Which of the following teeth **most often** refer pain to the temporal region?

- Mandibular molars
- Maxillary incisors
- Maxillary second premolars
- Maxillary molars

• **Maxillary second premolars**

If careful diagnosis **does not reveal** the affected tooth, other teeth and related anatomic structures become suspect. Pulpitis in one tooth may cause pain in other areas → **the pain is referred.**

Site of Pain Referral	Tooth Pulp Causing Pain
Forehead region	Maxillary incisors
Nasolabial area	Maxillary canines, premolars
Temporal region	Maxillary second premolars
Ear	Mandibular molars
Mental region of mandible	Mandible incisors, canines, and premolars

Important: The nerve endings of cranial nerves VII, IX, and X are widely distributed within the subnucleus caudalis of the trigeminal *(V)* nerve. A profuse intermingling of these nerve fibers creates the **potential for the referral of dental pain to many sites.**

Which tooth will **almost always** have two canals?

- Maxillary **first** premolar
- Maxillary **second** premolar
- Mandibular **first** premolar
- Mandibular **second** premolar

• Maxillary first premolar

Approximately 60% have two roots, one buccal and the other palatal, each with a single canal. The two roots may be completely separate or merely twin projections rising from the middle third of the root to the apex *(this is more common).* The two roots are usually equal in length from apex to cusp. However, the lingual root and canal may be wider.

In approximately 40% of **maxillary first premolars, only one root is present, usually with two separate canals**. A cross section at the cervical line shows a canal shaped like a figure eight *(ellipse)*. The access opening is a thin oval. **Be careful not to perforate on the mesial** *(the concavity on the mesial makes perforation very common).*

The apical foramen of the **maxillary first premolar** is usually close to the anatomic apex, and the apical portion of the roots often taper rapidly, ending in extremely narrow and curved root tips. The buccal root can fenestrate through the bone, leading to problems such as inaccurate apex location, chronic post-operative sensitivity to palpation over the apex, and increased risk of an irrigation accident. This tooth is also prone to mesiodistal root fractures and fractures at the base of the cusps, especially the buccal cusp.

Maxillary second premolars: The most common configuration in this **tooth is a single root,** occurring approximately 85% of the time. Approximately 15% of the time, two separate roots are present, each with a single canal. The access opening is **exactly the same** as that for maxillary first premolars *(thin oval).*

Notes:

1. **When only one canal is present** *(first or second premolar)*, it is usually found in the center of the access preparation. If only one canal is found, **but** it is not in the center of the tooth, **it is probable that another canal is present.**
2. **Overfilling either tooth** may force materials directly into the maxillary sinus.

Surrounding the wax pattern with a material which can accurately duplicate its shape and anatomical features is referred to as:

- Investing
- Burnout
- Casting
- Pickling

• Investing

Gypsum bonded investments are used with Type I,II, and III gold alloys. Gold alloys used for cast gold restorations shrink upon solidification. Therefore, it is necessary to compensate for the solidification shrinkage of the specific alloy used by **expanding the mold** enough to equal the shrinkage.

The **dimensional compensation** necessary is accomplished by **two** methods of expansion**:**

1. **Setting expansion** → occurs as a result of normal crystal growth but can be enhanced by allowing the investment to set in the presence of water, producing **hygroscopic expansion.**
2. **Thermal expansion** → is achieved through the normal expansion that occurs upon heating the silica *(quartz or cristobalite)*. **Note:** The amount of expansion depends on the particular refractory material used *(cristobalite produces greater expansion than does quartz).* ***Thermal expansion is the **principal cause** for mold expansion.

Variables that influence expansion:

- The **older** the investment is → the **less** it will expand
- If the water / powder ratio is **increased** → the expansion is **reduced**
- The **longer** the spatulation time → the **greater** the expansion
- The l**onger** the time between mixing and immersion in a water bath → the **less** it will expand

Note: During **solidification** of an alloy, the number of grains forming depends on the rate of cooling and the presence of nucleating agents.

Which of the following finishing margins is essentially a **hollow ground bevel,** creating more bulk of restorative material near the margin and providing a greater cavosurface angle?

- Knife edge
- beveled shoulder
- Chamfer
- Shoulder

• Chamfer

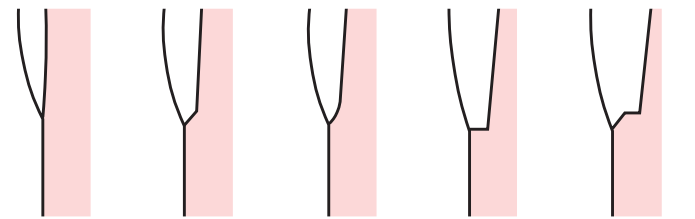
A **chamfer** is essentially a **hollow ground bevel.** Instead of a flat diagonal cut across the cavosurface margin, the chamfer is **"scooped out"** creating more bulk of restorative material near the margin and providing a greater cavosurface angle.

Cavosurface angle configurations that are used when preparing a tooth for a **cast gold restoration:**

A **bevel** is a diagonal cut across the cavosurface margin which is **flat in one dimension only** and curved in its other dimensions. It involves the external ends of enamel prisms and follows a continuous curved outline. It can be either a **short bevel** which cuts only the external one-third of the enamel prisms, a **full bevel** involving the entire thickness of enamel, or a **wide bevel** involving not only enamel but some dentin as well.

A **plane** is a diagonal cut across the cavosurface margin which is **flat in all dimensions.** A plane may involve the entire thickness of enamel *(which it usually does)* or most of it but **cannot be curved in any direction.**

Types of Finish Margins



The acronym **MEN** is a group of genetically distinct familial diseases involving adenomatous hyperplasia and malignant tumor formation in several:

- Sebaceous glands
- Intestinal glands
- Endocrine glands
- Salivary glands

• **Endocrine glands**

***These tumors occur in association with a variety of other pathologic features.

The **multiple endocrine neoplasia syndromes** *(also called* **MEN Syndrome***)* have been classified into three distinct syndromes, each is inherited as an autosomal dominant trait:

- **Men I** → consists of tumors or hyperplasia of the pituitary, parathyroids, adrenal cortex, and of the pancreatic islets.
- **Men II** *(also called* **Sipple's Syndrome** *and subtype A)* → is characterized by parathyroid hyperplasia or adenoma, but no tumors to the pancreas. **However,** in addition, these patients have pheochromocytomas of the adrenal medulla and medullary carcinoma of the thyroid gland.
- **Men III** *(also known as subtype IIB)* → is characterized by **mucocutaneous neuromas,** pheochromocytomas of the adrenal medulla and medullary carcinoma of the thyroid gland.

Important: The most constant feature of **Men III** is the presence of neuromas, particularly of the **oral cavity.** These are most common on the lips, tongue, and buccal mucosa.

Note: The most important aspect of this syndrome is the **medullary carcinoma of the thyroid** because of its ability to metastasize and cause death. Therefore, the detection of the mucosal neuromas may alert the clinician for early diagnosis and treatment.

Which of the following is probably the most common benign peripheral nerve tumor?

- Traumatic neuroma
- Neurilemoma *(Schwannoma)*
- Neurofibroma
- Lipofibroma

- **Neurofibroma** → this is a tumor of the nerve fibers itself, it commonly appears as a sessile, firm, pink nodule

On occasion a solitary neurofibroma is seen in isolation, however, more frequently they are seen as a part of neurofibromatosis. **Neurofibromatosis** is a genetic disorder that may be associated with multiple neurofibromas. This disease is transmitted through an autosomal dominant mutant gene. There are two types of neurofibromatosis, type 1 and type 2. Type 1 *(von Recklinghausen's disease)* affects 1 in 3000 people; however, the majority of cases are mild with a limited number of tumors. Type 2, which is more severe, affects 1 in 50,000 people.

Tumor	Etiology	Clinical Character	Treatment and Prognosis
Traumatic Neuroma	Trauma to a peripheral nerve	Most common site over mental foramen in edentulous mouths; nodule or swelling, which may be painful to digital pressure	Excision with small proximal portion of involved nerve; recurrence uncommon
Neurilemoma *(Schwannoma)*	It is derived from proliferation of **Schwann cells** of the neurolemma that surrounds peripheral nerves	Encapsulated mass that presents as an asymptomatic lump. The **tongue** is the most common location. Bony lesions may cause pain or paresthesia.	Conservative excision; recurrence rare
Neurofibroma	Some investigators say it is derived from the Schwann cell;	**Two forms:** 1. **Solitary neurofibroma** — asymptomatic nodule, occurs on tongue, buccal mucosa and vestibule 2. **Multiple** lesions as part of the syndrome neurofibromatosis	1. **Solitary:** surgical excision 2. **Neurofibromatosis:** removal is impractical. Watch for high rate of malignant transformation
Palisaded Encapsulated Neuroma	Unknown	Sessile, smooth– surfaced nodule of less than 1 cm in diameter. Predilection for the face, with nose and cheek most common	Local surgical excision: recurrence rare

Which of the following is considered to be the normal prothrombin time *(PT)?*

- < 7 seconds $\pm$ 2 seconds
- < 11 seconds $\pm$ 2 seconds
- < 14 seconds $\pm$ 2 seconds
- < 25 seconds $\pm$ 2 second

• **< 11 seconds $\pm$ 2 seconds**

***To be a good candidate for surgery, the PT time should be **within 5 - 7 seconds** of the control sample.

Other tests used to measure a patient's clotting mechanisms:

- PTT *(partial thromboplastin time)* → detects coagulation defects of the intrinsic system. **Basic test for hemophilia.** Normal value - 25-36 seconds.
- Bleeding time → *(Ivy method)*, normal value = less than 9 minutes.
- Platelet counts → normal value = 150,000 - 450,000 per 1 cu mm of blood. The **minimal platelet count** for oral surgery is **50,000.**
- **INR** → is now the **preferred lab test** for assessing anticoagulant therapy in the patient taking warfarin.

The **INR** now is the preferred laboratory test for assessing anticoagulant therapy in the patient taking warfarin. The PT test has been used but this test was of limited value because of the variability among laboratories. To promote standardization of the PT test, the World Health Organization developed an international reference thromboplastin from human brain tissue and recommended that the PT ratio be expressed as the INR. While the INR range for minor oral surgery is subjective, local hemostatic measures generally are very effective if the INR **is less than 4.** No oral surgery, even of a minor nature, should be performed if the INR is **greater than 5.** For most patients on long-term warfarin therapy, the target INR is 2–3; these patients can be managed safely and effectively in the dental office. The normal INR for a non-anticoagulant patient **is 1.**

Important: Perhaps the **single most important** consideration in ruling out hemorrhagic disorder is **history.**

What nerve supplies sensory innervation to the anterior two-thirds of the tongue?

- Ophthalmic division *(V–1)*
- Maxillary division *(V–2)*
- Mandibular division *(V–3)*

• **Mandibular division *(V–3)***

Remember: The trigeminal nerve contains **no** parasympathetic component at its origin.

Sensory innervation of V–3:

- Cheek
- Mandibular buccal gingiva

} **long buccal** nerve *(sensory only)*

- Jaw joint *(TMJ)*
- Auricle
- External auditory meatus

} **auriculotemporal** nerve *(sensory only)*

- Floor of mouth
- Mandibular lingual gingiva
- Anterior two-thirds of tongue

} **lingual** nerve *(sensory only)*

- Mandibular teeth
- Skin of chin and lower lip

} **Inferior alveolar** nerve *(mixed sensor and motor)*

Innervation of the tongue:

Motor: Hypoglossal *(XII)* nerve supplies both the intrinsic and extrinsic muscles of the tongue.

Sensory: Anterior 2/3: taste → chorda tympani branch of the facial nerve *(VII)*

sensation → lingual branch of mandibular division of trigeminal nerve

Posterior 1/3: both taste and general sensation by the glossopharyngeal nerve

Which space maintainer is most often used when the primary first molar needs to be prematurely extracted?

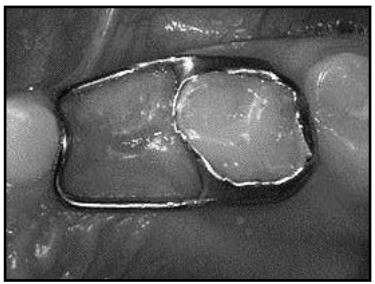
- "Band and loop" space maintainer
- "Distal shoe" space maintainer
- "Lingual arch" appliance
- "Nance" appliance

- **"Band and loop" space maintainer**

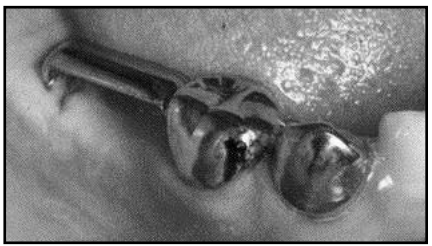
Space maintainers which replace one prematurely missing primary tooth include:

- The **"band and loop"** → used after unilateral loss of a primary first molar. It consists of a band which is cemented usually to a primary second molar. Attached to this band is a loop, which extends to the distal surface of the canine. The loop prevents the mesial migration of the primary second molar.

  ***Note:** Limited strength allows only single tooth-space maintenance.



This photograph shows an example of a fixed unilateral appliance on the maxillary left side for a seven-year-old patient. The photograph demonstrates the appliance after cementation. This appliance is referred to as a **band and loop** space maintainer and is a favorite among many clinicians.



This appliance is called a **distal shoe** space maintainer or a distal extension space maintainer. It is used to prevent unerupted first permanent molars from moving mesially with the premature loss of second primary molars. The example shown is a crown with a distal extension segment soldered to the crown. The distal segment is extended into the tissue against the unerupted first permanent molar. The distal extension, also called a distal shoe, is used when the second primary molars are lost prior to the eruption of the first permanent molars *(i.e., very premature loss)*.

A nine year old patient had an extraction of the primary mandibular first molar. The ideal treatment at this time is:

- Place a fixed bridge
- Place a space maintainer
- Place a removable partial denture
- Do nothing and observe
- Place an implant

• Place a space maintainer

Although this can be done with either fixed or removable appliances, fixed appliances are preferred in most situations because they eliminate the factor of patient cooperation. If the space is unilateral, it can be managed by a unilateral fixed appliance *("band and loop" space maintainer)*. If molars on both sides have been lost and the permanent incisors have erupted, it is usually better to place a **"lingual arch"** space maintainer *(See picture below)*.

The **lingual arch** appliance, as demonstrated in the photograph, would be the appliance of choice for some clinicians in a situation where both primary first molars have been lost in the primary dentition. The bilateral appliance is very stable since it is anchored to two teeth.

Notes:

1. Premature loss of a **primary maxillary second molar** usually produces a Class II molar relationship on the affected side. A **distal shoe** space maintainer may help alleviate this potential problem. This appliance extends backwards from a crown on the primary first molar and subgingivally to the mesial line of the unerupted first permanent molar, **thus preventing** mesial migration.
2. With the **"lingual arch"** space maintainer, the primary second molars or permanent first molars are banded. Typically, the "lingual arch" space maintainer is comprised of two bands which are cemented to the primary second molars or permanent first molars with a loop of wire that rests on the cingula of the incisors.

Which **pulpotomy technique** is recommended in the treatment of **primary** teeth that have had a **carious exposure?**

- Calcium hydroxide technique
- Formocresol technique

• Formocresol technique

The **formocresol technique** is recommended in the treatment of primary teeth that have had a carious exposure. Selection of teeth is the same as for the calcium hydroxide technique and is also carried out in one appointment. After the coronal pulp has been removed *(amputated),* a cotton pellet **moistened with formocresol** is placed in contact with the pulp stumps and is allowed to **remain for 5 minutes.** The pellet is then removed and the pulp chamber is dried. A thick paste of zinc oxide-eugenol is placed over the chamber and the tooth is restored. **The success of a formocresol pulpotomy for a primary tooth depends primarily on a vital root tip.**

The reason for performing a pulpotomy using either technique is that the coronal pulp shows evidence of inflammation and degenerative change due to microorganisms located there. The pulpotomy procedure **preserves** the radicular vital pulp tissue when the entire coronal pulp is amputated. This procedure **allows resorption and exfoliation** of the primary tooth but preserves its role as a natural space maintainer.

Note: Formocresol (*formalin and cresol*) will cause surface fixation of the pulpal tissue accompanied by degeneration of the odontoblasts.

All of the following are **contraindications** to performing a direct pulp cap on a primary tooth **except:**

- Spontaneous pain from the tooth
- A pinpoint exposure with little or no hemorrhaging (*bleeding*)
- A large exposure
- Excessive hemorrhaging (*bleeding*)
- Radiographic evidence of internal resorption

• A pinpoint exposure with little or no hemorrhaging (*bleeding*)

Direct pulp capping is primarily used on permanent teeth. The reason it is not widely used on primary teeth is because of the alkaline pH of CaOH. CaOH can effect (*irritate*) the pulp either mildly or **most often severely.** With a **mild irritation,** there is a mild inflammatory reaction which will resolve itself and regroup as reparative dentin. With **severe irritation,** there is a **probability of internal resorption.** In primary teeth this severe irritation resulting in internal resorption happens **more often than not.** In permanent teeth this **rarely occurs,** because the severe inflammatory response will cause reparative dentin to form.

Despite this, there are **indications** for performing a direct pulp cap on **primary** teeth:

- Tooth must be **asymptomatic**
- Must be a **small exposure** with **little** or no **hemorrhaging**

Mineral trioxide aggregate *(MTA)* was developed at the University of Loma Linda to seal communications between the root canal system and the external tooth surface at all levels, and recently indicated in pulp treatment as a direct pulp capping agent. Studies have shown that mineral trioxide aggregate presents similar responses to calcium hydroxide in the pulp tissue and periapical region when used for direct pulp capping.

Local anesthetics theoretically should be **less effective** in acutely inflamed tissue than in normal tissue because in inflamed tissue what happens?

- The pH rises, thus inactivating the anesthetic
- The pH rises, thus decreasing available free base
- The pH decreases, thus decreasing available free base
- The pH remains the same, the extracellular fluid dilutes the anesthetic

- **The pH decreases, thus decreasing available free base**

At body pH *(7.4)*, a local anesthetic when infiltrated, will chemically exist as a portion which is ionized *(has a proton attached)* and as a portion which is non-ionized *(has no proton attached)*. **Note:** A proton is nothing more than a hydrogen *(H+)* atom. That portion which is ionized has difficulty penetrating the nerve and will not be effective. That portion which is non-ionized will penetrate the nerve to cause anesthesia. That portion which is non-ionized is also known as the free base. The more proportion of the anesthetic which is in the free base form, the more effective it will be.

When tissue conditions are **normal** *(pH 7.4),* approximately **10-20%** portion of an infiltrated local anesthetic is in the form of the free base *(non-ionized form)*. This is enough to penetrate the nerve to cause anesthesia. When tissues are **acidic**, as in the case of tissue infection, less free base portion exists and more ionized portion is present. There is not enough free base form to penetrate the nerve to cause anesthesia. Therefore, the local anesthetic when infiltrated to the tissue site is not effective at the normal anesthetic doses.

A dental anesthetic carpule contains 1.8 ml of a 2% solution of lidocaine with 1:100,000 epinephrine. How much lidocaine and epinephrine does the carpule contain?

- 3.6 mg lidocaine and 0.18 mg epinephrine
- 3.6 mg lidocaine and 0.018 mg epinephrine
- 36 mg lidocaine and 0.18 mg epinephrine
- 36 mg lidocaine and 0.018 mg epinephrine

- **36 mg of lidocaine and 0.018 mg of epinephrine**

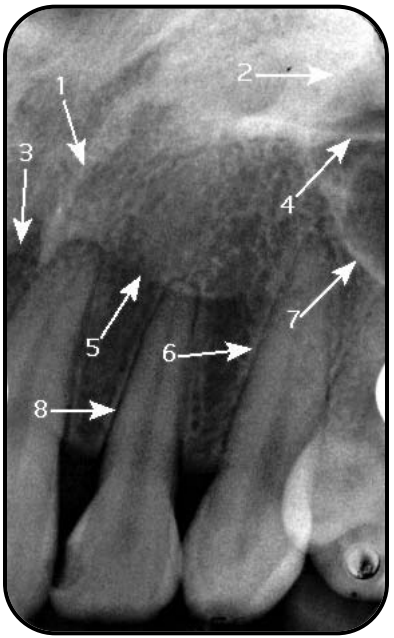
Key to question: 1 ml of a 2% solution of lidocaine with 1:100,000 epinephrine contains 20 mg of lidocaine and 0.010 mg of epinephrine.

A dental carpule contains 1.8 ml solution. Therefore, 1.8 ml of 2% solution of lidocaine with 1:100,000 epinephrine contains 36 mg of lidocaine and 0.018 mg epinephrine.

Epinephrine *(vasoconstrictor)* is included in local anesthetics for the following reasons:

- It prolongs the duration of action
- It reduces toxicity
- It reduces the rate of vascular absorption
- It provides a hemostatic effect to reduce bleeding at injection site

Identify each structure that the arrows 1 — 8 point to in the **anterior region** of the maxilla.



"Courtesy Dr. Stuart C. White, UCLA School of Dentistry."

1. **The opaque line** → Lateral wall of nasopalatine canal

2. **The opaque line** → Anterior wall of maxillary sinus

3. **The radiolucent structure** → Nasopalatine fossa

4. **The opaque line** → Floor of nasal fossa

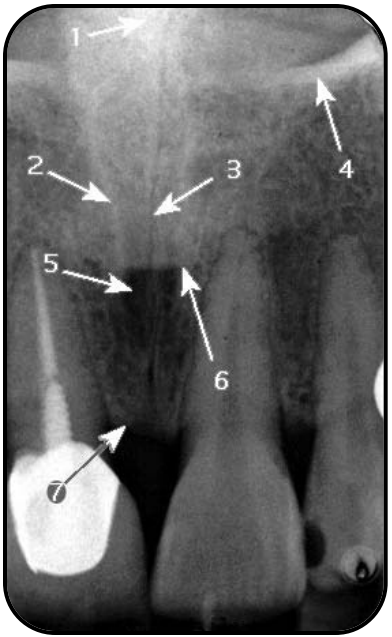
5. **The opaque structure** → Soft tissue tip of nose

6. **The opaque line** → Lamina dura

7. **The opaque line** → Border of maxillary sinus

8. **The radiolucent line** → Periodontal ligament space

Identify each structure that the arrows 1 — 7 point to in the **anterior region** of the maxilla.



"Courtesy Dr. Stuart C. White, UCLA School of Dentistry."

1. **The opaque structure** → Anterior nasal spine

2. **The opaque line** → Lateral wall of nasopalatine canal

3. **The radiolucent line** → Intermaxillary suture

4. **The opaque line** → Floor of nasal fossa

5. **The radiolucent structure** → Nasopalatine fossa

6. **The radiopaque line** → Soft tissue tip of nose

7. **The opaque structure** → Alveolar crest