

Management of the Palatally Ectopic Maxillary Canine

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EXAM-DAY SUMMARY

everything on this page → detail in §§ overleaf

SCALE & AETIOLOGY → §1

- 2nd most impacted tooth after lower 8s; prevalence ~1.5%
- Palatal ≫ buccal; buccal often erupts unaided
- Aetiology unclear, likely **polygenic**; familial clustering
- Company it keeps: absent/small/malformed 2s • **absence of crowding** • late dentition

AGE LANDMARKS → §1, §3

- Annual palpation from **8 y**; palpable buccally by **10–11 y**
- Late eruption: after **12.3 y** ♀ / **13.1 y** ♂
- Interceptive window **10–13 y**; adolescence optimal for exposure

SEQUELAE → §2

- Main risk = incisor **root resorption**; CBCT **66.7%** of adjacent 2s
- Peak **11–12 y**; rarely starts after **14 y**
- Canine crown resorption up to **14%**, mainly adults; cysts rare
- Prior upper 6 impaction → ↑ palatal canine impaction + resorption

SUSPICION TRIGGERS → §3

- **Not palpable by 10–11 y** • asymmetric palpation
- Adjacent teeth malpositioned or abnormally mobile
- Then: full malocclusion assessment + accurate localisation

PARALLAX → §4

- = apparent displacement of object with change of **observer** position
- **Horizontal more reliable than vertical**; vertical improved by ↑ tube angulation
- Horiz: occlusal + PA canine, or 2 PAs (1 + 3 regions)
- Vert: occlusal (beam ↓) + OPT (beam ↑ ~8°); SLOB rule

CBCT → §4

- Small FOV → localisation + incisor resorption; ↑ effective dose
- SEDENTEXCT: only when plain films can't support a plan
- BOS: **no indication for routine CBCT**; unsure → DMFR specialist first

1 • INTERCEPTION Grade A→ §6

- Extract primary c at **10–13 y**, not severely displaced, ideally uncrowded
- Consider space maintenance/creation; **no improvement at 12 mo** → **change plan**
- 78% (Ericson & Kurol) • 62% (Power & Short)
- Systematic reviews: insufficient evidence for *routine* use

2 • EXPOSE + ALIGN Grade C→ §7

- Motivated, good dental health, will wear **fixed** appliances
- Not alignable if: **near midline** • **above apices** • **horizontal**
- Extra indication: hypodontia / poor-prognosis adjacent teeth

OPEN VS CLOSED • AGE → §7

- No clear winner: position, pain, aesthetics, perio, time, cost
- **Repeat surgery commoner with closed**
- Adults: prognosis ↓ with age (ankylosis • replacement resorption), takes longer

3 • REMOVAL Grade C→ §8

- Declines treatment / happy with appearance; good 2–4 contact
- **Early incisor resorption** → remove; severe (losing the incisor) → **expose & align**
- Camouflage 4 as 3: mesiopalatal rotation • buccal root torque • grind palatal cusp
- Risk: adjacent roots + neurovascular supply — consent

4 • TRANSPLANT Grade B→ §8

- After other options fail / appliances refused / malposition too great
- Needs space + alveolar bone; no ankylosis; atraumatic; **apex open**
- **>¾ root formed** → **RCT within 10 days**; sectional archwire 6 weeks
- >5 y canine data absent; other teeth up to 90%

5 • OBSERVE Grade C→ §9

- No pathology, no resorption; good 2–4 contact or sound primary c
- Severely displaced + remote may stay *in situ*
- **No guidance on radiographic review interval** — clinical review remains obligatory

GRADES & PROCESS → §5

- A = interception • B = transplantation • **C = expose/align, removal, observe**
- Radiograph first → counsel patient **and parent** → informed consent
- Seek specialist opinion before starting any option

§1 The problem — prevalence, aetiology, associations

- **Rank:** maxillary canine = **second only to the mandibular third molar** for impaction · prevalence ★~1.5%
- **Palatal >> buccal:** numerous sources → palatally ectopic far commoner than buccal
 - buccal canines less extensively studied → greater proportion appear to erupt naturally without active intervention
- **Who meets it:** general dental practitioners (GDPs) + orthodontists commonly → both must know the management pathway
- **Cost of missing it:** inefficient diagnosis/management → more complex remedial treatment → costly in clinical time for practitioner *and* patient · damage to adjacent teeth → **litigation claims**
- **Aetiology:** remains unclear · likely **polygenic**
 - supported by ↑ frequency among family members vs expected
- **Associated anomalies** (all considered genetic in origin): missing · malformed · diminutive lateral incisors · absence of crowding · late developing dentitions
- **Normal eruption landmarks:** majority palpable in buccal sulcus by ★10–11 y
 - eruption after ★12.3 y girls · 13.1 y boys = late

KEY POINTS

Palatal canine = genetic phenotype, not a crowding phenomenon → **absence** of crowding + anomalous/absent laterals + late dentition + positive family history are the company it keeps.

★ EXAM PEARL

The counter-intuitive discriminator: buccal ectopia tracks **crowding**; palatal ectopia tracks **genetics and an uncrowded arch** — and it is the palatal one that predicts a better interceptive result when uncrowded.

§2 Sequelae — what an ectopic canine costs

- **Main risk:** **root resorption of adjacent teeth**, usually the incisors
- **Scale:** cone-beam computed tomography (CBCT) study → resorption in ★66.7% of **permanent lateral incisors** adjacent to ectopic canines
 - not always of clinical significance — detection ≠ significance
- **Timing of resorption:** most frequent between ★11 and 12 y · rarely *starts* after 14 y
 - → the diagnostic window and the damage window are the same window
- **Predictor:** previous impaction of an **upper first permanent molar** → higher prevalence of palatal canine impaction *and* of associated incisor root resorption
- **Canine crown resorption:** most likely in **adults** · quoted frequencies up to ★14%
- **Cystic change:** possible · frequency generally thought to be **low**

CAUTION

Resorption is silent and peaks at 11–12 y — before most patients are referred. A canine not palpable at 10–11 y is a **radiographic** question that day, not "review in a year".

§3 Clinical detection and screening

- **Routine screening:** clinical inspection + **buccal palpation of the alveolus** in the canine region — ★**annually from age 8 y**
- **Suspect ectopia if:**
 - not palpable in the buccal sulcus by **10–11 y**
 - palpation shows an **asymmetrical** eruption pattern
 - position of adjacent teeth implies malposition of the permanent canine
 - **abnormal mobility** of adjacent permanent teeth
- **Then:** comprehensive assessment of the whole malocclusion → including **accurate localisation** of the canine ✗ never localisation alone

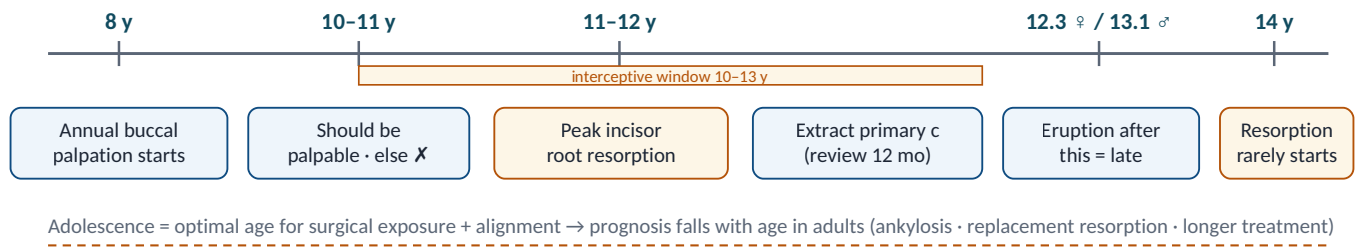


Diagram 1 — Age landmarks: screening from 8 y · palpability 10–11 y · resorption peak 11–12 y · interceptive window 10–13 y · late eruption thresholds 12.3/13.1 y · resorption rarely begins after 14 y.

§4 Radiographic localisation

- **Timing:** radiography before **10–11 y** usually of little benefit → knowledge gained does not justify it
- **Method:** two different radiographs + the **principle of parallax**
- **Parallax defined:** apparent displacement of an object because of different positions of **the observer**
 - radiographically → two films, x-ray tube head in two different positions
- **Plane of tube shift:** horizontal plane = horizontal parallax · vertical plane = vertical parallax
- **Which is better:** ★ **horizontal parallax is more reliable** than vertical for localising unerupted canines
 - reliability of vertical may be improved by **increasing tube-head angulation**

Table 1 — Radiograph pairs for parallax localisation

Parallax	Combination
Horizontal (more reliable)	Upper standard occlusal (midline view) + periapical centred on the canine region or Two periapicals — one centred on the upper central incisor, one on the canine region
Vertical	Upper standard occlusal (midline view, beam aimed downwards) + panoramic (beam aimed upwards ~8° to the horizontal) or Periapical (bisected angle, beam downwards) + panoramic (beam upwards ~8°)

Tube head shifts →



Palatal (lingual) canine
moves

with the tube → **same** direction Buccal canine moves **against** the tube → **opposite** SLOB Same Lingual Opposite Buccal Applies to either plane; with vertical parallax the "direction" is up/down on the two films rather than mesial/distal.

Diagram 2 — Interpreting the parallax pair. The tube-shift rule (SLOB) is the standard interpretation convention; the guideline itself specifies only the radiograph combinations of Table 1.

MNEMONIC

SLOB — Same Lingual, Opposite Buccal: the object moving in the same direction as the tube shift lies palatally.

4.1 CBCT — when it is justified

- **Capability:** small field of view (FOV) CBCT → localisation of ectopic canines + identification of incisor root resorption
- **Cost:** typically **higher overall effective dose** of ionising radiation than conventional radiography
- **UK/European guidance** (incl. **SEDENTEXCT**): small FOV CBCT *may* be appropriate in **selected cases** — only where conventional radiographs fail to give adequate information to construct a treatment plan
- **British Orthodontic Society (BOS) Orthodontic Radiographs Guidelines:** ★ **no indication for the routine use of CBCT**

- **Uncertain?** → seek the opinion of a **specialist in dental and maxillofacial radiology beforehand**

★ EXAM PEARL

Two separate traps in one topic: **horizontal** parallax beats vertical (evidence, Armstrong et al.), and CBCT is **never routine** — it is a rescue investigation for when plain films cannot support a plan.

§5 Treatment planning — the five options

- **Step 1:** radiographic examination first → confirm the position of the unerupted canine
- **Step 2:** counselling of **patient and parent** on the various options → **fully informed consent**
- **Reality check:** planning is *not* straightforward → large number of patient factors + orthodontic considerations
 - → **strongly recommended:** seek a specialist opinion *before* initiating any of the five options

Table 2 — The five options at a glance

Option	Core indication	SIGN grade
1 • Interceptive extraction of primary canine	10–13 y · not severely displaced · ideally uncrowded	A
2 • Surgical exposure + orthodontic alignment	Unsuitable for interception · motivated · will wear fixed appliances · alignable position	C
3 • Surgical removal of the canine	Declines treatment / happy with appearance · early incisor resorption · good 2–4 contact	C
4 • Transplantation	Other options failed/inappropriate · unwilling to wear appliances · malposition too great	B
5 • No active treatment / observe	No pathology · acceptable appearance · good 2–4 contact or sound primary canine	C

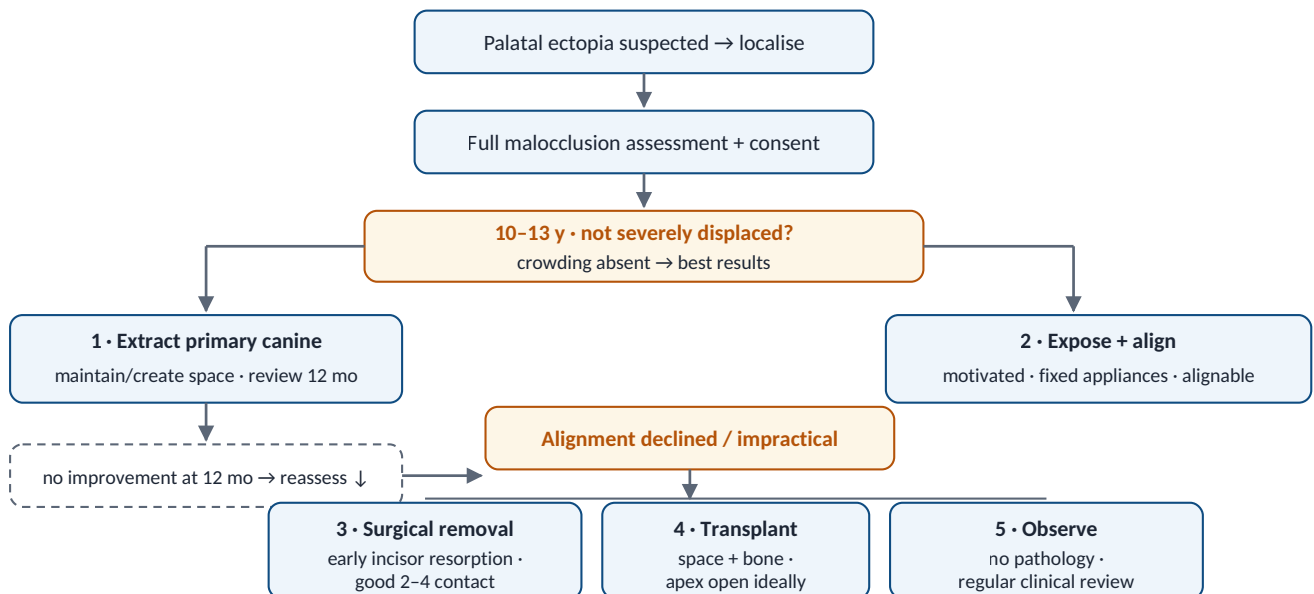


Diagram 3 — Decision pathway assembled from the guideline's option criteria; the five options are alternatives, not a fixed sequence, and any of them may be the correct first choice.

5.1 SIGN evidence framework

Recommendation grades throughout are SIGN grades (SIGN 50, *A Guideline Developer's Handbook*, Edinburgh 2011).

Table 3 — SIGN levels of evidence

Level	Evidence type
1++	High-quality meta-analyses · systematic reviews of randomised controlled trials (RCTs) · RCTs with very low risk of bias
1+	Well-conducted meta-analyses · systematic reviews · RCTs with low risk of bias
1-	Meta-analyses · systematic reviews · RCTs with high risk of bias
2++	High-quality systematic reviews of case-control or cohort studies · high-quality case-control/cohort studies with very low risk of confounding or bias + high probability the relationship is causal
2+	Case-control/cohort studies · low risk of confounding or bias · moderate probability the relationship is causal
2-	Case-control/cohort studies · high risk of confounding or bias · significant risk the relationship is not causal
3	Non-analytic studies — case reports, case series
4	Expert opinion

Table 4 — SIGN grades of recommendation

Grade	Basis
A	≥1 meta-analysis, systematic review or RCT rated 1++ and directly applicable to the target population or a body of evidence principally of 1+ studies, directly applicable, consistent results
B	Body of evidence including 2++ studies, directly applicable, consistent or extrapolated from 1++ / 1+
C	Body of evidence including 2+ studies, directly applicable, consistent or extrapolated from 2++
D	Evidence level 3 or 4 or extrapolated from 2+

★ EXAM PEARL

Grade ≠ effectiveness. Interception carries **Grade A** while systematic reviews decline to endorse routine primary-canine extraction — the grade reflects the **quality of the trial evidence available**, not how well the intervention works.

§6 Option 1 — interceptive extraction of the primary canine

- **Premise:** in carefully selected cases where the ectopic permanent canine is **not severely displaced** → some evidence that extracting the adjacent **primary canine** improves the permanent canine's position
- **Age:** approximately ★10–13 y
- **Crowding:** better results reported in its **absence**
- **Space:** need to **maintain** space — or even **create additional** space — requires consideration
- **Review rule:** no radiographic improvement ★12 months after extraction → consider alternative options
- **Grade:** SIGN A

6.1 The evidence trail

- **Ericson & Kurol 1988:** ★78% of palatally ectopic canines reverted to a normal eruption path after primary canine extraction
 - success ↓ as degree of malposition ↑ · method judged cost-effective and simple
- **Power & Short 1993:** confirmed the finding, success rate slightly lower — ★62%
- **Systematic reviews** (incl. Cochrane 2021): further research published, but evidence **not sufficiently robust** to support **routine** extraction of the primary maxillary canine to facilitate eruption of the successor
- **Verdict:** further well-reported RCTs required → meanwhile reasonable to offer in carefully selected cases
- **Consent must state:** surgical exposure + orthodontic treatment **may ultimately still be required** · the supporting evidence is **not conclusive**

KEY POINTS

78% (Ericson & Kurol) → 62% (Power & Short) → "insufficient evidence for routine use" (systematic reviews). Selective, consented, reviewed at 12 months — never automatic.

§7 Option 2 — surgical exposure and orthodontic alignment

- **Indication:** case not suitable for interceptive extraction of the primary canine

- **Patient factors:** willing to wear **fixed** appliances · well motivated · **good dental health** (treatment time often prolonged)
- **Position must be alignable** — impractical if:
 - close proximity to the **midline** · **above the apices** of adjacent teeth · **horizontal** angulation
- **Extra reasons to treat:** other dental anomalies present (e.g. hypodontia) · adjacent teeth with poor long-term prognosis
- **Evidence base:** much of it from **case studies** — but many years of clinical experience → can be a highly successful approach
- **Cooperation and motivation are paramount** · **Grade C**

7.1 Open vs closed exposure

- **Cochrane comparison:** **no clear evidence** favouring either technique for → movement into the correct position without repeat surgery · pain · discomfort · aesthetics · periodontal health · length of treatment · cost
- **One difference:** ★ **repeat surgery is more common with the closed technique** (Burden et al.)

7.2 Age and prognosis

- **Adults do worse:** prognosis for successful resolution is lower than in younger patients and **worsens with age**
 - mechanism → ↑ risk of **ankylosis** and/or **replacement resorption** of the permanent canine crown
- **Duration:** when undertaken in adults, successful completion should be expected to take **considerably longer**
- **Optimal timing:** ★ **adolescence** — multiple independent sources concur

★ EXAM PEARL

"Open or closed?" has no evidence-based winner **except** on repeat surgery, which is commoner with closed. Anything claiming closed exposure gives better periodontal or aesthetic outcomes is beyond the evidence.

§8 Options 3 and 4 — surgical removal and transplantation

8.1 Option 3 — surgical removal of the ectopic canine

- **Consider if:** patient declines active treatment and/or is happy with their dental appearance
- **Resorption rule:** **early** root resorption of adjacent incisors on radiograph → consider removal
 - ✗ but where resorption is **severe** and necessitates extraction of the incisor → **exposure and alignment of the canine is usually indicated instead**
- **Best results:** good contact between **lateral incisor and first premolar** · or patient willing to undergo orthodontics to **substitute the first premolar for the canine**
- **Also considered when:** canine severely malpositioned · alignment and transplantation both ruled out · pathological changes present · retention would **impede orthodontic tooth movement**
- **Premolar-as-canine camouflage:** mesiopalatal **rotation** of the premolar · **buccal root torque** · **grinding of the palatal cusp**
- **Retained primary canine:** clinical experience → **large variation** in life expectancy
- **Grade C**

CAUTION

Surgical removal risks damage to the **roots** and to the **neurovascular supply** of adjacent teeth — assess and **discuss with the patient** before consenting.

8.2 Restorative liaison

- **Prosthetic replacement likely** (canine removed and/or severely resorbed incisor lost) → restorative dentist's opinion **at the outset** is invaluable
- **Even when closing space:** input helpful where adjacent teeth will need modification to improve aesthetics
- **Implant planned:** liaise **in advance** with the practitioner(s) who will provide the implant-retained prosthesis

8.3 Option 4 — transplantation

- **Position in the pathway:** not normally considered unless other active (or interceptive) treatment has **failed** or is inappropriate
- **Consider if:** patient unwilling to wear appliances · malposition too great for practical alignment · grossly displaced canine · prolonged orthodontics unacceptable to the patient
- **Site requirements:** **adequate space** for the canine + **sufficient alveolar bone** to accept the transplanted tooth

- **Tooth requirements:** good prognosis · **no evidence of ankylosis** · best results if removed with **minimal trauma** and **before closure of the apex**
- **Endodontics:** if root formation is advanced (i.e. **more than three-quarters** formed) → root canal therapy may need to be **commenced within 10 days** of transplantation
- **Grade B**

8.4 Transplantation outcomes

- **Early studies:** disappointing long-term results → **high frequency of root resorption**
- **Modern technique:** meticulous **atraumatic** surgery + stabilisation with a **sectional archwire for six weeks** → better results
- **Longevity:** long-term (>5 y) prognosis of transplanted palatal canines **not yet evaluated**
 - for other transplanted teeth (e.g. premolars) survival reported as high as ★**90%**

★ EXAM PEARL

Two ten-based numbers that get confused: review interception at **12 months**; start endodontics on a transplanted canine within **10 days** when >¾ of root is formed.

§9 Option 5 — no active treatment, and safe observation

- **Patient criteria:** does not want treatment · or is happy with their dental appearance
- **Radiographic criteria:** **no** evidence of root resorption of adjacent teeth · **no** other pathology
- **Occlusal criteria:** ideally good contact between lateral incisor and first premolar · **or** primary canine with a good prognosis
- **Severely displaced canines:** may be left *in situ* if no pathology — particularly when the canine is **remote from the dentition**
- **Duty of continuing care:** the practitioner providing continuing care must carry out **careful clinical examination regularly** → confirm the unerupted canine poses no risk to wellbeing
- **Evidence gap:** ★**no guidance exists** on how frequently radiographic checks should be made in the absence of relevant clinical signs or symptoms
- **Grade C**

CAUTION

"Leave and observe" is a **treatment decision with a follow-up obligation**, not discharge. Record the review interval, the clinical checks made, and the reasoning — the litigation risk in this condition attaches to undetected resorption.

9.1 Key evidence at a glance

Table 5 — The studies behind the recommendations

Source	What it established
Ericson & Kurol 1986–88	Palpability by 10–11 y · 78% reversion after primary canine extraction · incisor resorption from ectopic canines
Power & Short 1993	62% favourable eruption after removal of the deciduous canine
Armstrong et al. 2003	Horizontal parallax more reliable than vertical
Walker et al. 2005 (CBCT)	66.7% of adjacent permanent lateral incisors showed resorption
Burden et al. 1999	Closed exposure → more repeat surgery than open
Parkin et al. Cochrane 2017	No clear superiority of open vs closed exposure across outcomes
Benson et al. Cochrane 2021	Insufficient evidence for routine interceptive extraction
Becker & Chaushu 2003	Adult prognosis lower, worsens with age, treatment longer
Sagne & Thilander 1997	Atraumatic technique + 6-week sectional archwire improves transplant results
McSherry 1998 (further reading)	Review: the ectopic maxillary canine