MEDICAL EDUCATION RESOURCE

Surface Marking and Radiological Anatomy

Introduction

Surface marking helps identify underlying anatomical structures through external landmarks, assisting in examination, clinical diagnosis and surgical procedures. Radiological anatomy correlates these landmarks with imaging, improving interpretation of X-rays, CT, and MRI.

Surface Landmarks

These are palpable or easily visible points on the face, head, and neck, used to project deeper structures.

Landmarks on the Face

(Information taken from the section beginning at L38–L41 of the retrieved document)

• **Frontozygomatic suture** – felt as a depression at the upper lateral orbital margin.
• **Infraorbital margin** – sharp border below the orbit, useful for nerve block positioning.
• **Zygomatic arch** – easily felt; marks the position of the temporalis muscle and its fascia.
• **Mandibular notch** – felt as a curved depression between the condylar and coronoid processes; used to locate masseteric nerve entry.
• **Jugal point** – anterior end of the upper border of zygomatic arch; an orientation point for fractures.

Landmarks of the Lateral Side of the Head

(Information supported by L41–L42 and additional parts of file result 1)

• **Marginal tubercle of the zygoma** – projects along the frontal process of the zygomatic bone, used in surgical approaches.

• **Pterion** – junction of frontal, parietal, temporal and sphenoid bones; thinnest part of skull, overlies middle meningeal artery.
• **Frankfurt plane** – line from infraorbital margin to external acoustic meatus; standard anthropometric reference.
• **Mandibular notch and neck of mandible** – visible and palpable during intraoral nerve blocks and maxillofacial examination.

Landmarks on the Side of the Neck

(Supported by L43–L44 and elaborated using the content in file result 1 under “Landmarks on Anterior Aspect of Neck”)

• **Mandible** – lower border forms base of the face; angle of mandible helps assess facial nerve injury or swelling.
• **Hyoid bone** – felt just above the thyroid cartilage; used to assess swallowing and floor of mouth pathology.
• **Thyroid cartilage** – prominent "Adam’s apple”; key guide to laryngeal structures.
• **Cricoid cartilage** – felt as a complete ring below thyroid cartilage; landmark for emergency airway access (cricothyrotomy).
• **Tracheal rings** – palpable in the midline; deviation suggests mediastinal shift.
• **Sternocleidomastoid muscle** – defines anterior and posterior triangles of the neck; guides identification of major vessels and nerves.

LANDMARKS ON THE ANTERIOR ASPECT OF THE NECK

• **Mandible**
The lower border of the mandible forms the base of the face. The angle of the mandible lies opposite the second cervical vertebra. The mental protuberance forms the chin.

• **Hyoid Bone**
Located in the midline just above the thyroid cartilage. It moves upwards during swallowing.

• **Thyroid Cartilage**

Forms the prominent *laryngeal prominence (Adam's apple)*. More prominent in males.

• **Cricothyroid Membrane**

A soft interval between the thyroid and cricoid cartilages. Important for emergency cricothyrotomy.

• **Cricoid Cartilage**

A complete ring of cartilage located below the thyroid cartilage. Serves as a key landmark for subglottic space and upper trachea.

• **Trachea**

Tracheal rings can be palpated in the midline. Deviation to either side indicates mediastinal shift.

• **Suprasternal Notch**

A depression between the medial ends of the clavicles. Used to identify tracheal deviation and measure jugular venous pressure.

OTHER IMPORTANT LANDMARKS

• **Frontozygomatic Suture**

Felt as a slight depression at the upper part of the lateral orbital margin.

• **Marginal Tubercle of Zygoma**

A small projection on the posterior border of the frontal process of the zygomatic bone.

• **Frankfurt Plane**

A reference plane used in skull orientation—extends from the infraorbital margin to the upper margin of the external acoustic meatus.

• **Jugal Point**

Represents the anterior end of the upper border of the zygomatic arch.

• **Mandibular Notch**

A curved depression between the condylar and coronoid processes of the mandible.

SURFACE MARKING OF VARIOUS STRUCTURES

The following structures are projected onto the skin surface using reliable anatomical planes and palpable points.

ARTERIES

Common Carotid Artery

• Draw a vertical line from the **sternoclavicular joint** to the **upper border of the thyroid cartilage**.
• The artery lies deep to the sternocleidomastoid along this line.

External Carotid Artery

• Begins at the upper border of the thyroid cartilage.
• Passes upward anterior to the ear.
• Ends behind the neck of the mandible by dividing into maxillary and superficial temporal arteries.

Facial Artery

• Starts at the **angle of the mandible**, just anterior to the masseter.
• Winds upward and medially across the face to the **corner of the mouth**, then to the **side of the nose**, and finally to the **medial canthus**.

Superficial Temporal Artery

• Mark a point just above the **tragus of the ear**.
• The artery then ascends vertically in front of the ear within the temporal region.

Occipital Artery

• Begins opposite the facial artery origin.
• Runs posteriorly toward the **mastoid region**, then ascends to the **occiput**.

Vertebral Artery (Cervical Part)

• Lies deep in the neck and not directly palpable.
• Projected from the **transverse process of C6** upward through the cervical transverse foramina to the foramen magnum.

VEINS / SINUSES (Surface Marking)

Internal Jugular Vein

• Begin at the **mastoid process**.
• Draw a straight line to the **sternoclavicular joint**.
• The vein lies deep to the sternocleidomastoid along this entire course.

External Jugular Vein

• Starts just **behind the angle of the mandible**.
• Runs obliquely across the sternocleidomastoid.
• Ends above the **middle of the clavicle**.

Anterior Jugular Vein

• Begins near the **midline below the chin**.
• Runs downward close to the midline and dips deep above the sternum.

Superior Sagittal Sinus (Surface Projection on Scalp)

• Mark a midline curve from the **glabella** to the **external occipital protuberance**.
• Lies deep to the sagittal suture.

Transverse Sinus

• Draw a horizontal line from the **inion** toward the **mastoid process** on each side.

Sigmoid Sinus

• Curves downward from the end of the transverse sinus to the **jugular foramen** behind the mastoid.

NERVES (Surface Marking)

Facial Nerve (Extracranial Course)

• Emerges at the **stylomastoid foramen** (just below and medial to the mastoid tip).
• Runs forward into the parotid gland, dividing into temporofacial and cervicofacial branches.

Accessory Nerve (Spinal Part)

• Appears at the **middle of the posterior border of sternocleidomastoid**.
• Crosses the posterior triangle obliquely to the **trapezius**.

Hypoglossal Nerve

• Mark a point midway between the **mastoid process** and **angle of mandible**.
• It curves forward across the carotid arteries and goes deep to the mylohyoid toward the tongue.

Lingual Nerve

• Courses below the **submandibular duct**, approaching the lateral tongue.
• Marked indirectly: below the mandible, near molar region inside oral cavity.

Infraorbital Nerve

• Emerges at the **infraorbital foramen**, one fingerbreadth below the infraorbital margin.

GLANDS (Surface Marking)

Parotid Gland

• Occupies the area:
– Between **zygomatic arch** and **angle of mandible**
– Anterior to the **mastoid process**
• Draw an inverted triangle covering this region.

Submandibular Gland

• Lies beneath the **mandibular body**.
• Mark the area in the submandibular fossa between the angle and chin.

Thyroid Gland

• Two lobes lie beside the trachea from the **5th cervical vertebra to 1st thoracic vertebra**.
• The isthmus crosses the **2nd–4th tracheal rings**.

Parathyroid Glands

• Small nodules located on the **posterior surface** of the thyroid lobes, near the middle and lower thirds.

PARANASAL SINUSES (Surface Marking)

Frontal Sinus

• Located above the **medial third of the supraorbital margin**.
• Usually marked as a rectangle above the eyebrows.

Maxillary Sinus

• Occupies the region of the **cheek**.
• Surface marking corresponds to an area bounded by the infraorbital margin above and the upper teeth below.

Ethmoidal Sinuses

• Lie deep between the medial orbit walls.
• Surface marking corresponds to the **medial canthus** region.

Sphenoidal Sinus

• Situated deep in the skull.
• Surface marking approximates to the area **deep behind the nasal root**.

RADIOLOGICAL ANATOMY (Overview)

Radiological anatomy defines how major bones, sinuses and foramina appear on standard X-ray views, helping correlate surface landmarks with imaging.

LATERAL VIEW OF SKULL (PLAIN SKIAGRAM)

Key structures visible:

- Frontal, parietal, occipital, temporal bones
- Sphenoid (greater and lesser wings)
- Sella turcica
- Frontal and maxillary sinuses
- Mastoid air cells
- Coronal and lambdoid sutures
- External acoustic meatus
- Mandible: ramus, angle, condyle, coronoid
- Zygomatic arch
- Cranial fossae outline
- Tip of the odontoid process

SPECIAL PA VIEW FOR PARANASAL SINUSES (Occipitofrontal / Waters / Caldwell Views)

Waters View (Occipitomental View)

- Best shows **maxillary sinuses**.
- Also visualizes orbital rims, nasal cavity, zygoma.

Caldwell View (Occipitofrontal View)

- Visualizes **frontal sinus and ethmoidal cells**.
- Petrous ridges appear in the lower orbit.

Submentovertical (SMV) View

- Shows **sphenoidal sinus**, zygomatic arches, and skull base.

CAROTID ANGIOGRAM (Key Features)

Internal Carotid Artery (ICA)

- Shows cervical, petrous, cavernous and cerebral parts.
- Carotid siphon appears as an S-shaped curve.

• Anterior and middle cerebral arteries branch in characteristic patterns.

External Carotid Artery (ECA)

• Shows branching into maxillary, superficial temporal, facial and lingual arteries.

Clinical Importance

• Identifies aneurysms, stenosis, arteriovenous malformations.
• Assesses collateral circulation in stroke.