arch

- 2 distal tongue bud (lateral lingual swelling)
- 1 median tongue bud (tuberculum impar)

2\(^{nd}\) arch \(\rightarrow\) copula

3\(^{rd}\) & 4\(^{th}\) arch \(\rightarrow\) hypobranchial eminence
Development of the tongue

Primordium: ~ 4W

1\textsuperscript{st} arch → \{ 2 distal tongue bud \quad \text{fuse} \quad \text{median sulcus} \\
\quad \text{(lateral lingual swelling)} \downarrow \text{overgrowing} \quad \text{oral part} \}

1 median tongue bud \quad \text{overgrowing} \quad \text{oral part}

1\textsuperscript{st} arch \quad \text{CN V}

2\textsuperscript{nd} arch → \copula

2\textsuperscript{nd} arch \quad \text{CN VII}

3\textsuperscript{rd} & 4\textsuperscript{th} arch \quad \text{CN IX, X}

foramen cecum

overgrowing \quad \text{pharyngeal part}

hypobranchial eminence
Development of the tongue
Development of the thyroid gland

Primordium: day 24

Foramen cecum

median endodermal thickening

thyroid diverticulum

descending thyroglossal duct

thyroid gland 7 W
Congenital Abnormalities

- Thyroglossal duct cysts and sinuses

  - Median location
Congenital Abnormalities

- Ectopic thyroid gland