ANATOMY · SKULL & DENTITION · ILLUSTRATED GUIDE

CANINE SKULL & DENTAL ANATOMY

Canine Skull & Dental Anatomy (PDF)

The skull bones in every view, the dog dental formula, Triadan numbering, tooth structure, eruption and the normal bite — with labelled atlas plates. Companion to the article at vet-ebooks.com.

Contents

The 11 sections of this guide, in order.

IN SHORT

Canine skull and dental anatomy makes far more sense once you see it as one system: a set of named bones that house and align the teeth, and a set of teeth built to grasp, shear and grind. This guide walks the **dog skull** bone by bone in every view, explains the three **skull shapes** and why they matter, and then works through the **dog dental formula**, the **Triadan numbering** vets use, the **structure of a tooth**, the eruption timeline and the normal bite — with labelled atlas plates throughout and a free **illustrated PDF** for the dissection room.

KEY POINTS

1. The skull is **two boxes joined by the face**: a rounded braincase (occipital, parietal, temporal, frontal, sphenoid, ethmoid) and the facial skeleton that carries the teeth (incisive, maxilla, nasal, palatine, mandible).
2. The **permanent dental formula is 2 × (I 3/3, C 1/1, P 4/4, M 2/3) = 42**; the deciduous formula is 2 × (I 3/3, C 1/1, P 3/3) = 28. **P1 and every molar have no deciduous precursor.**
3. The dog is a **secodont carnivore**: the **upper P4 and lower M1 carnassials** shear past each other like scissor blades. The upper P4 has **three roots** and is the strongest tooth of the upper jaw.
4. Every tooth is **enamel over the crown, cementum over the root, dentine in between and pulp in the centre**, held in its socket by the **periodontal ligament** (a gomphosis).
5. **Skull shape drives clinical risk:** brachycephalic dogs crowd and rotate their teeth and obstruct their airway (BOAS); dolichocephalic dogs have long noses and spaced teeth.
6. The bony **foramina are the nerve-block map** — infraorbital (maxillary block), mental (mental block) and mandibular (inferior alveolar block).

About the images

The labelled diagrams and dissection plates are reproduced for educational reference from *Miller and Evans' Anatomy of the Dog* (Evans HE, de Lahunta A, 5th ed.) and *Anatomy of the Dog* (Budras KD, McCarthy PH, Fricke W, Richter R, 5th ed.). Each figure is credited beneath it; copyright remains with the original authors and publishers.

This illustrated guide to **dog dental anatomy** and the **canine skull** works through the whole system — the bones of the **dog skull**, the **dog dental formula**, exactly how many teeth dogs have, the Triadan numbering vets use, the structure of a tooth and the normal bite. It is written for veterinary students and clinicians, with labelled atlas plates throughout and a free PDF, and it pairs with our whole-body Dog Anatomy guide.

01 The bones of the dog skull

The dog skull looks complicated because it is built from about **50 individual bones**, but almost all of them fall into two groups. The **braincase (neurocranium)** is the rounded box at the back that protects the brain and inner ear: the **occipital** bone around the foramen magnum, the paired **parietal** and **frontal** bones of the roof, the **temporal** bones housing the ear (their petrous part encloses the three middle-ear ossicles — malleus, incus and stapes — and the inner ear), and the **sphenoid** and **ethmoid** complexes on the floor and at the nose. The **facial skeleton (splanchnocranium)** is everything in front that carries the teeth and frames the nose and orbit: the **incisive** (premaxilla), **maxilla**, **nasal**, **lacrimal**, **zygomatic**, **palatine**, **pterygoid** and **vomer**, plus the mobile **mandible** and, slung beneath the skull, the **hyoid apparatus** — the U-shaped chain of small bones (basihyoid, thyrohyoid, ceratohyoid, epihyoid and stylohyoid) that suspends the tongue and larynx.

Rather than memorise 50 names, learn the skull one view at a time. In **lateral view** you can see how the facial bones tile forward from the braincase and how the **zygomatic arch** (zygomatic bone + zygomatic process of the temporal) forms the cheek. Colour-coding each bone, as in the plate below, makes the sutures obvious.

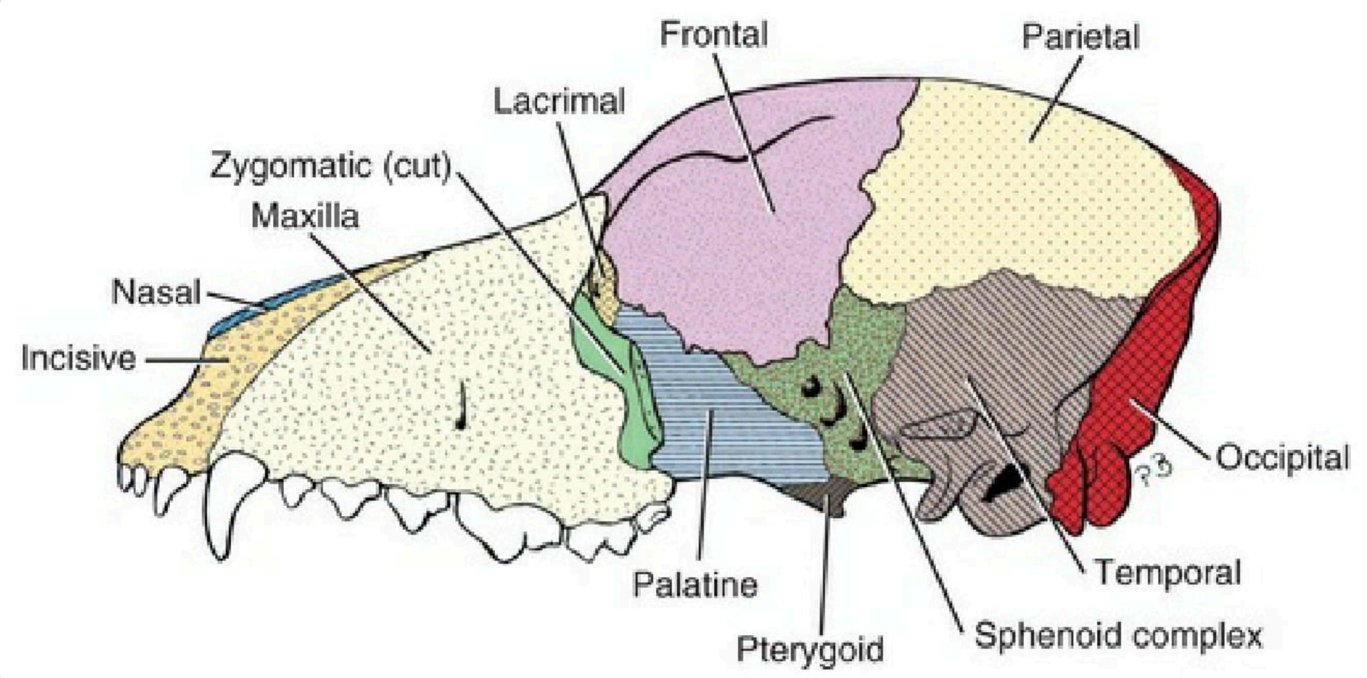

Fig 1 — The dog skull, lateral aspect. Each bone shaded and named: incisive and nasal at the front, the large maxilla carrying the cheek teeth, the frontal over the orbit, the parietal and occipital of the braincase, and the temporal, sphenoid, palatine and pterygoid deep to the zygomatic arch (here cut away).

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.3, bones of the skull, lateral aspect. Reproduced for educational reference.

The **dorsal view** shows the roof of the skull and the midline landmarks you palpate in a live dog: the **external sagittal crest** and **nuchal crest** (attachment for the temporalis and neck muscles), the **temporal fossa**, the **zygomatic processes** of the frontal and temporal bones that bound the orbit, and the **infraorbital foramen** — a key dental landmark.

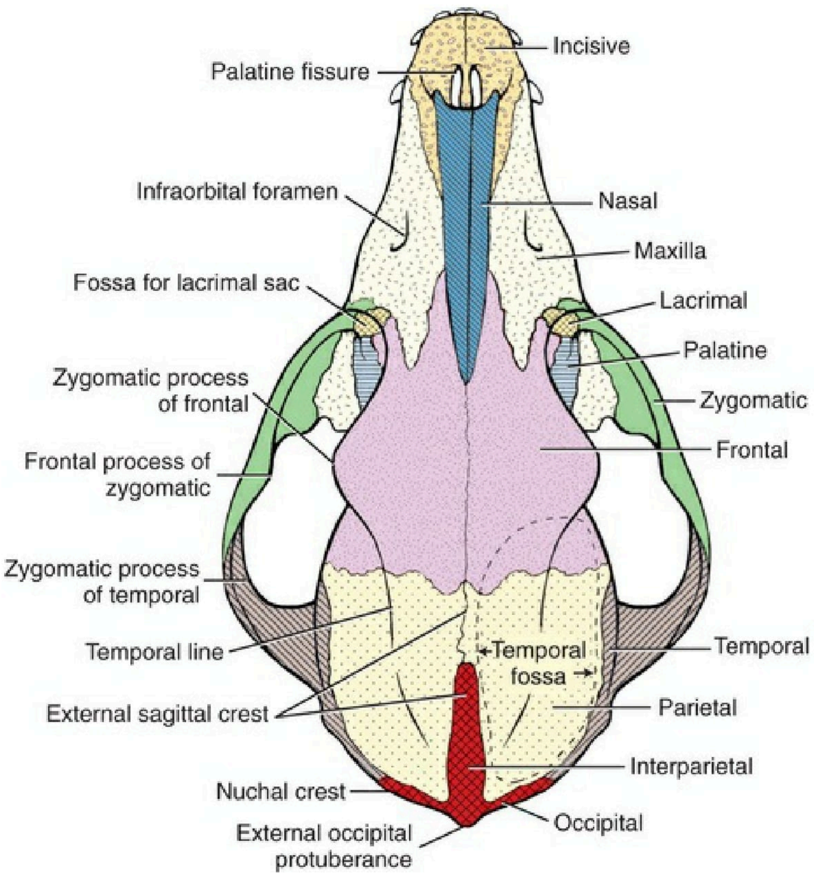

Fig 2 — The dog skull, dorsal aspect. The roof of the skull: the paired nasals over the nasal cavity, the maxilla and frontal, the temporal fossa and external sagittal crest for the jaw muscles, and the infraorbital foramen and palatine fissure at the front.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.4, bones of the skull, dorsal aspect. Reproduced for educational reference.

The **ventral view** is the one to know for the hard palate, the tooth rows and the base of the skull. The **palatine processes of the incisive, maxilla and palatine bones** form the bony hard palate; behind them lie the **choanae** (the openings into the pharynx), the **pterygoid** and **sphenoid** bones, the **tympanic bullae** and, at the very back, the **occipital condyles** and **foramen magnum**. The **oval foramen** here transmits the mandibular nerve.

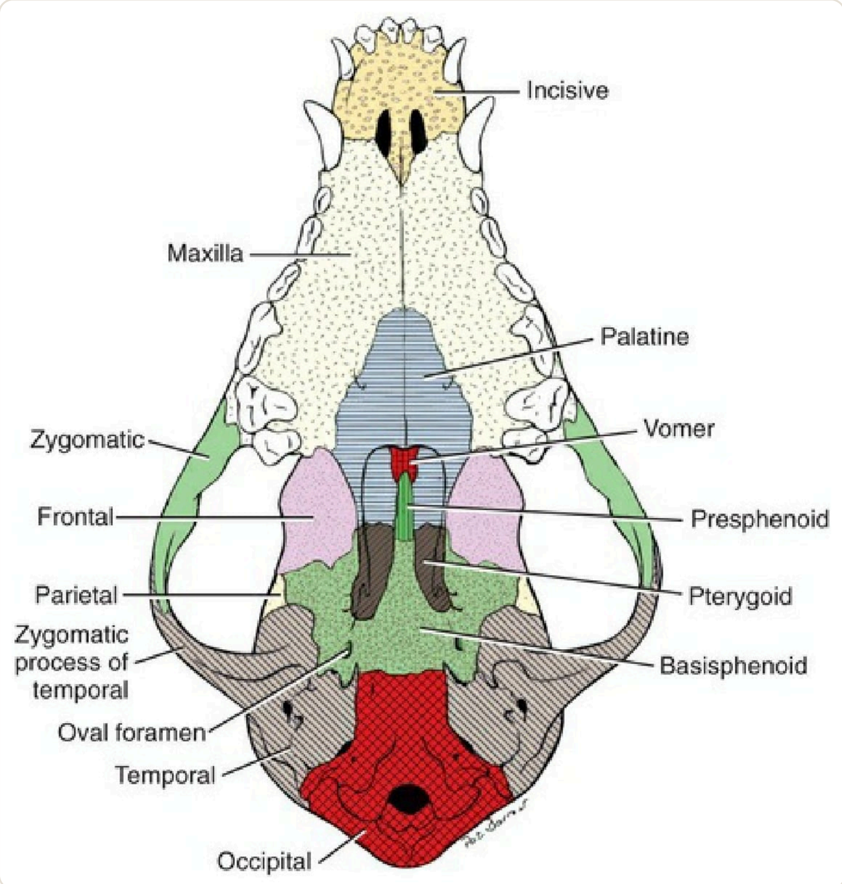

Fig 3 — The dog skull, ventral aspect. The bony palate formed by the incisive, maxilla and palatine bones, the vomer and presphenoid on the midline, the pterygoid and basisphenoid, and the occipital bone with its condyles and the oval foramen for the mandibular nerve.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.5, bones of the skull, ventral aspect. Reproduced for educational reference.

02 Inside the skull: sinuses & the key foramina

Cut the skull along the midline and its internal architecture appears. The nasal cavity is filled by the delicate scroll-like **ethmoturbinates**, walled off from the braincase by the perforated **cribriform plate of the ethmoid** (through which the olfactory nerves pass) and divided in the midline by the **perpendicular plate of the ethmoid** and the **vomer**. Behind sits the braincase proper, floored by the **sphenoid**.

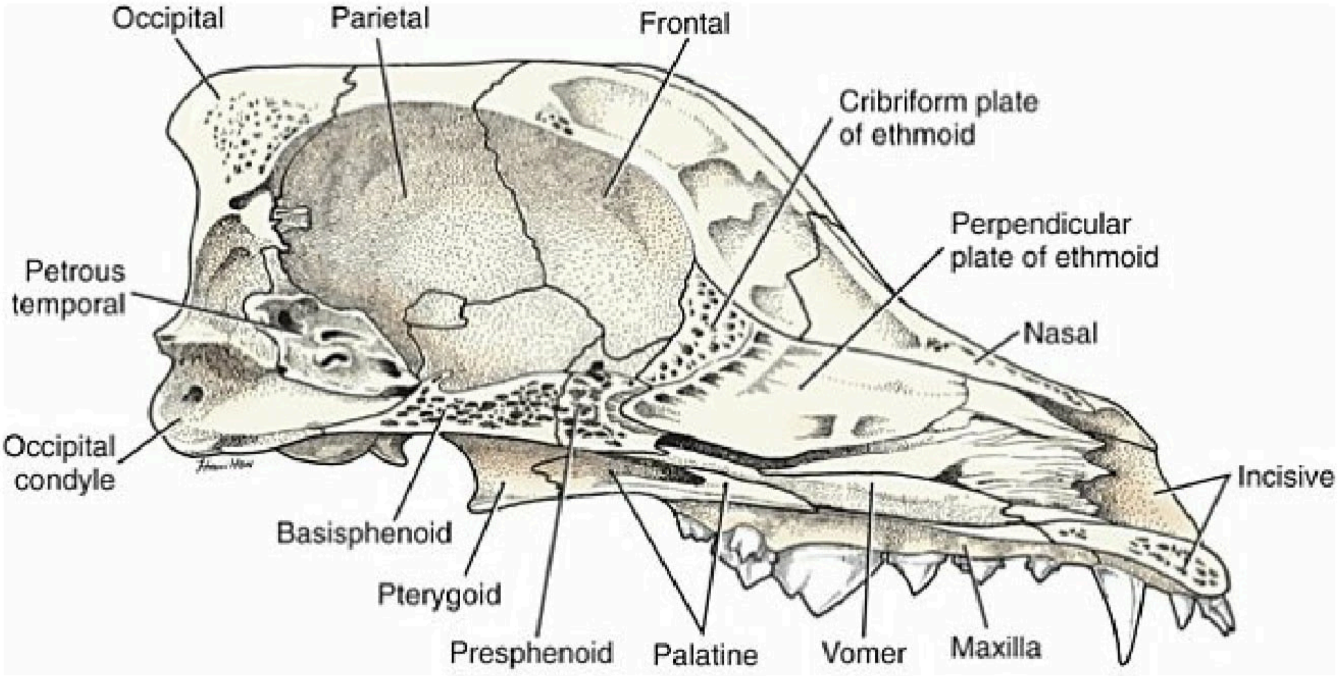

Fig 4 — The dog skull, median (sagittal) section. The interior: the cranial cavity of the braincase behind, the cribriform and perpendicular plates of the ethmoid separating brain from nose, the vomer and hard palate below, and the maxilla and incisive framing the nasal cavity in front.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.9, bones of the skull, medial aspect of a sagittal section. Reproduced for educational reference.

Two practical themes come out of the interior. First, the **paranasal sinuses** — air spaces lined by mucosa. The **frontal sinus** is the large one (a site of sinusitis and, in some breeds, of frontal-bone trauma), and the **maxillary recess** communicates with the nasal cavity beside the cheek-tooth roots. Their size varies dramatically with skull shape (see below), which is why the same drainage problem behaves differently in a Collie and a Bulldog. Both the frontal sinus and the maxillary recess **drain into the nasal cavity**, which is why nasal disease and sinusitis so often travel together.

Second, the skull is pierced by **foramina** that transmit nerves and vessels — and three of them are the anatomy behind everyday **dental nerve blocks**. The **infraorbital foramen** (above the upper P3) carries the infraorbital nerve; the **mental foramina** on the rostral mandible carry the mental nerves; and the **mandibular foramen** on the inner ramus admits the inferior alveolar nerve. Know these three holes and you know where to deposit local anaesthetic (anesthetic).

All of the teeth are supplied by a single cranial nerve — the **trigeminal (CN V)**. The upper arcade is served by its **maxillary division (CN V_2)** running in the infraorbital canal, and the lower arcade by the **inferior alveolar branch of the mandibular division (CN V_3)**. That is why these foramina are at once the sensory map of the mouth and the nerve-block map. More broadly, the base of the skull is drilled by a set of named foramina that a spot exam loves — each one the doorway for a particular cranial nerve:

FORAMEN / CANAL	WHAT PASSES THROUGH IT
Optic canal	Optic nerve (CN II)
Orbital fissure	Oculomotor (III), trochlear (IV), abducent (VI) & ophthalmic (V_1)
Round foramen	Maxillary nerve (CN V_2), leading into the alar canal
Oval foramen	Mandibular nerve (CN V_3)
Internal acoustic meatus	Facial (VII) & vestibulocochlear (VIII)
Jugular foramen	Glossopharyngeal (IX), vagus (X) & accessory (XI)
Hypoglossal canal	Hypoglossal nerve (CN XII)
Foramen magnum	Medulla oblongata / spinal cord

03 Skull shapes & why they matter

Dogs are the most skull-variable species on earth, and clinicians sort that variation into **three shapes**. **Dolichocephalic** skulls are long and narrow (Greyhound, Collie); **mesaticephalic** skulls are medium and are what most textbook descriptions assume (Labrador, Beagle); **brachycephalic** skulls are short and wide (Bulldog, Pug). The proportion is captured by the **cephalic index**, but you can classify most dogs by eye.

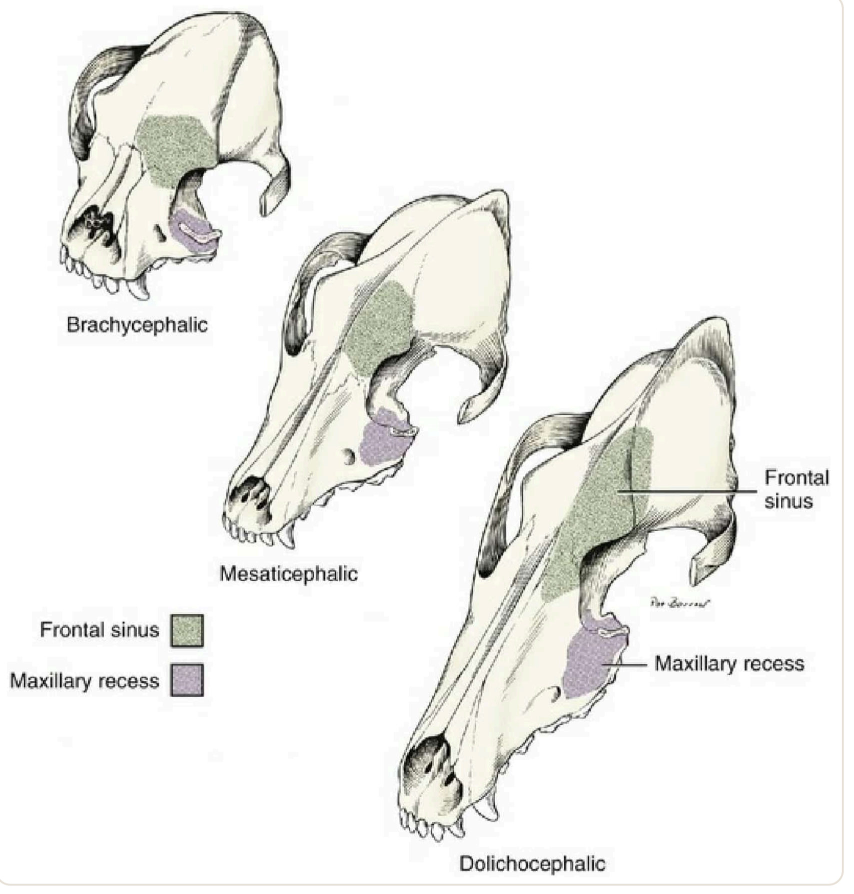

Fig 5 — The three canine skull shapes. Brachycephalic (short), mesaticephalic (medium) and dolichocephalic (long) skulls, with the frontal sinus (green) and maxillary recess (purple) shaded — note how the sinus and the whole nasal chamber enlarge as the muzzle lengthens.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.49, paranasal sinuses in three types of skull. Reproduced for educational reference.

This is not academic. Skull shape sets up predictable clinical problems, which is exactly the kind of thing a searcher wants spelled out:

SKULL TYPE	MUZZLE	TYPICAL BREEDS	WHAT IT MEANS IN THE CLINIC
Dolichocephalic	Long, narrow	Greyhound, Rough Collie, Borzoi, Dachshund	Long nasal chambers and a large frontal sinus; spaced teeth; sight-hound eye placement.
Mesaticephalic	Medium (the 'default')	Labrador, Beagle, German Shepherd	The proportions most textbook values describe; teeth well spaced with a normal scissor bite.
Brachycephalic	Short, wide	Bulldog, Pug, Boxer, Boston Terrier	Crowded, rotated, often missing premolars; shortened jaws → malocclusion and, in the airway, brachycephalic obstructive airway syndrome (BOAS).

The brachycephalic story is the most important. Shortening the jaws without shrinking the teeth leaves them **crowded and rotated**, trapping plaque and driving early **periodontal disease**; the same shortening of the airway skeleton underlies **brachycephalic obstructive airway syndrome (BOAS)**. Skull anatomy and welfare meet here.

04 The mandible & the temporomandibular joint

The lower jaw is a single functional unit made of left and right **mandibles** joined rostrally at the fibrous **mandibular symphysis** (which is why symphyseal separation is a common fracture in dogs hit by cars). Each mandible has a horizontal **body** holding the lower teeth and a vertical **ramus** behind. Learn the ramus by its processes: the **condylar process** that forms the jaw joint, the **coronoid process** that disappears up into the temporalis muscle, and the **angular process** at the back for the masseter and pterygoid.

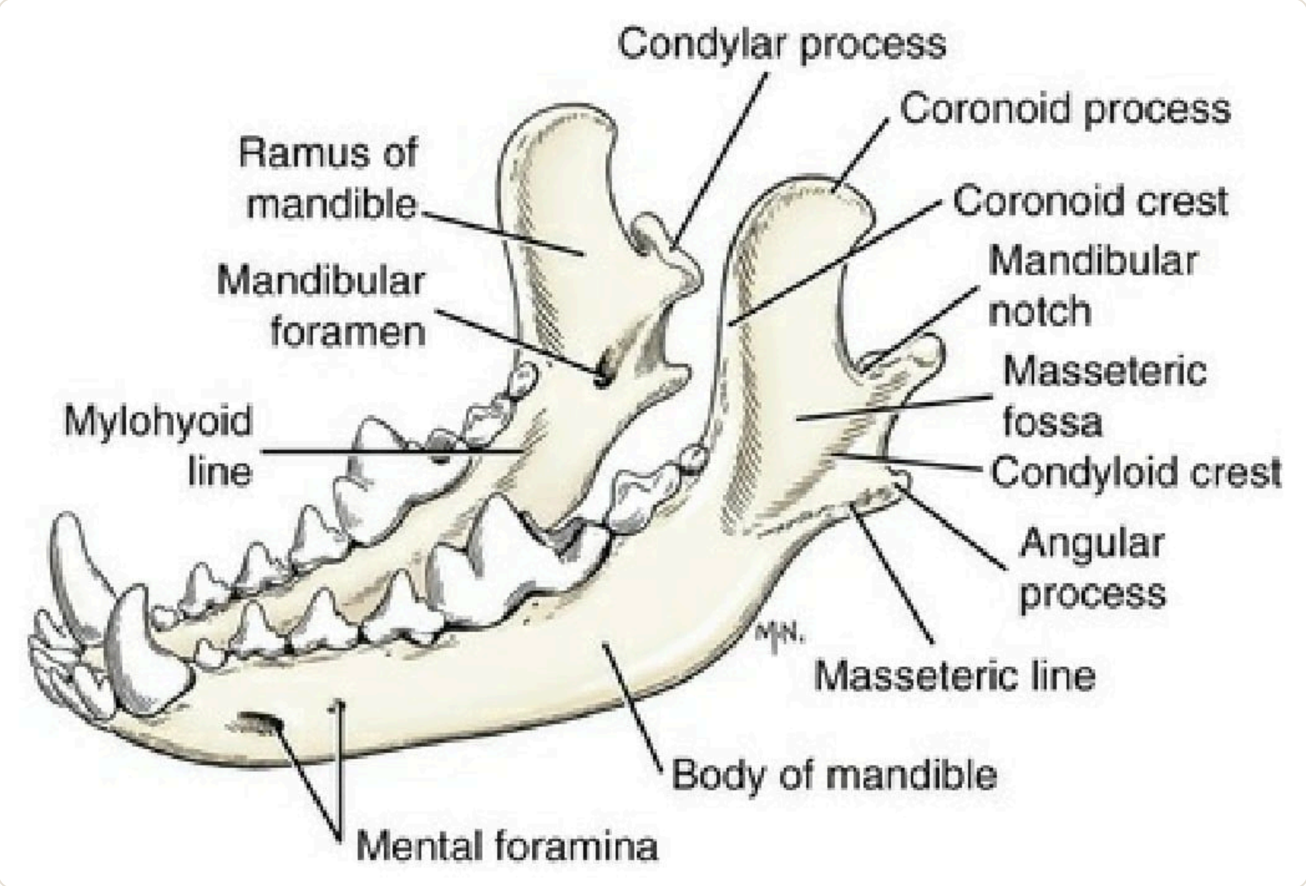

Fig 6 — The canine mandible, lateral aspect. The body carrying the lower cheek teeth, the ramus behind with its condylar, coronoid and angular processes, the masseteric fossa, and the mandibular foramen (nerve entry) and mental foramina (nerve exit) — the two ends of the inferior alveolar nerve's path.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 4.38, left and right mandibles. Reproduced for educational reference.

The **temporomandibular joint (TMJ)** is a hinge between the condylar process and the **mandibular fossa of the temporal bone**. In a carnivore it is built for a powerful, almost purely **vertical scissor action** with very little side-to-side grinding — the opposite of the sweeping, side-to-side grinding jaw of a horse or a cow. A prominent **retroarticular process** caudal to the fossa braces the condyle and helps prevent the dislocation that a sideways-grinding jaw would risk. That single design choice is why the carnassials can shear so effectively.

05 The dog dental formula: how many teeth do dogs have?

The **dog dental formula** is the compact way anatomists record which teeth are present. It lists, for one side of the mouth, the number of **incisors (I), canines (C), premolars (P) and molars (M)** in the upper arcade over the lower arcade, then doubles the whole thing for the two sides. Written out, the permanent formula is:

Permanent:

2 × (I 3/3, C 1/1, P 4/4, M 2/3) = **42 teethDeciduous:** 2 × (I 3/3, C 1/1, P 3/3) = **28 teeth**

Read the numerator as the upper arcade and the denominator as the lower. So an adult dog has, *on each side, upper*: three incisors, one canine, four premolars and two molars (10 teeth); *lower*: three incisors, one canine, four premolars and three molars (11 teeth). Ten plus eleven, times two, is 42. Across the whole mouth that is **12 incisors, 4 canines, 16 premolars and 10 molars — 42 teeth in total (20 in the upper jaw, 22 in the lower)**. The plate below shows the whole permanent set in place, upper and lower.

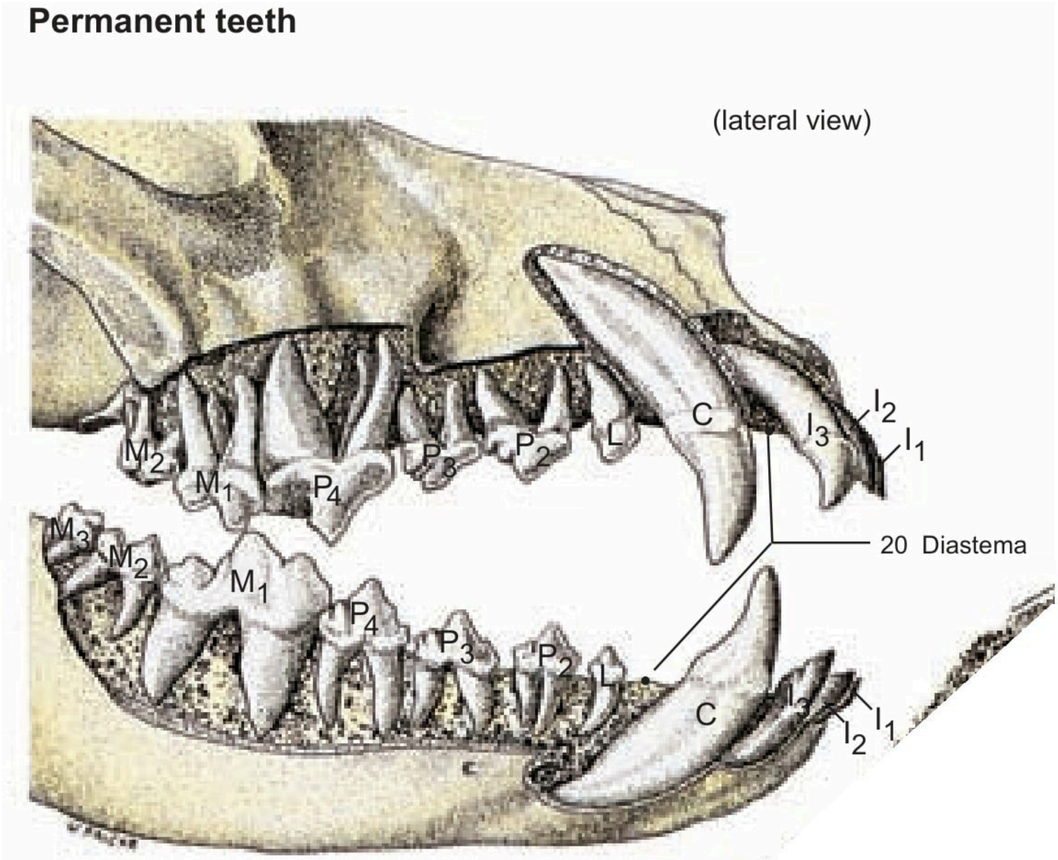

Fig 7 — The permanent dentition (a labelled dog-teeth diagram), lateral view. Both arcades in occlusion with every tooth labelled: incisors I1–I3, the canine (C), premolars P1–P4 and molars M1–M3 in the lower jaw (M1–M2 upper), with the **diastema** (20) that receives the opposing canine.

Image — Budras KD, McCarthy PH, Fricke W, Richter R. Anatomy of the Dog , 5th ed. — plate: permanent teeth, lateral view. Reproduced for educational reference.

Two quirks of the formula catch students out. First, the **upper jaw has two molars but the lower jaw has three** — a rare asymmetry worth memorising. Second, three tooth positions have **no deciduous precursor at all**: the first premolar (P1, upper and lower) and every molar erupt straight into the permanent set without a baby tooth before them.

The count is not perfectly fixed, either. Teeth can be congenitally **missing (hypodontia)** — common in brachycephalics, where the premolars are the usual casualties — or **supernumerary (extra)**, most often an additional incisor or premolar that crowds the arcade.

ARCADE	INCISORS	CANINES	PREMOLARS	MOLARS	TOTAL
Deciduous upper (one side)	3 (Di1–Di3)	1 (Dc)	3 (Dp2–Dp4)	0	7
Deciduous lower (one side)	3	1	3	0	7
Deciduous total					**2 × (7 + 7) = 28**
Permanent upper (one side)	3 (I1–I3)	1 (C)	4 (P1–P4)	2 (M1–M2)	10
Permanent lower (one side)	3	1	4 (P1–P4)	3 (M1–M3)	11
Permanent total					**2 × (10 + 11) = 42**

06 Triadan numbering: how vets label a tooth

Anatomical names ("upper right fourth premolar") are clear but slow. In practice, veterinary dentistry uses the **modified Triadan system**, a three-digit code that fits neatly on a dental chart. The **first digit is the quadrant** (1 = upper right, 2 = upper left, 3 = lower left, 4 = lower right, going clockwise as you face the dog) and the **last two digits are the tooth position**, counted from the midline: 01–03 are the incisors, 04 is the canine, 05–08 the premolars, 09–11 the molars.

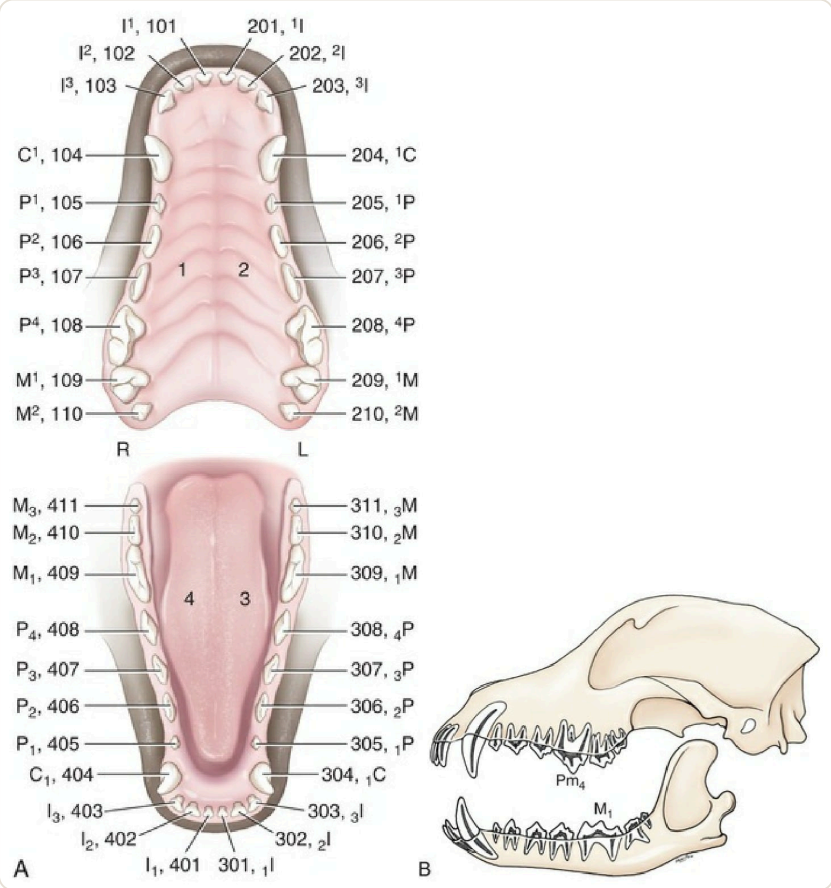

Fig 8 — Triadan numbering of the canine dentition — a dog dental chart. An open-mouth view (A) with every tooth labelled in *both* systems — anatomical (I^1, C^1, P^1–P^4, M^1–M^2) and Triadan (101–110, 201–210, 301–311, 401–411) — and (B) the shearing carnassials (upper Pm4, lower M1) on the skull.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 7.6, open-mouth view with teeth identified. Reproduced for educational reference.

QUADRANT	NUMBERS	WHICH SIDE
1	101–110	Upper **right**
2	201–210	Upper **left**
3	301–311	Lower **left**
4	401–411	Lower **right**

Two memory tricks make Triadan quick. The **"rule of 4 and 9"**: in every quadrant, position **04 is always the canine** and position **09 is always the first molar**. And because the dog is missing no anterior teeth, you simply count up. So the upper-right canine is **104**, the big upper-left carnassial (P4) is **208**, and the lower-right first molar (the lower carnassial) is **409**.

07 The types of dog teeth & the carnassials

The dog is a **heterodont** carnivore: it has four kinds of teeth, each shaped for a job. The small **incisors** at the front nibble and groom; the long **canines** grasp and hold; the **premolars** and **molars** behind them shear and crush. Crucially the dog is a **secodont** (cutting-toothed) carnivore, which is why the cheek teeth are bladed rather than flat.

TOOTH	UPPER / LOWER	ROOTS	JOB
Incisors (I1–I3)	3 / 3 each side	1 each	Nibbling, grooming, picking meat off bone; the small pincers at the front.
Canines (C)	1 / 1 each side	1 (very long)	Grasping and holding prey; the longest-rooted teeth — the root is longer than the crown.
Premolars (P1–P4)	4 / 4 each side	1 to 3	Shearing and holding. P1 is a small single-rooted peg with no deciduous precursor.
Upper carnassial = P4	1 / — each side	**3**	The **sectorial tooth** — the largest, strongest tooth of the upper jaw; shears against the lower M1.
Lower carnassial = M1	— / 1 each side	2	The lower shearing blade; occludes inside the upper P4 like scissor blades.
Molars (M1–M2 upper, M1–M3 lower)	2 / 3 each side	1–3	Crushing/grinding at the back of the mouth; upper molars have 3 roots, lower M1–M2 two, and the small lower M3 a single root. No deciduous precursors.

The stars of the show are the **carnassial teeth**. The **upper fourth premolar (P4)** and the **lower first molar (M1)** are enlarged, blade-like teeth whose crowns bypass each other like the two blades of a pair of scissors. As the jaw closes, the lower M1 slides up *inside* the upper P4, and the passing edges slice through meat and tendon — a much more efficient action than crushing. The upper P4 is the **largest, strongest tooth of the upper jaw and has three roots** (a fact you meet again the moment you try to extract it).

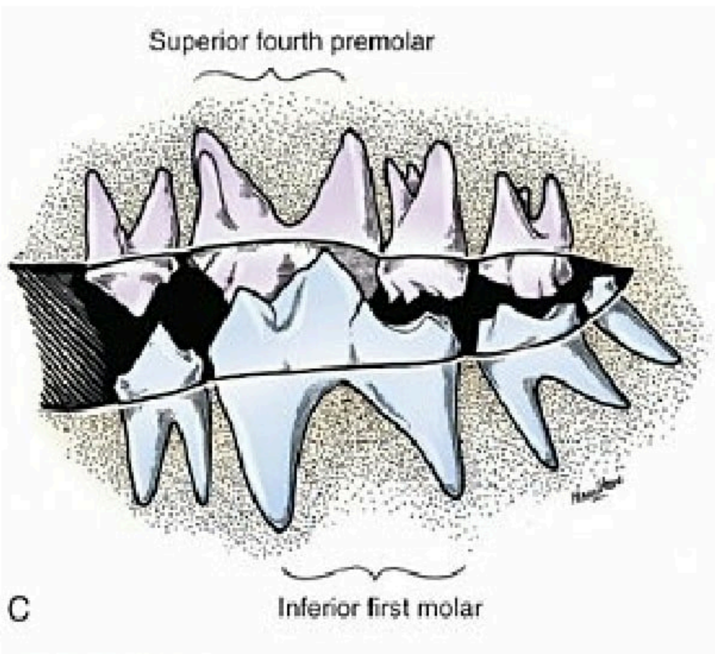

Fig 9 — The carnassial (shearing) occlusion. The upper fourth premolar (P4) and the lower first molar (M1) meet like scissor blades — the lower tooth passing on the inside (lingual) surface of the upper — slicing rather than crushing. This is the defining feature of the carnivore dentition.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 7.7C, bite of the shearing teeth, medial view. Reproduced for educational reference.

The cat is an even more specialised shearing carnivore, with only 30 teeth and a reduced molar row — see our Cat Anatomy guide for the comparison.

08 The structure of a tooth

Whatever its shape, every tooth is built from the same **four tissues**. **Enamel** is the glassy outer shell of the crown — the hardest substance in the body, about 96% mineral (hydroxyapatite), only ~0.1–1 mm thick in the dog and, critically, **acellular: once formed it cannot be repaired**. Beneath it, **dentine** forms the bulk of the tooth; it is a living, bone-like tissue laced with tubules, so a fracture that exposes dentine is sensitive. **Cementum**, a thin bone-like layer, covers the **root** and anchors the periodontal fibres (fibers). In the centre lies the **pulp cavity** — the dental pulp of nerves, vessels and lymphatics that enters through the **apical foramen** (or, in the dog, a spray of small canals called the **apical delta**) and runs up the **root canal**.

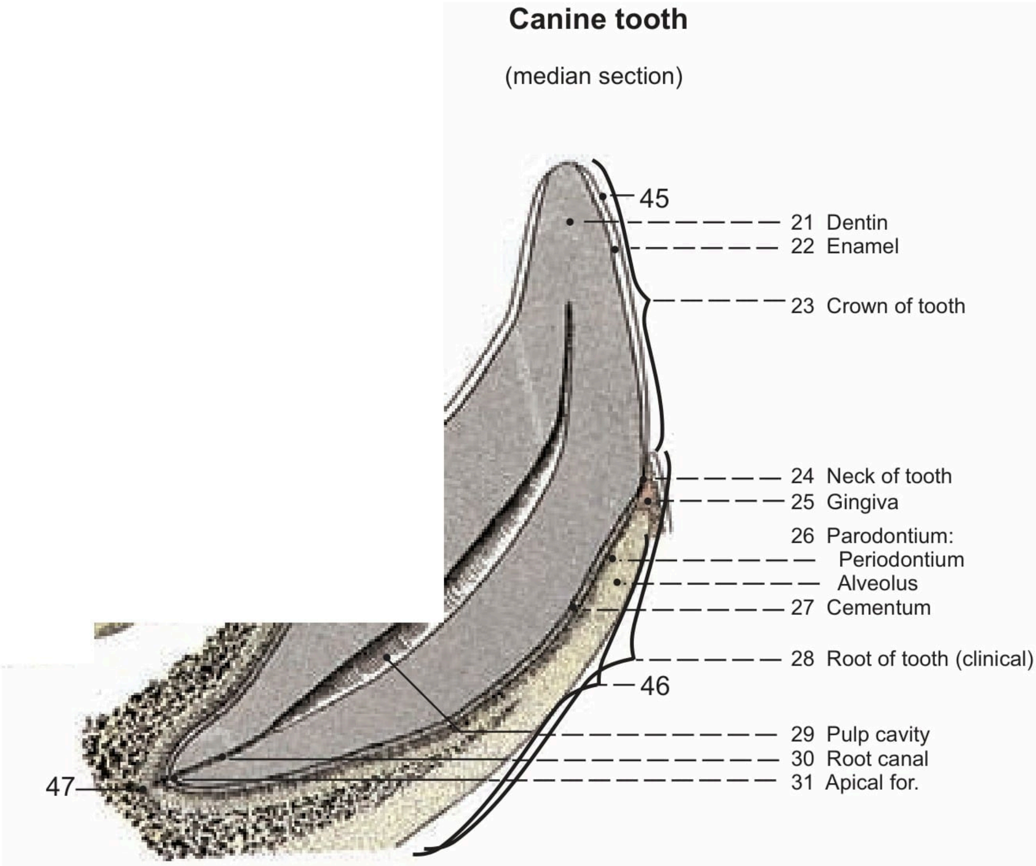

Fig 10 — The parts of a tooth (canine, median section). A canine tooth sectioned lengthways: **enamel** (22) over the **crown** (23), **dentine** (21) forming the bulk, the **pulp cavity** (29) and **root canal** (30) reaching the **apical foramen** (31), the **neck** (24) at the gum line and **cementum** (27) over the **root** (28).

Image — Budras KD, McCarthy PH, Fricke W, Richter R. Anatomy of the Dog , 5th ed. — plate: canine tooth, median section. Reproduced for educational reference.

The junctions matter. The **crown** is the enamel-covered part; the **root** is the cementum-covered part in the socket; the **neck** (cementoenamel junction) is where the two meet at the gum line. A tooth is not fused to bone — it is suspended in its **alveolus (socket)** by the **periodontal ligament**, whose collagen fibres run from cementum to alveolar bone. Together the gingiva, periodontal ligament, cementum and alveolar bone make up the **periodontium**, and this fibrous peg-in-socket joint is a **gomphosis**. The plate below shows the whole apparatus in situ — and why it matters that a canine root sits right against the nasal cavity.

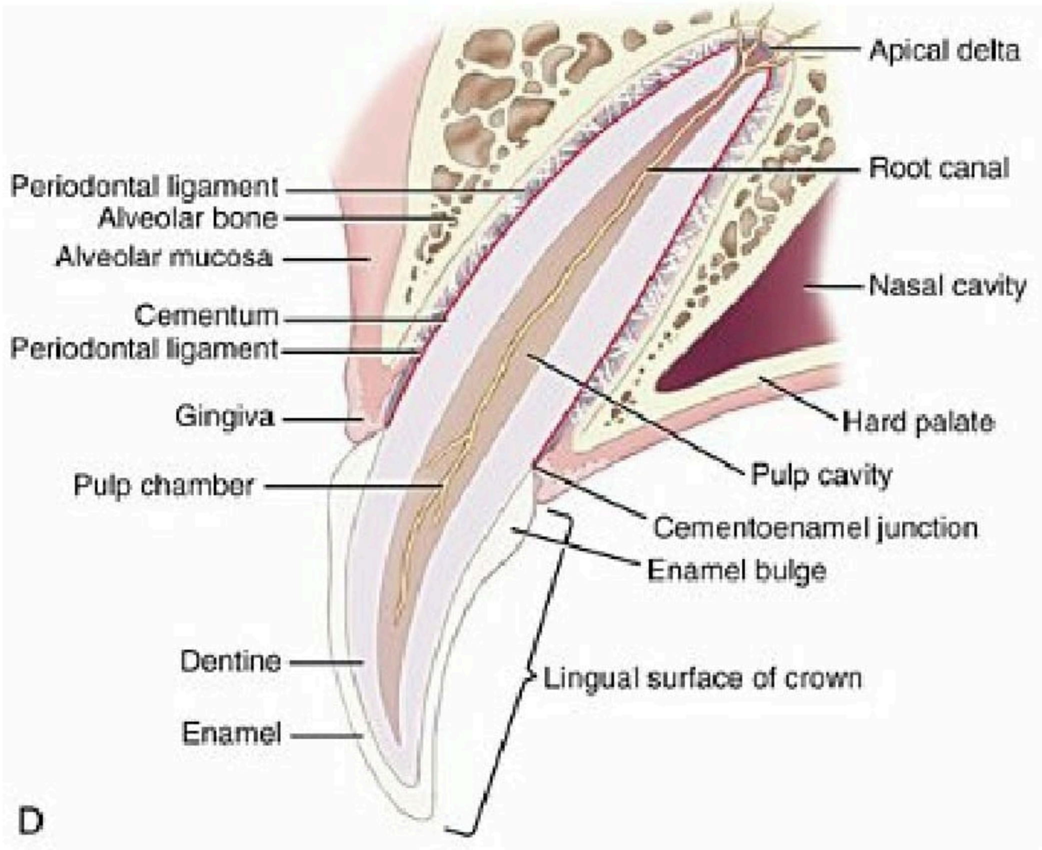

Fig 11 — A canine tooth in situ with its periodontium. The same tooth in the jaw: the **periodontal ligament** suspending the root between **cementum** and **alveolar bone**, the **gingiva** at the neck, the pulp reaching the **apical delta** — and the root lying directly against the **nasal cavity** and hard palate.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 7.7D, diagrammatic section through a superior canine. Reproduced for educational reference.

Naming the surfaces: how to say where on a tooth

Once you can name a tooth, you need to name *where* on it — the vocabulary every dental chart, referral letter and extraction note uses. These directions replace "front/back/inside/outside," which are ambiguous once a tooth is out of the mouth.

TERM	DIRECTION IT POINTS
Mesial	Toward the midline of the dental arch (rostral, for the front teeth)
Distal	Away from the midline (caudal)
Vestibular (buccal / labial)	Facing the cheek, or the lip at the front
Lingual / palatal	Facing the tongue (lower teeth) or the palate (upper teeth)
Occlusal	The biting surface that meets the opposing tooth
Coronal / apical	Toward the crown tip / toward the root apex

09 Puppy teeth: the deciduous set & eruption timeline

Puppies are born **edentulous** (toothless). The **deciduous ("milk" or puppy) teeth** come in over the first weeks, and because there are no deciduous molars a full puppy set is only **28 teeth**. From around three months the permanent teeth push the deciduous ones out, and the set is usually complete by **six to seven months**. Knowing the timeline lets you **age a young dog** and, just as usefully, spot a **retained deciduous tooth** — classically a persistent deciduous canine sitting alongside its permanent replacement, crowding it and needing extraction.

TOOTH	DECIDUOUS ERUPTS	PERMANENT ERUPTS
Incisors	3–6 weeks	2–5 months
Canines	3–4 weeks	5–6 months
Premolars	4–8 weeks	4–6 months
Molars	(no deciduous)	5–7 months

Rule of thumb:

up to 3 weeks, edentulous; by ~6 weeks the deciduous set is complete; permanent incisors start around 3 months; the permanent dentition is in by ~6 months.

10 Occlusion: the normal bite & malocclusions

A normal canine bite is a **scissor bite**. The lower incisors close just *behind* the upper incisors (their cusps resting on the cingulum of the uppers), and the **lower canine slots into the diastema** in front of the upper canine, so the two interlock without hitting. Behind them the premolar cusps interdigitate in a neat zig-zag — a "pinking-shear" pattern — culminating in the carnassial shear.

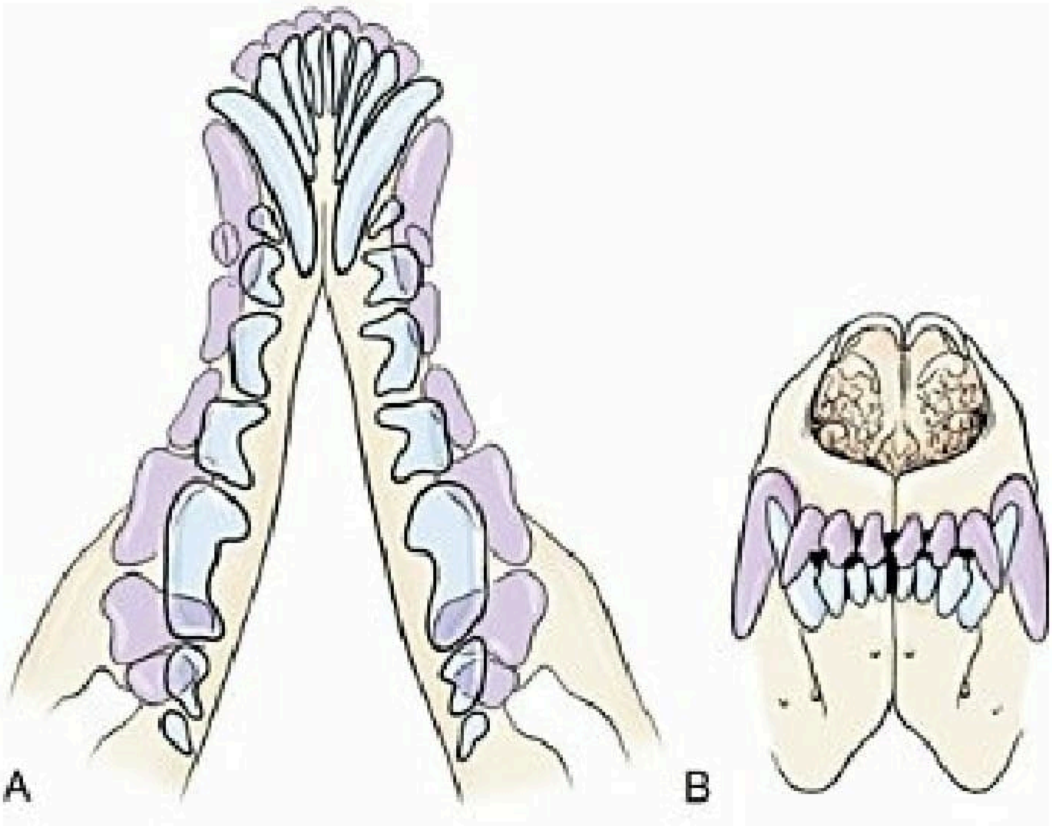

Fig 12 — How the two arches meet. (A) The upper and lower arches superimposed — the upper teeth (pink) bite *lateral* to the lower teeth (blue), so the cusps interdigitate rather than collide. (B) The incisors and canines from the front: the lower canine closes *rostral* to the upper canine, slotting into the diastema.

Image — Evans HE, de Lahunta A. Miller and Evans' Anatomy of the Dog , 5th ed. — FIG 7.7 A and B, superimposition of the dental arches and the bite of the incisor and canine teeth. Reproduced for educational reference.

When this alignment is off, it is a **malocclusion**, and the classes are worth knowing because they are common exam and consult questions:

- **Class 1 (neutrocclusion):** the jaws are the right length but one or more teeth are out of position (e.g. a rotated premolar, or a lingually displaced "base-narrow" lower canine that traumatises the palate).
- **Class 2 (mandibular distocclusion / "overbite"):** the lower jaw is relatively short, so the lower teeth sit too far caudal — the lower canines can strike the palate.
- **Class 3 (mandibular mesiocclusion / "underbite"):** the lower jaw is relatively long, so the lower incisors sit in front of the uppers. This is the **normal, breed-defined bite** in many brachycephalics (Bulldog, Boxer) — a reminder that "normal" is breed-dependent.

11 Why skull & dental anatomy matters clinically

Everything above turns directly into clinical practice. Read it backwards from the anatomy and the day-to-day dentistry falls out:

Nerve blocks follow the foramina

Regional anaesthesia (anesthesia) for dental work is pure applied osteology. The **infraorbital block** deposits anaesthetic at the infraorbital foramen to desensitise the upper premolars, canine and incisors; the **maxillary block** reaches further caudal for the molars; the **mental block** at the middle mental foramen covers the lower incisors and canine; and the **inferior alveolar (mandibular) block** at the mandibular foramen numbs an entire lower quadrant. If you can find the holes on the skull, you can place the block.

Extraction is a lesson in root anatomy

Roots decide difficulty. Single-rooted incisors and P1 come out simply; the long-rooted **canine** needs a surgical approach because its root is longer than its crown; and the multi-rooted **carnassials must be sectioned** into single-root segments first — the **three-rooted upper P4** is the classic. Because the upper cheek-tooth roots lie against the **maxillary recess and nasal cavity**, over-enthusiastic elevation there risks an **oronasal fistula** — the anatomy in the tooth-in-situ plate above made real. It is also why a **dental radiograph**, before and after extraction, is now standard of care — to confirm the root number going in and complete removal coming out.

Reading the periodontium: probing depth and furcation

Periodontal disease is the commonest disease of dogs, and the anatomy above is what you are actually assessing. Plaque mineralises into **calculus**, the gingival margin inflames, and if it progresses past gingivitis into **periodontitis** the attachment itself is lost: periodontal ligament, cementum and alveolar bone. Because that loss happens below the gumline, the visible crown tells you very little — probing and dental radiographs tell you everything.

In a multi-rooted tooth the space where the roots divide is the **furcation**, and bone loss there is graded by what a probe can do: **F1**, the probe just detects the furcation; **F2**, it enters but will not pass through; **F3**, it passes straight through from one side to the other. An F3 furcation means the bone between the roots has gone, and it changes the plan from scaling to extraction. This is why the carnassials and molars are lost first — they are the teeth with furcations to lose.

The carnassial abscess: a swelling under the eye

One presentation is worth knowing purely from the anatomy, because it is routinely mistaken for a skin problem. The **maxillary fourth premolar** (Triadan 108 and 208) is the upper carnassial and it has **three roots**. The mesiobuccal root sits immediately beneath the thin bone of the maxilla just rostroventral to the eye. When that root abscesses, the pus takes the shortest route out — through the bone and skin — and the dog presents with a firm swelling or a **draining tract below the medial canthus**, often with no obvious mouth pain at all. Owners describe a bite wound or an "eye infection"; antibiotics settle it briefly and it recurs every time. The lesion is a **tooth root abscess**, and it resolves only when the tooth is treated.

Skull shape predicts the problem list

A brachycephalic skull tells you, before you even open the mouth, to expect **crowded and rotated premolars, missing or malformed teeth and early periodontal disease** — and to think about the airway. A dolichocephalic skull warns of long, deep-rooted teeth and generous nasal chambers. Skull shape is a one-glance risk assessment.

12 Quiz: test yourself (15 questions)

Cover the answers and work down the list. These cover the points most often examined in **canine skull and dental anatomy** — the dental formula, the carnassials, tooth structure and the nerve-block foramina.

SELF-TEST1. How many permanent teeth does an adult dog have, and how many deciduous?**Answer: 42** permanent and **28** deciduous. The formula is 2 × (I3/3 C1/1 P4/4 M2/3) = 42.2. Write the permanent dental formula of the dog.**Answer: 2 × (I 3/3, C 1/1, P 4/4, M 2/3) = 42.** Upper arcade 10 teeth, lower arcade 11, each side.3. Which teeth are the carnassials, and what do they do?**Answer:** The **upper fourth premolar (P4)** and the **lower first molar (M1)**. They shear past each other like scissor blades to slice meat and tendon.4. How many roots does the upper P4 have? Why does it matter?**Answer: Three.** All three (two buccal + one palatal) must be sectioned and removed at extraction, and its palatal root sits against the maxillary recess/nasal cavity.5. Which permanent teeth have no deciduous precursor?**Answer: P1** (upper and lower) and **all the molars**. They erupt without shedding a baby tooth first.6. What is the modified Triadan number of the upper right canine?**Answer: 104.** Quadrant 1 (upper right) + tooth position 04 (the canine).7. Name the four tissues of a tooth from outside in.**Answer: Enamel** (crown) and **cementum** (root) on the outside, **dentine** forming the bulk, and the **pulp** (nerves and vessels) in the centre.8. Where is enamel found, and can it repair itself?**Answer:** Only over the **crown**. It is the hardest tissue in the body (~96% mineral) but is **acellular and cannot regenerate** — a fracture that exposes dentine or pulp needs treatment.9. What holds a tooth in its socket?**Answer:** The **periodontal ligament**, whose collagen fibres run between the **cementum** of the root and the **alveolar bone** — a fibrous joint called a **gomphosis**.10. Where does the diastema lie in the dog?**Answer:** In the **upper** arcade between the third incisor and the canine; in the **lower** arcade between the canine and the first premolar — the spaces the opposing canine slots into.11. Which foramen do you target for a maxillary (infraorbital) nerve block? **Answer:** The **infraorbital foramen**, above the distal root of the upper third premolar — it transmits the infraorbital nerve, a continuation of the maxillary nerve (CN V2).12. Which foramen carries the nerve for a lower-jaw block, and where is it?**Answer:** The **mandibular foramen** on the medial ramus — it admits the inferior alveolar nerve, which exits rostrally through the **mental foramina**.13. What is a normal canine bite called, and what defines it?**Answer:** A **scissor bite**: the lower incisors rest just behind the upper incisors, and the lower canine sits in the diastema in front of the upper canine.14. Why do brachycephalic dogs have dental problems?**Answer:** Their jaws are shortened but the teeth are near full-size, so teeth are **crowded, rotated and often missing** — trapping plaque and driving early periodontal disease.15. At what age is the permanent dentition usually complete?**Answer:** By about **6–7 months**. Deciduous teeth are all in by ~6 weeks; permanent teeth replace them and the molars erupt between ~4 and 7 months.

13 Canine skull & dental anatomy — frequently asked questions

How many teeth does a dog have?

An adult dog has **42 permanent teeth**; a puppy has **28 deciduous teeth** (there are no deciduous molars). The permanent formula is 2 × (I 3/3, C 1/1, P 4/4, M 2/3).

What is the dog dental formula?

Permanent: **2 × (I 3/3, C 1/1, P 4/4, M 2/3) = 42**. Deciduous: **2 × (I 3/3, C 1/1, P 3/3) = 28**. The numerator is the upper arcade, the denominator the lower; note the upper jaw has two molars and the lower has three.

What are the carnassial teeth in a dog?

The **upper fourth premolar (P4)** and the **lower first molar (M1)**. They shear past each other like scissor blades to slice meat, and the upper P4 — the “sectorial” tooth — is the largest tooth of the upper jaw, with three roots.

What is the Triadan system?

A three-digit tooth-numbering code used in veterinary dentistry. The first digit is the quadrant (1–4) and the last two are the tooth position from the midline (04 is always the canine, 09 the first molar). The upper-right canine is **104**.

What are the layers of a dog’s tooth?

From outside in: **enamel** over the crown, **cementum** over the root, **dentine** forming the bulk, and the **pulp** (nerves and vessels) in the centre. The tooth is held in its socket by the **periodontal ligament**.

Why do flat-faced (brachycephalic) dogs have dental problems?

Their jaws are shortened but the teeth are close to full size, so the teeth become **crowded, rotated and sometimes missing**. Crowding traps plaque and drives early **periodontal disease**, and the same skull shortening underlies airway disease (BOAS).

When do puppies lose their teeth?

A puppy’s **28 deciduous (milk) teeth** are all in by about **6 weeks**. From around **3 months** the permanent teeth push them out, and the full adult set of **42 teeth** is usually in place by **6–7 months**. A milk tooth still present alongside its adult replacement — classically a retained deciduous canine — should be checked and usually extracted.

How can you age a dog by its teeth?

In a **young dog** you age by **eruption** — which deciduous and permanent teeth are through (see the timeline above). In an **adult** the estimate switches to **wear and tartar**: the incisor cusps flatten and calculus builds with age. Wear-based ageing is only a rough guide, because diet, chewing habits and dental care vary hugely between dogs.

What are the four types of dog teeth?

Incisors (the small front teeth for nibbling and grooming), **canines** (the long fangs for grasping), **premolars** and **molars** (the cheek teeth for shearing and crushing). The dog is **heterodont** — four tooth types, each shaped for a different job.

How is dog skull and dental anatomy different from other species?

The dog is a shearing carnivore, so its jaw hinges vertically and its cheek teeth are bladed carnassials — unlike the side-to-side grinding jaws and flat cheek teeth of herbivores. See our Dog Anatomy, Cat Anatomy, Horse Anatomy and Cattle Anatomy visual guides for the comparison.

When to refer

- **The dental nerve block** — infraorbital, maxillary, mental and inferior-alveolar blocks are placed at named foramina you can find on the skull.
- **Extracting the upper carnassial (P4)** — three roots to section, and the maxillary recess/nasal cavity right above them.
- **The retained deciduous canine** — a baby tooth left beside its permanent replacement; know the eruption timeline to catch it.
- **The base-narrow lower canine** — a Class 1 malocclusion where the lower canine traumatises the palate.
- **The brachycephalic mouth** — crowding, rotation and early periodontal disease you can predict from skull shape alone.

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