Pain Management Workshop: Anatomy Review

University of Manitoba | Rady Faculty of Health Sciences

Presenter Disclosure

- **Faculty Member:** Diane Girardin, dip. DH, RDH

- **Relationships with commercial interests:**
  - None to report

Disclosure of Commercial Support

- This program has not received any financial support from industry.

- This program has not received any gifts-in-kind from industry.

Landmarks to Identify

Maxilla

Facial Surface

- Anterior Nasal Spine
- Canine Eminence
- Canine Fossa
- Infraorbital Foramen
- Zygomatic Process
- Pterygomaxillary Fissure & pterygopalatine Fossa
- Foramen for PSA Nerve
- Maxillary Tuberosity

Maxilla

Palatal Surface

- Incisive Foramen
- Premaxilla
- Palatine Process

Palatine Bone

- Horizontal Process of the Palatine Bone
- Greater Palatine Foramen

Landmarks (Continued)

Mandible

Facial Aspect

- Condylar Head
- Condylar Neck
- Coronoid Process
- Ramus
- Coronoid Notch
- Mandibular Notch
- External border of the Ramus
- Mental Foramen
- Mental protuberance
- Alveolar Process

Mandible

Lingual Aspect

- Mylohyoid Line
- Mandibular Foramen
- Lingula
- Genial Tubercles
- Lingual Foramen
- Internal border of the Ramus

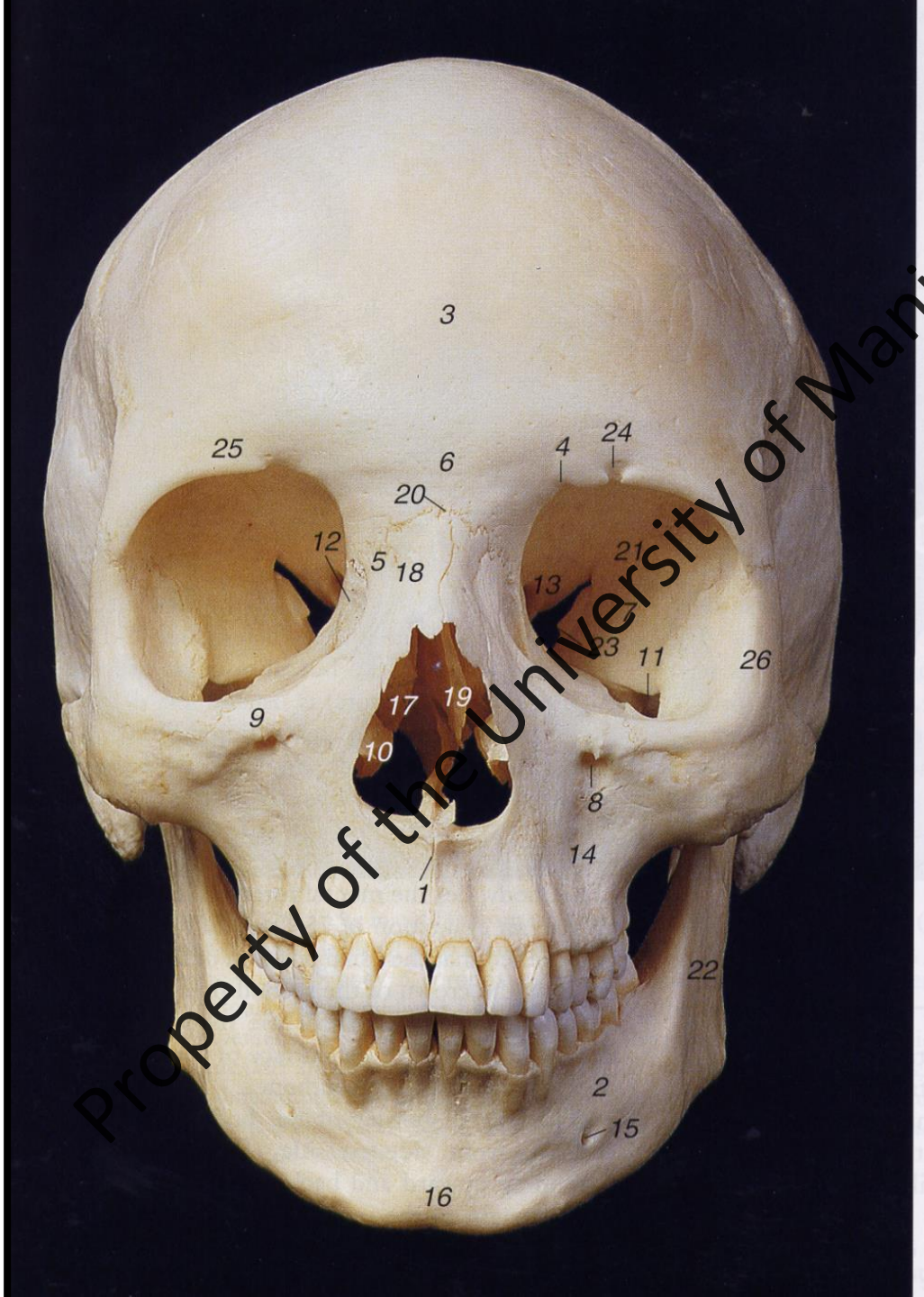
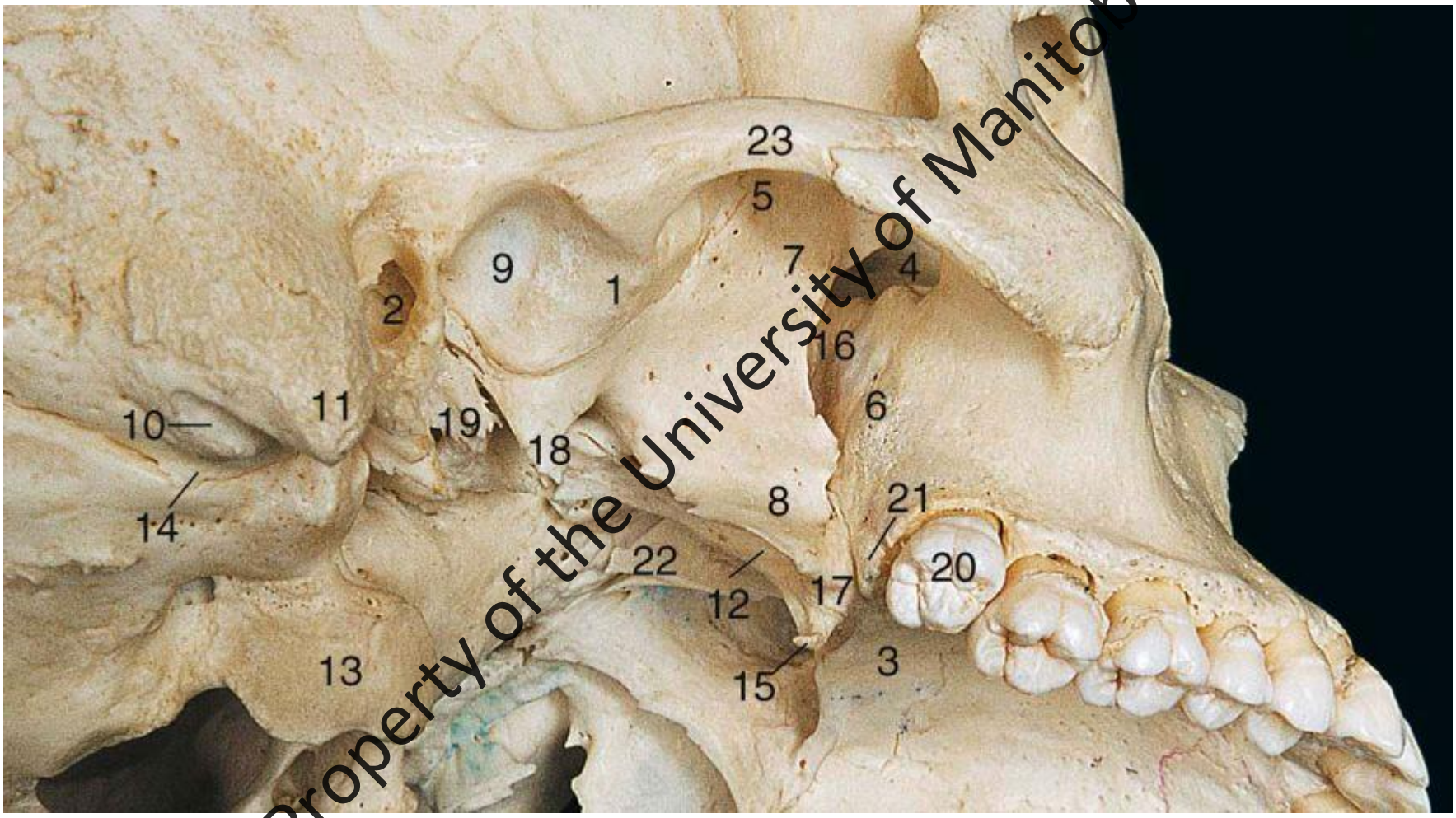
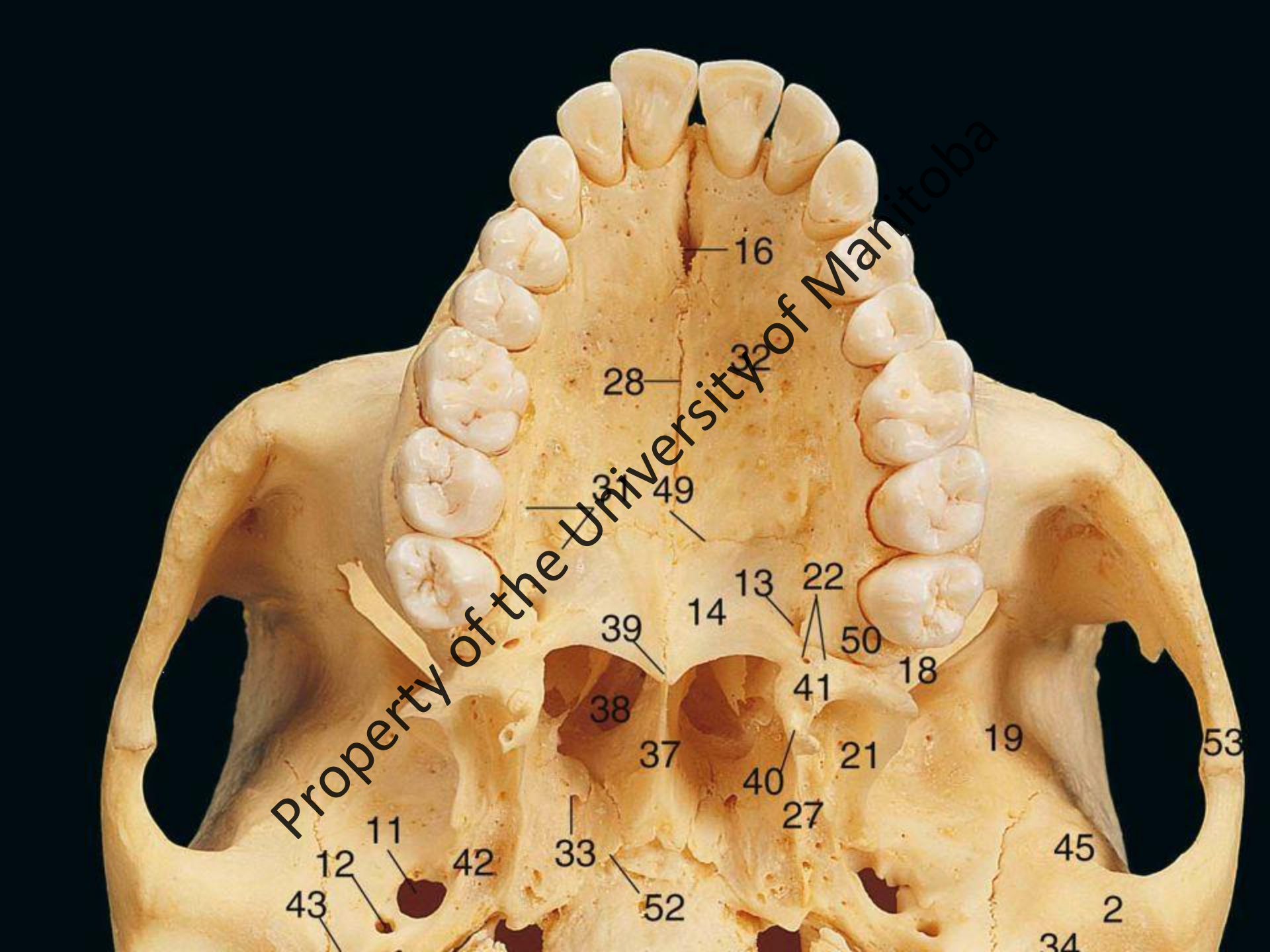
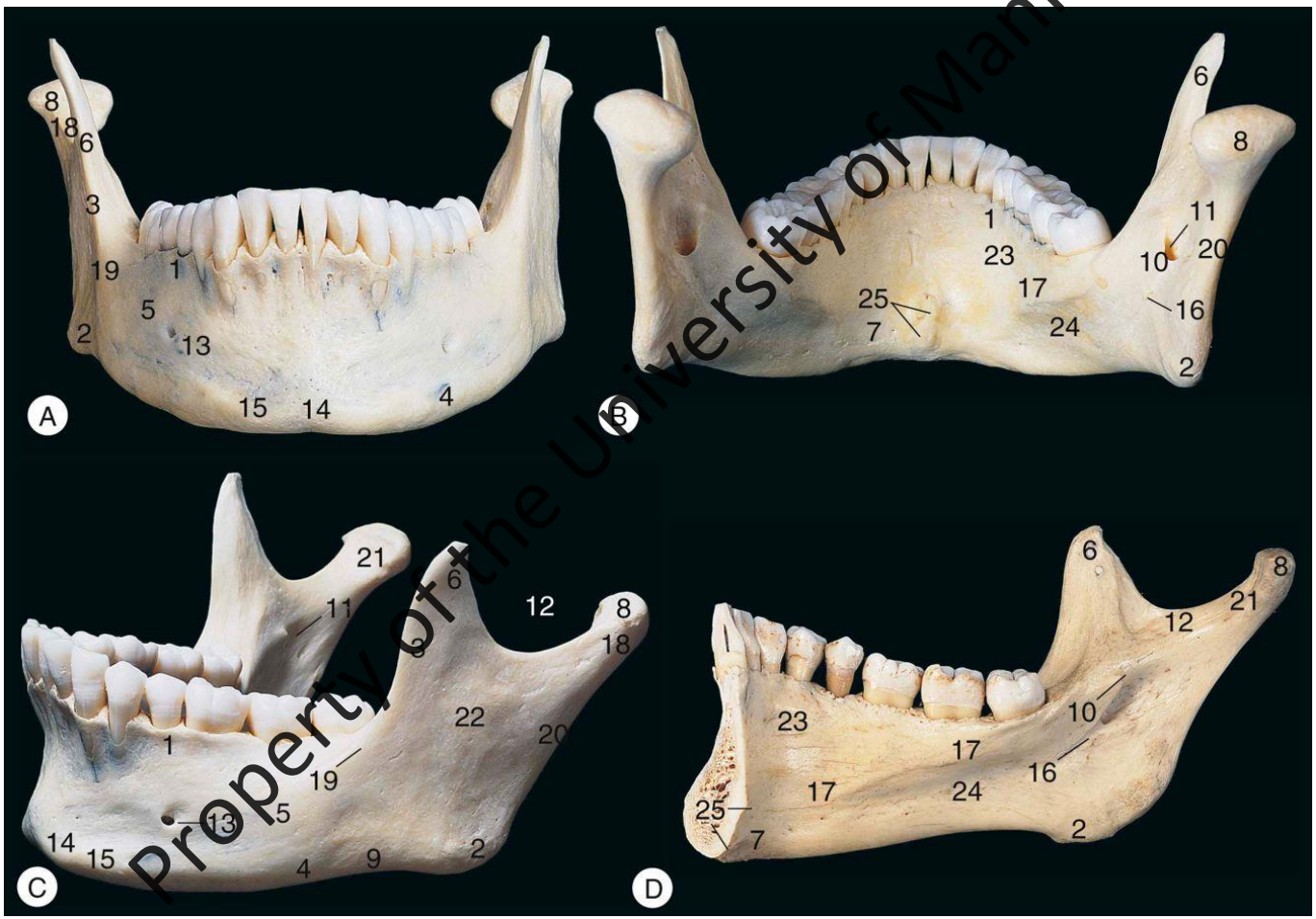


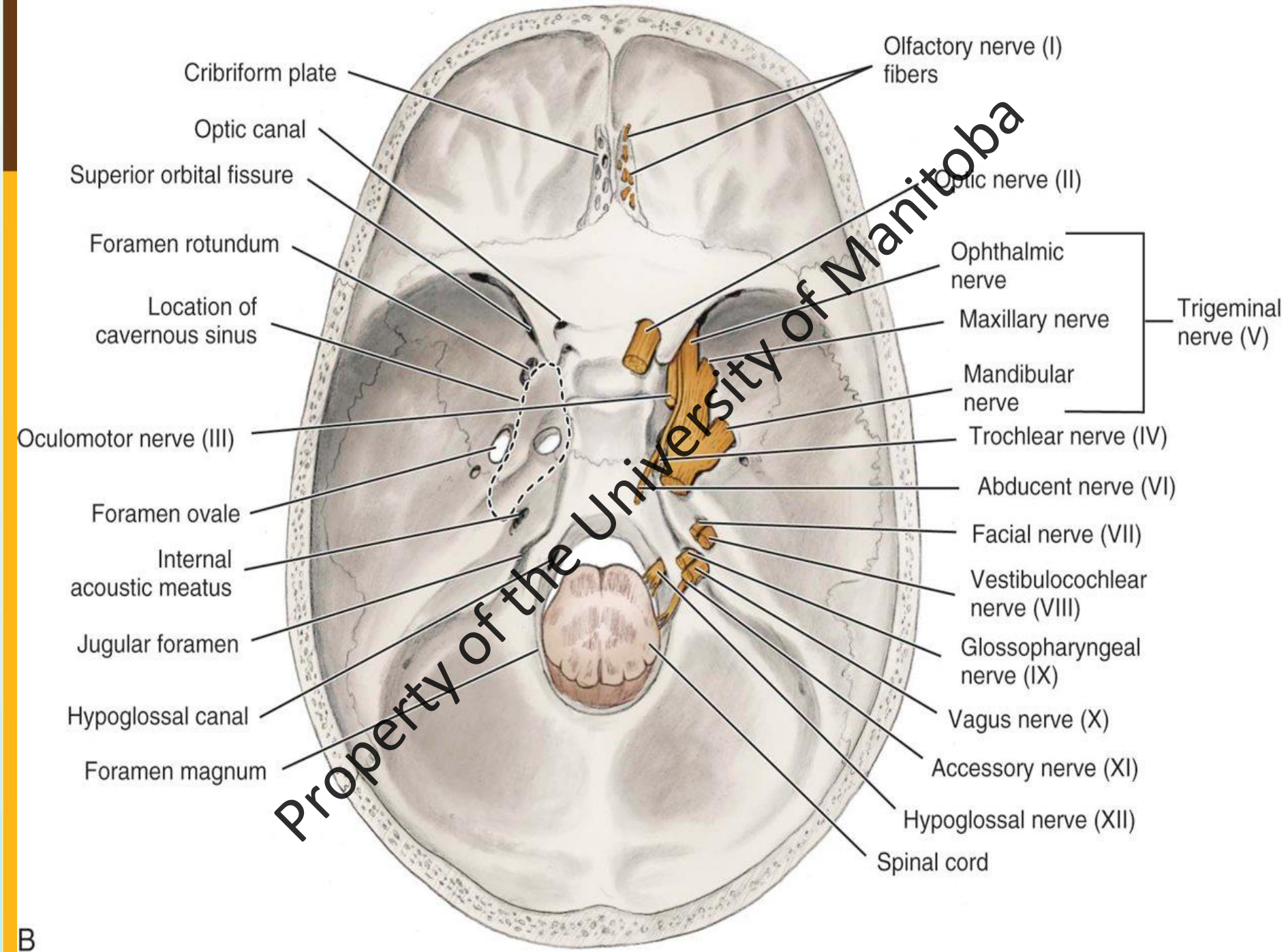
Figure 12-16. Anterior view of the skull. *1*, Anterior nasal spine; *2*, body of mandible; *3*, frontal bone; *4*, frontal notch; *5*, frontal process of maxilla; *6*, glabella; 7, greater wing of sphenoid bone; *8*, infraorbital foramen; *9*, infraorbital margin; *10*, inferior nasal concha; *11*, inferior orbital fissure; *12*, lacrimal bone; *13*, lesser wing of sphenoid bone; *14*, maxilla; *15*, mental foramen; *16*, mental protuberance; *17*, middle nasal concha; 18, nasal bone; *19*, nasal septum; *20*, nasion; *21*, orbit (orbital cavity); *22*, ramus of mandible; *23*, superior orbital fissure; *24*, supraorbital foramen; *25*, supraorbital margin; *26*, zygomatic bone. (Data from Abrahams PH, Marks SC Jr, Hutchings RT: *McMinn's color atlas of human anatomy*, ed 5, St Louis, 2003, Mosby.)



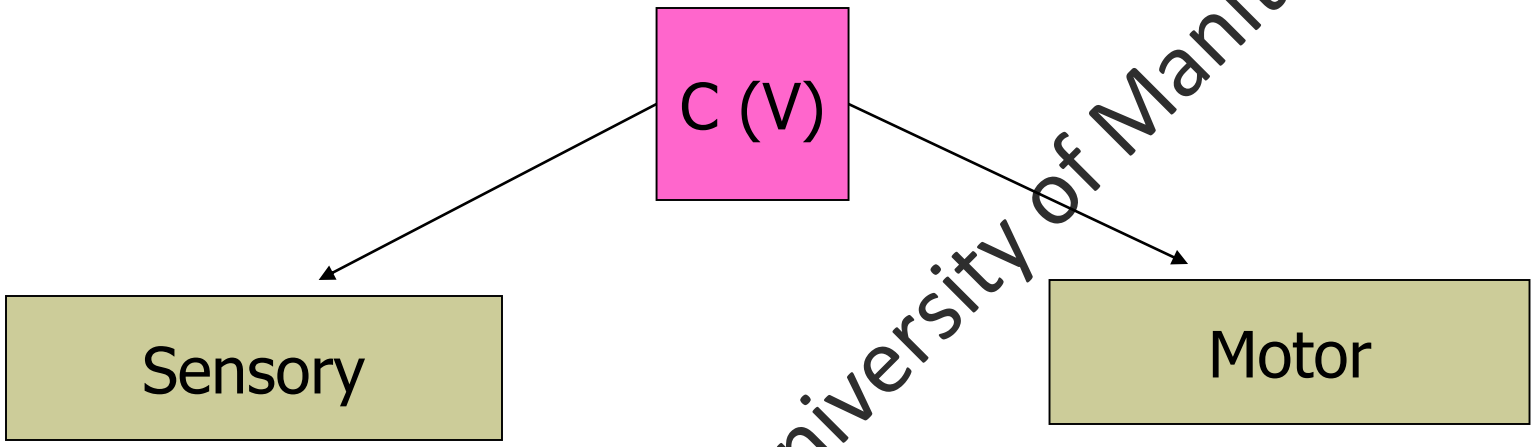


MANDIBLE





Trigeminal Nerve C (V)



General Sensation
Face
Mucous membranes
Teeth
Alveolar Bone
Periodontal Tissues

Muscles of Mastication
Mylohyoid
Digastric

Divisions of C (V)

V_1 Ophthalmic

V_2 Maxillary

V_3 Mandibular

Opthalmic Division (V1)

Cranial Exit:
Superior orbital fissure

Innervates:
Eyeball
Conjunctiva
Lacrimal Gland
Mucous Membranes of nose & paranasal sinuses
Skin of Forehead
Eyelids & Nose

Maxillary Division (V2)

Cranial Exit:

Foramen Rotundum

Innervates:

Maxillary teeth, alveolar bone and periodontal structures

Pathway:

- Crosses pterygopalatine Fossa
- Three branches:
  - Zygomatic n.
  - Posterior Superior Alveolar n.
  - Pterygopalatine n. (Greater Palatine n. & nasopalatine n.)
- Then enters orbit through inferior orbital fissure & becomes the Infraorbital n. & occupies the infraorbital canal
- Enters face through infraorbital foramen as the infraorbital n.
- While within the infraorbital foramen, the nerve gives off 2 branches that travel through the maxilla into the face, MSA and ASA

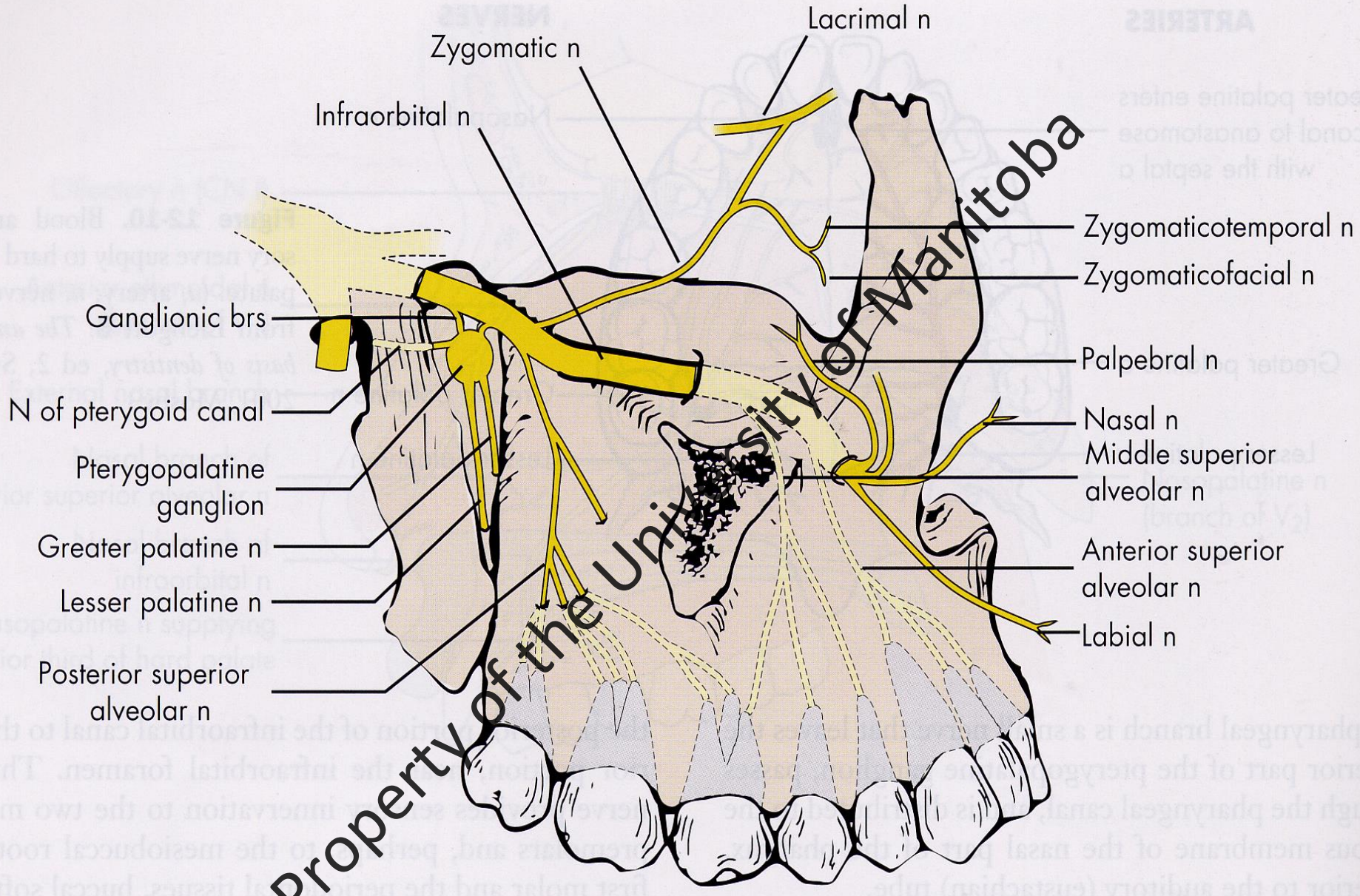


Figure 12-11. Maxillary nerve and its branches (*brs*, branches; *n*, nerve). (Data from Liebgott B: *The anatomical basis of dentistry*, ed 2, St Louis, 2001, Mosby.)

Mandibular Division (V3)

Cranial Exit:

Foramen Ovale

Anterior Division:

Long buccal n.

- Important to anesthetize this nerve in therapy requiring soft tissue manipulation of buccals of Mandibular molars

Mandibular Division (V3) (continued)

Posterior Division

1. Lingual n.
2. Mylohyoid n.
3. Inferior Alveolar n. (enters mandibular canal at level of mandibular foramen and travels as far as the mental foramen)
4. Mental n.
5. Incisive n. (Stays in bone beyond mental foramen and innervates teeth anterior to mental foramen)
6. Dental Plexus

*.95% of Mandibular Canals are Bifid

Landmarks for the ASA

- Canine Eminence
- Canine Fossa
- Sensation to Central, Lateral and Canine AND Facial Gingiva

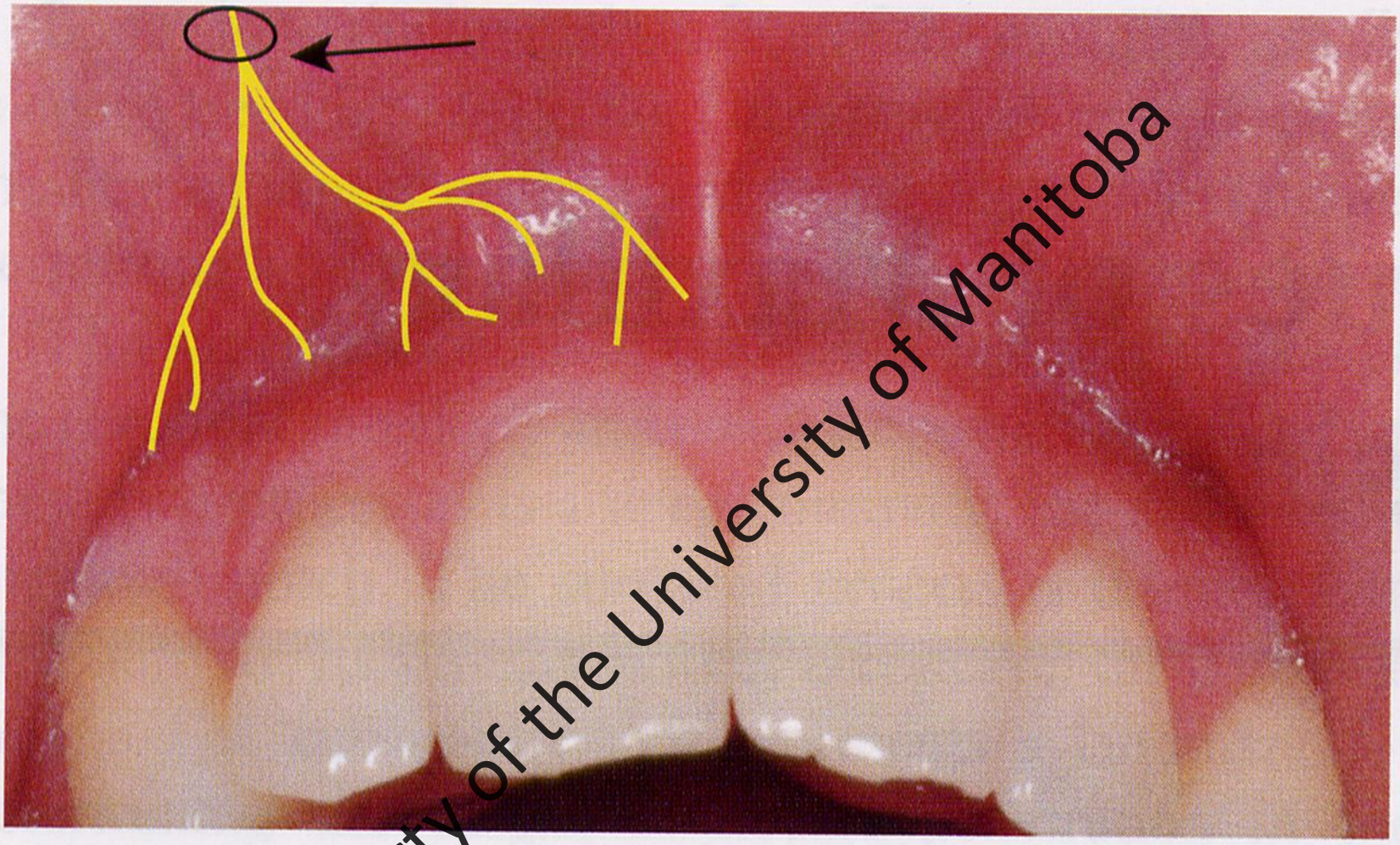


Figure 13-3. Nerve block. Local anesthetic is deposited close to the main nerve trunk, located at a distance from the site of incision *(arrow)*.

Landmarks for the MSA

- Zygomatic Process
- Two Premolars
- Mucobuccal Fold

- Sensation to the 2 premolars and the mesial buccal root of the first molar **AND**

  The Facial Gingiva

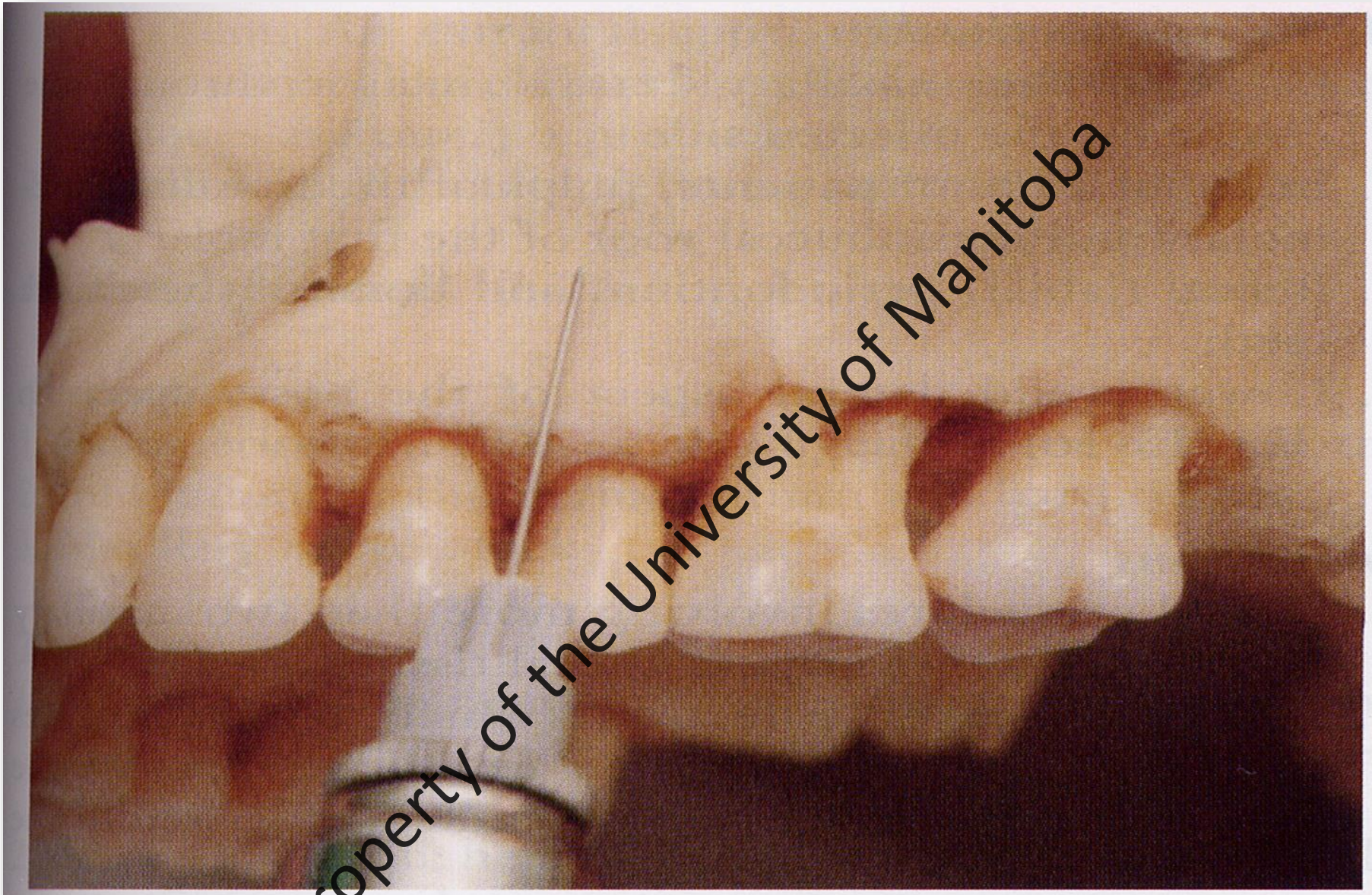


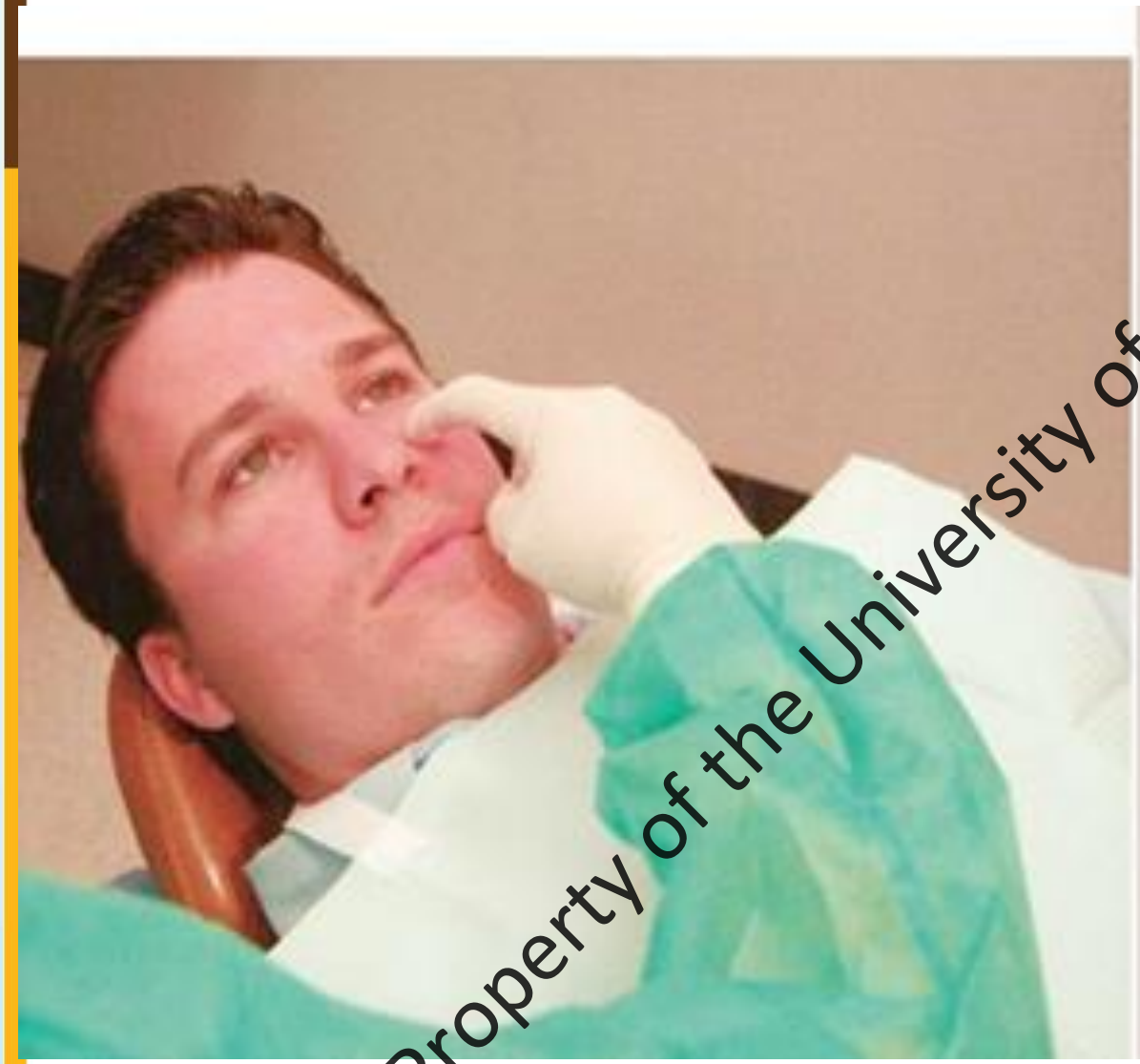
Figure 13-13. Position of needle between maxillary premolars for a middle superior alveolar (MSA) nerve block.

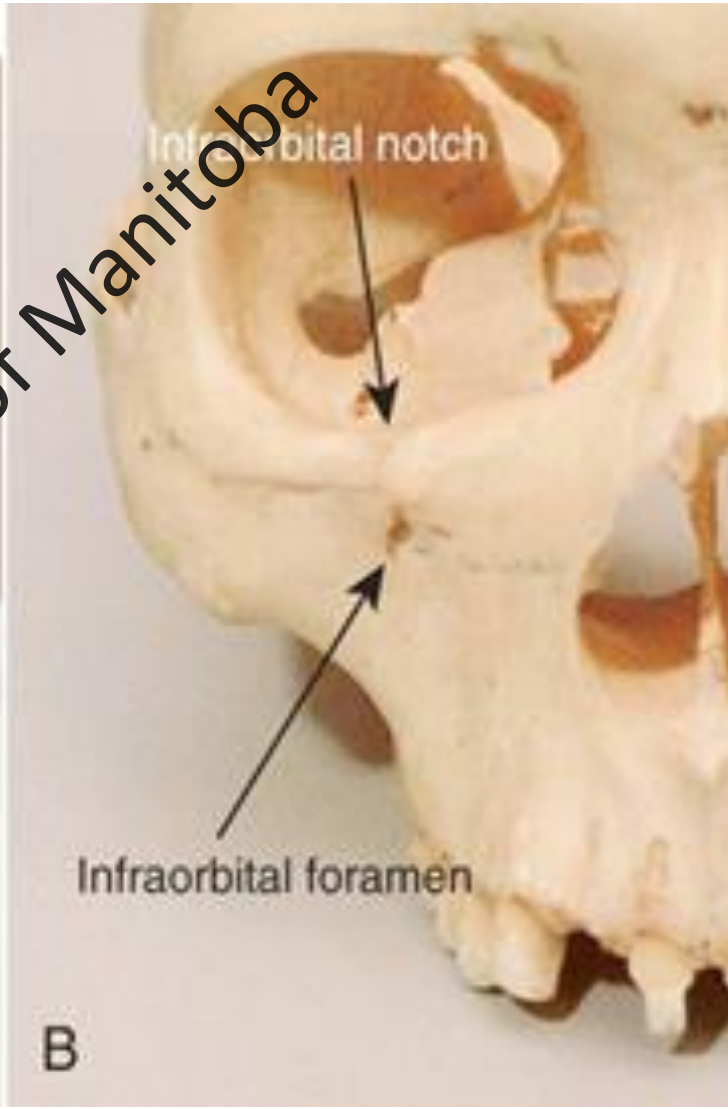
Figure 13-15. Needle penetration for a middle superior alveloar (MSA) nerve block.

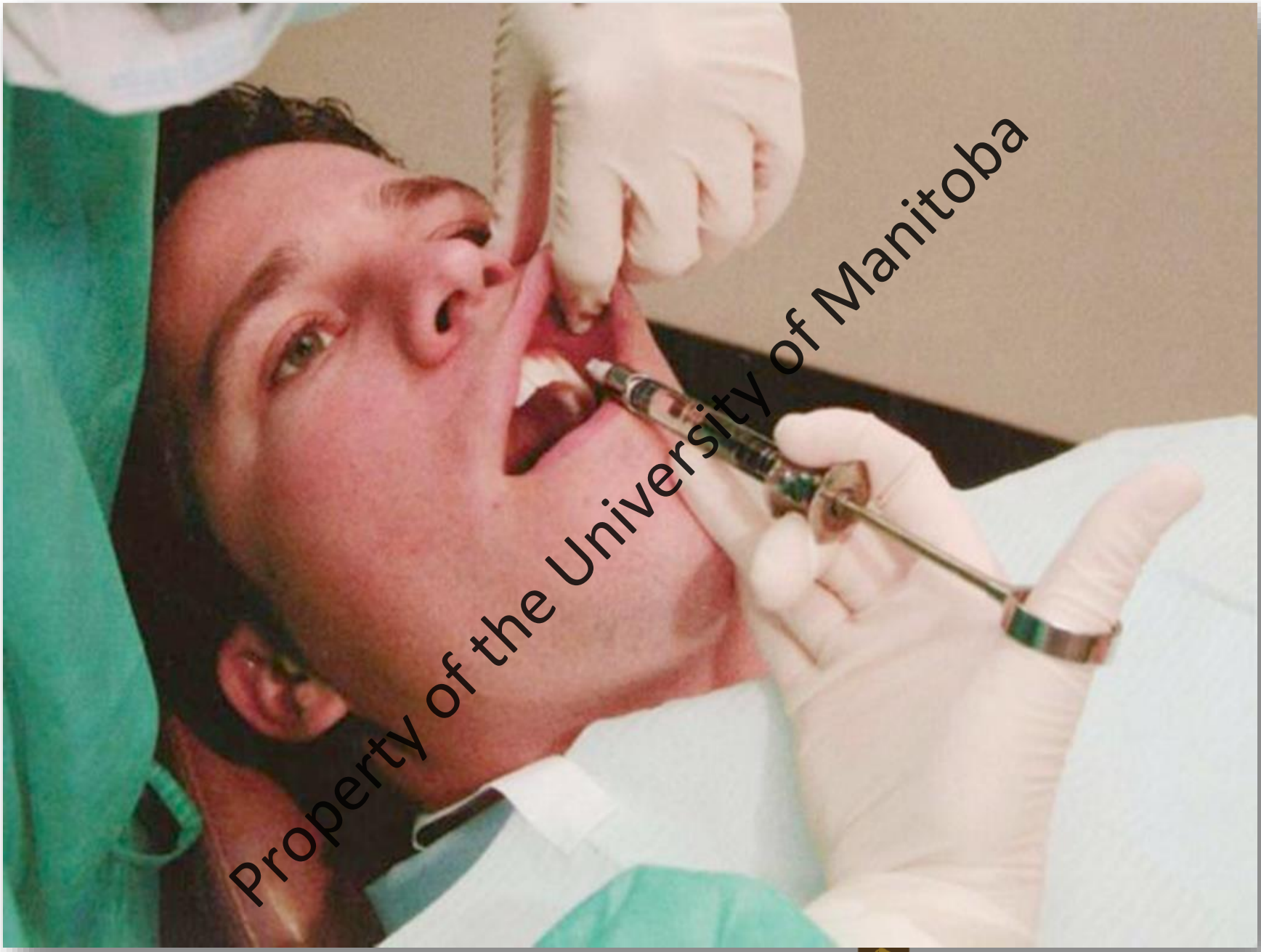
Landmarks for the Infra-Orbital (I/0)

- Mucobuccal fold
- First pre-molar
- Infra-orbital notch
- Infra-orbital foramen

Sensation to Mx anteriors, pre-molars and MB root of Mx first molar, buccal gingiva, lower eyelid, lateral aspect of the nose, upper lip



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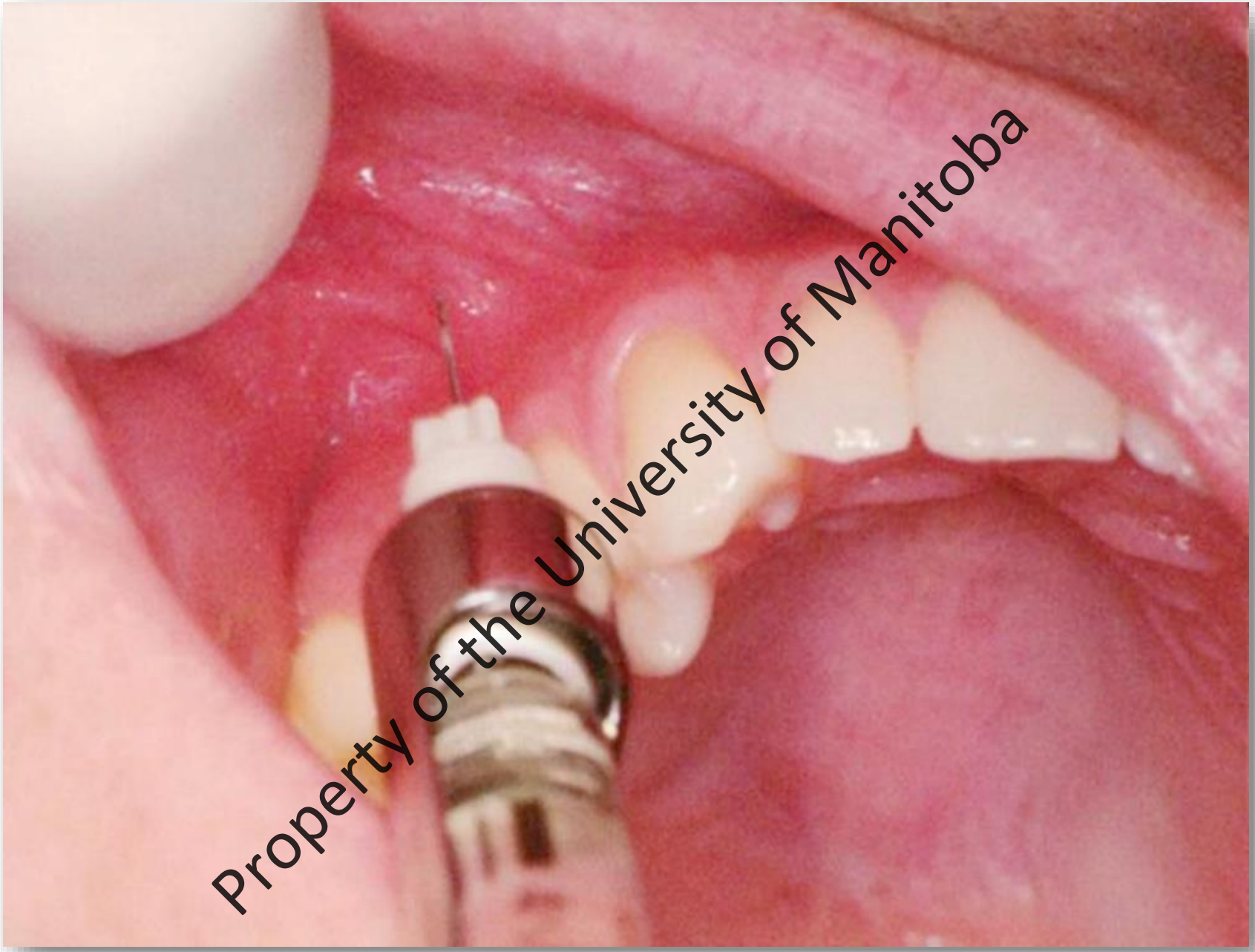
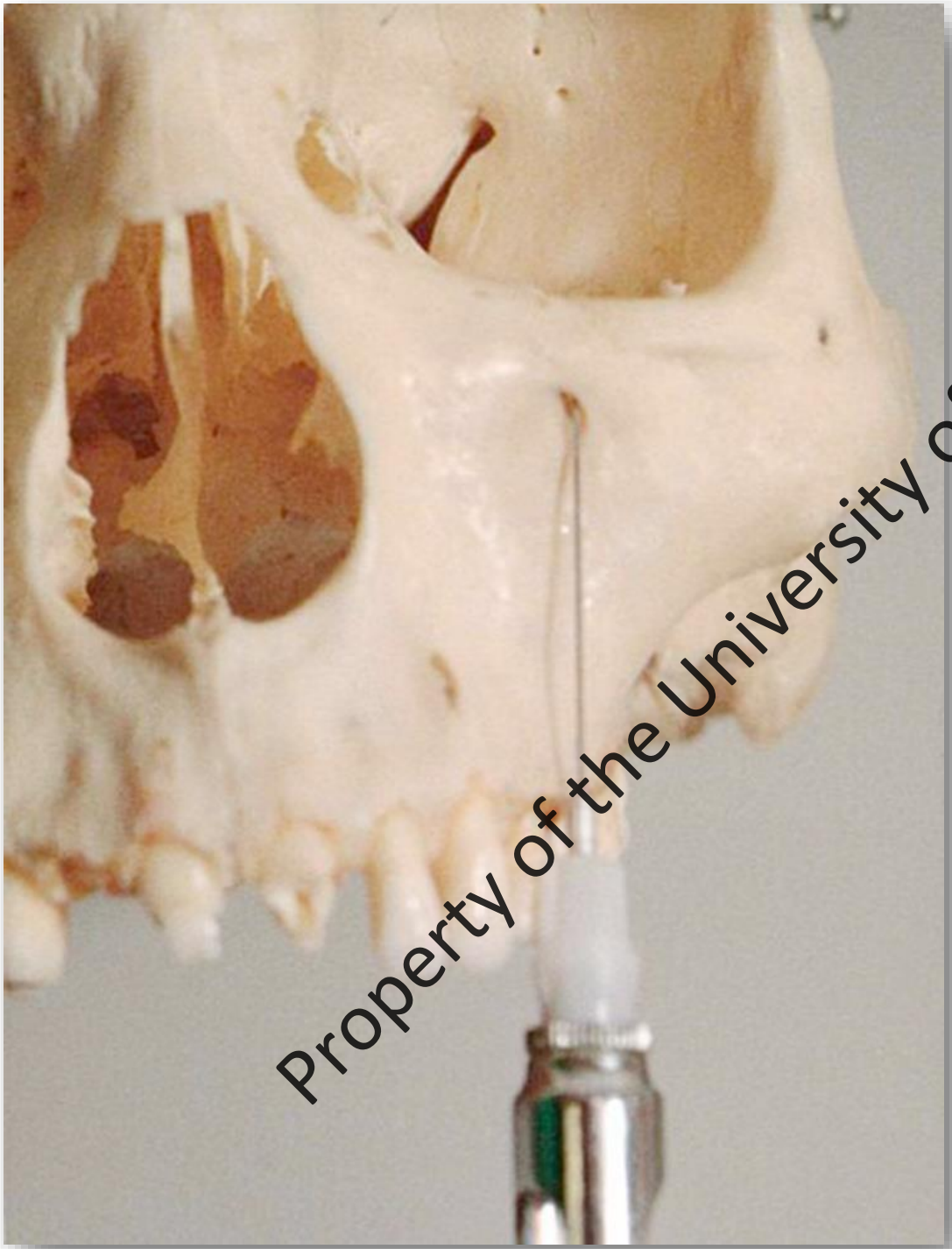




Landmarks for the PSA

- Zygomatic Process (of the maxilla)
- Mucobuccal fold
- Maxillary Tuberosity

Sensation to the three molars with exception of MB root of the 1st molar

AND the Facial Gingiva

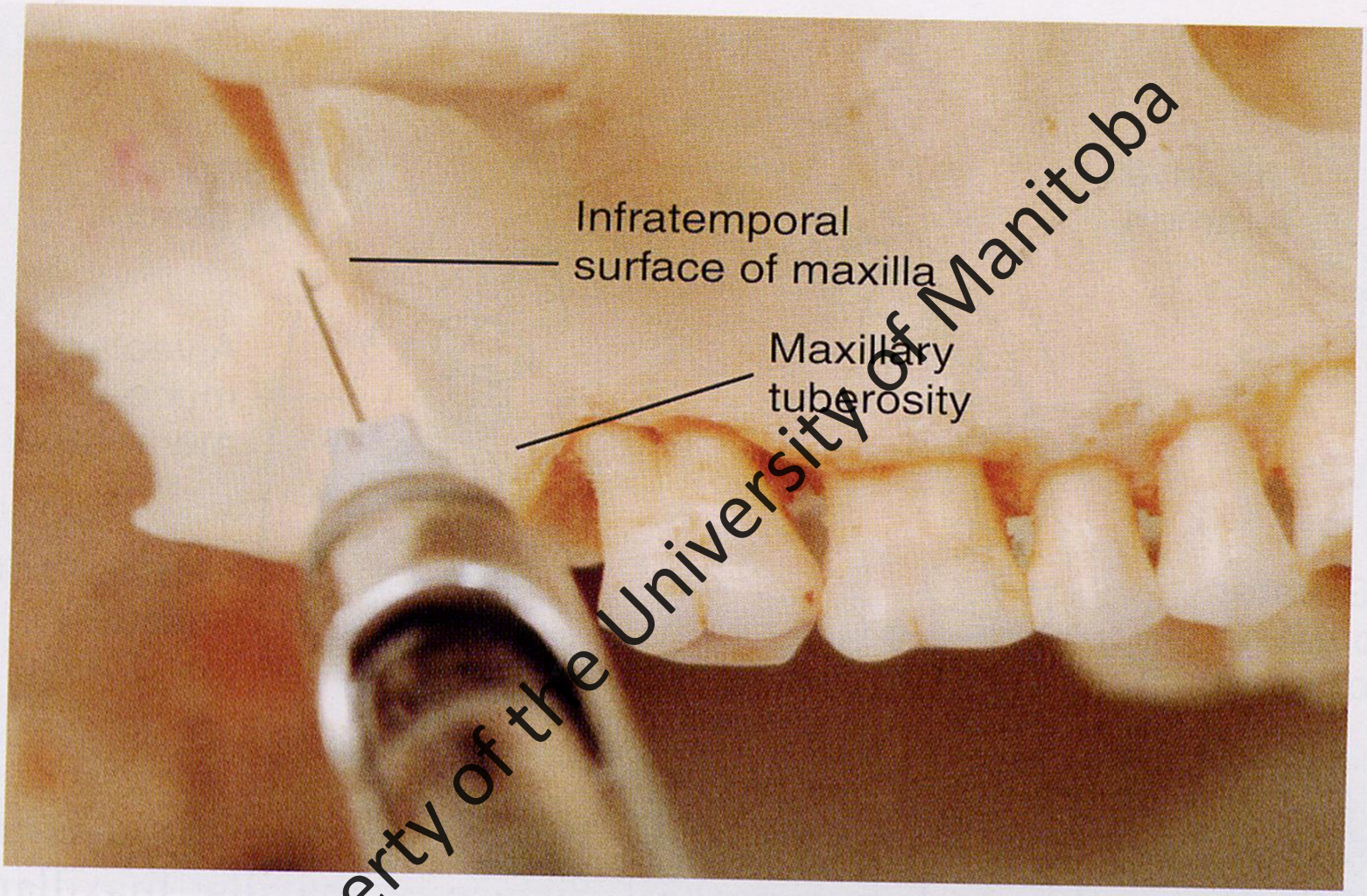
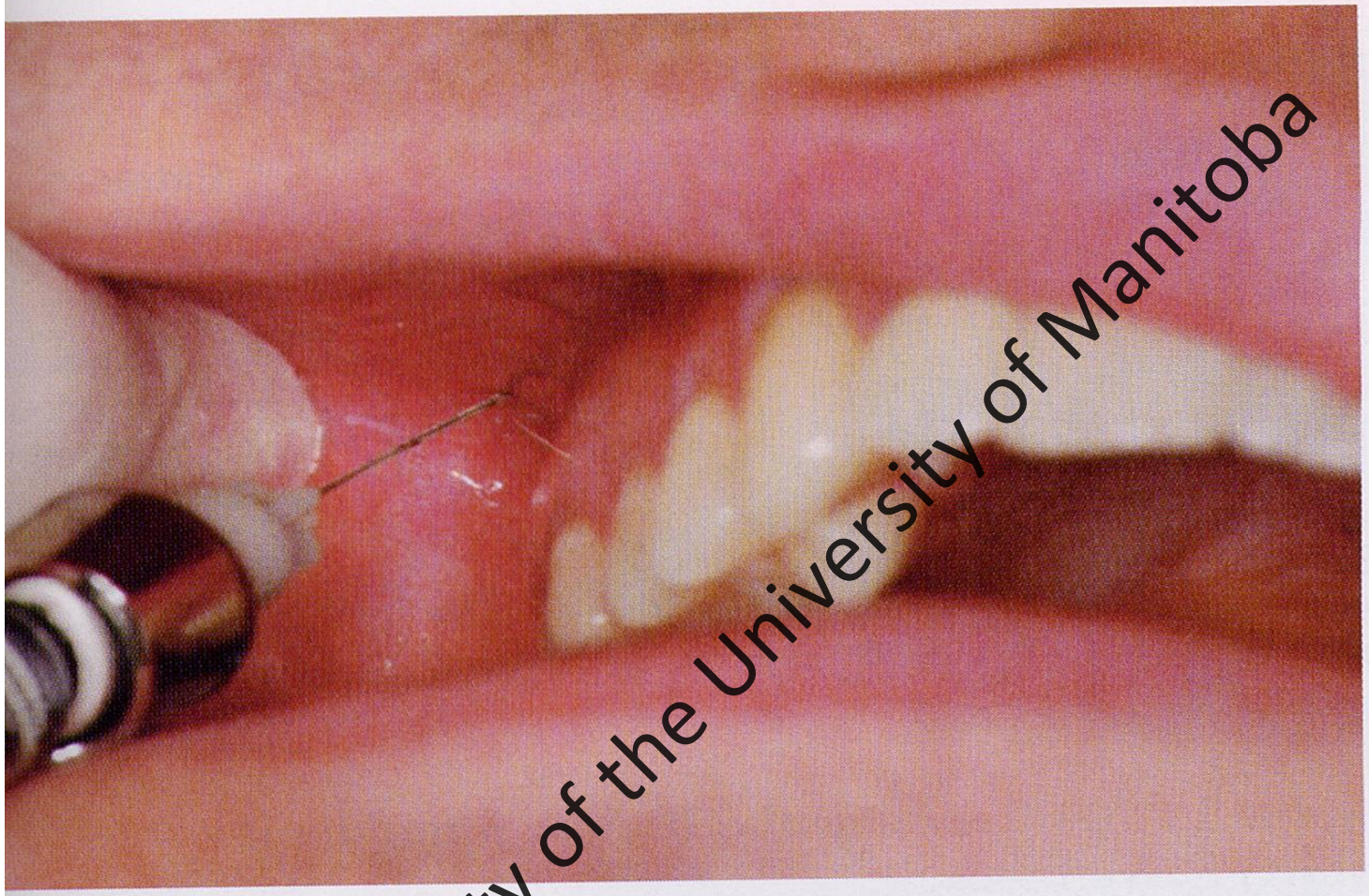
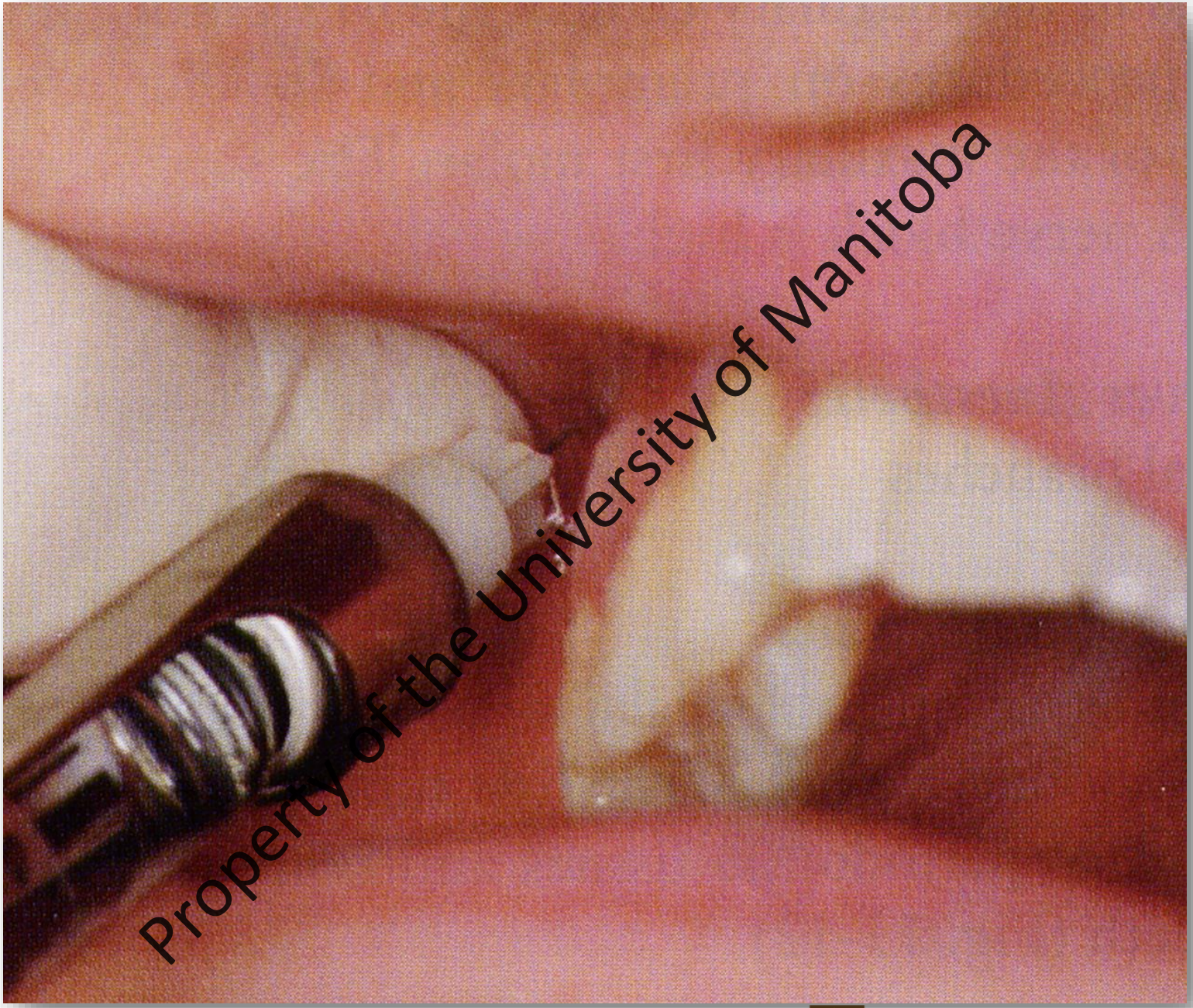


Figure 13-7. Needle at the target area for a posterior superior alveolar (PSA) nerve block.



e 13-9. Posterior superior alveolar (PSA) nerve block. e retracted at the site of penetration. Notice orientation of le: inward, upward, backward.



Palatal Injections

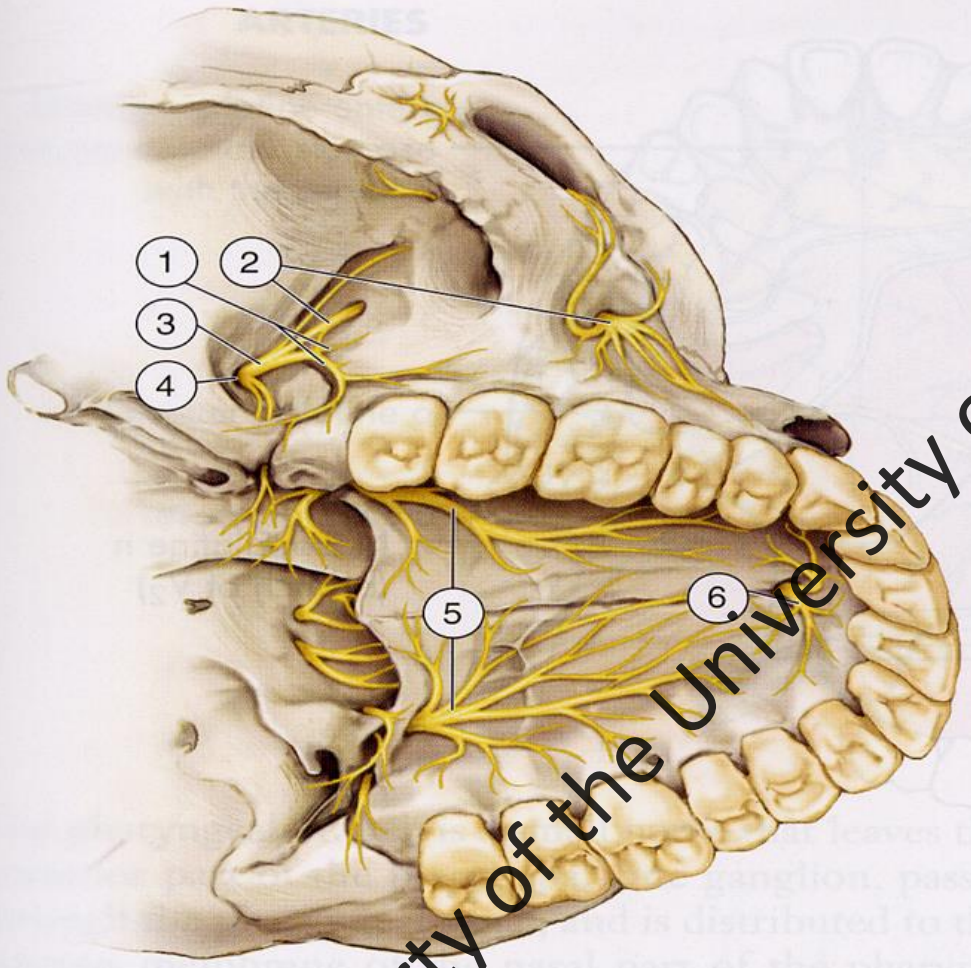


Figure 12-7. Distribution of the maxillary division (V_2). *1*, Posterior superior alveolar branches; *2*, infraorbital nerve; *3*, maxillary nerve; *4*, foramen rotundum; *5*, greater palatine nerve; *6*, nasopalatine nerve. (Data from Haglund J, Evers H: *Local anaesthesia in dentistry*, ed 2, Södertälje, Sweden, 1975, Astra Läkemedel.)

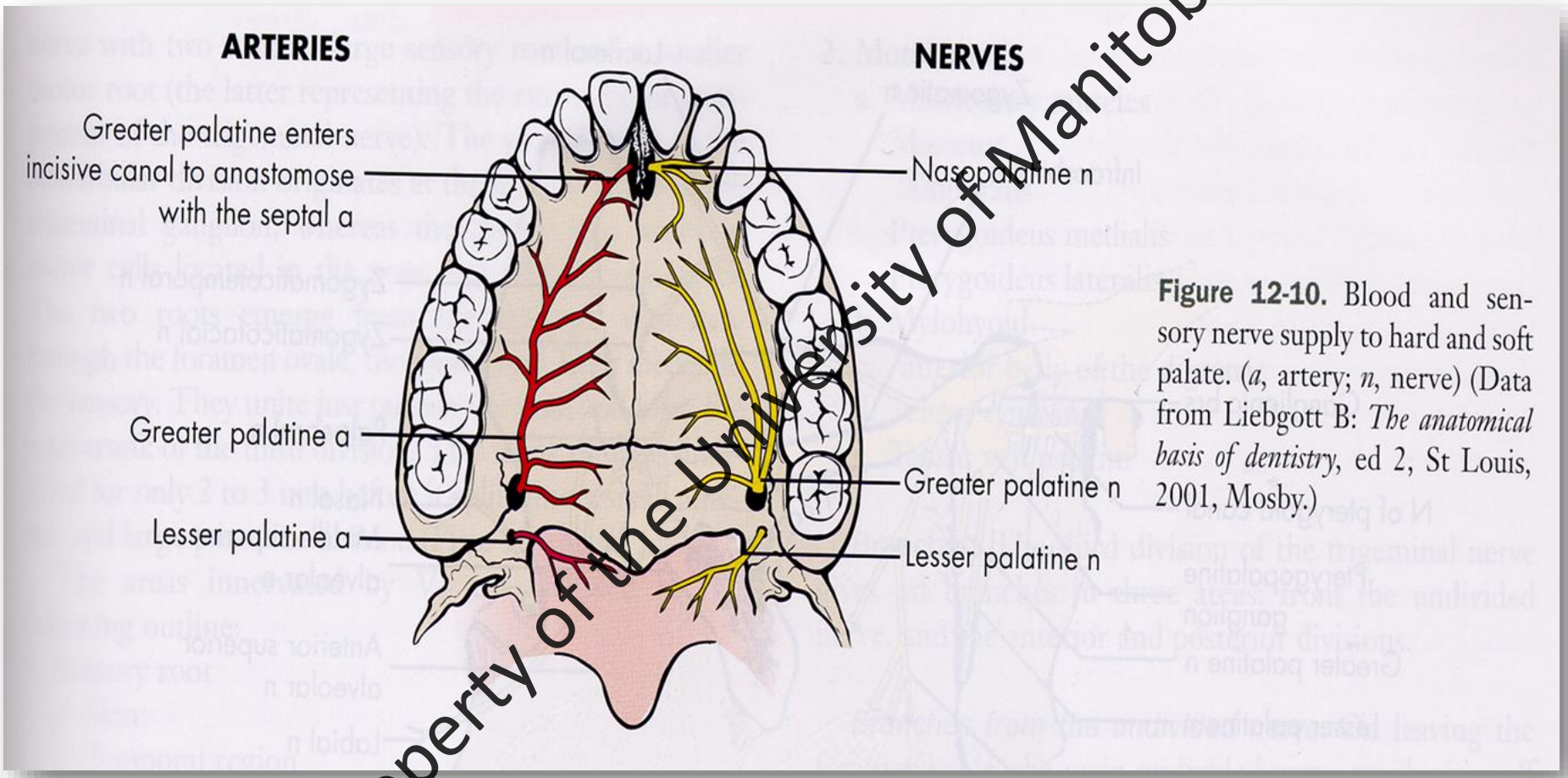


Figure 12-10. Blood and sensory nerve supply to hard and soft palate. (*a*, artery; *n*, nerve) (Data from Liebgott B: *The anatomical basis of dentistry*, ed 2, St Louis, 2001, Mosby.)

Injection

Nasopalatine n.

- Incisive canal
- Incisive foramen

Landmarks:

Central Incisors & Incisive Papilla

Sensation:

Premaxilla

Palatal gingiva **only** from canine to canine

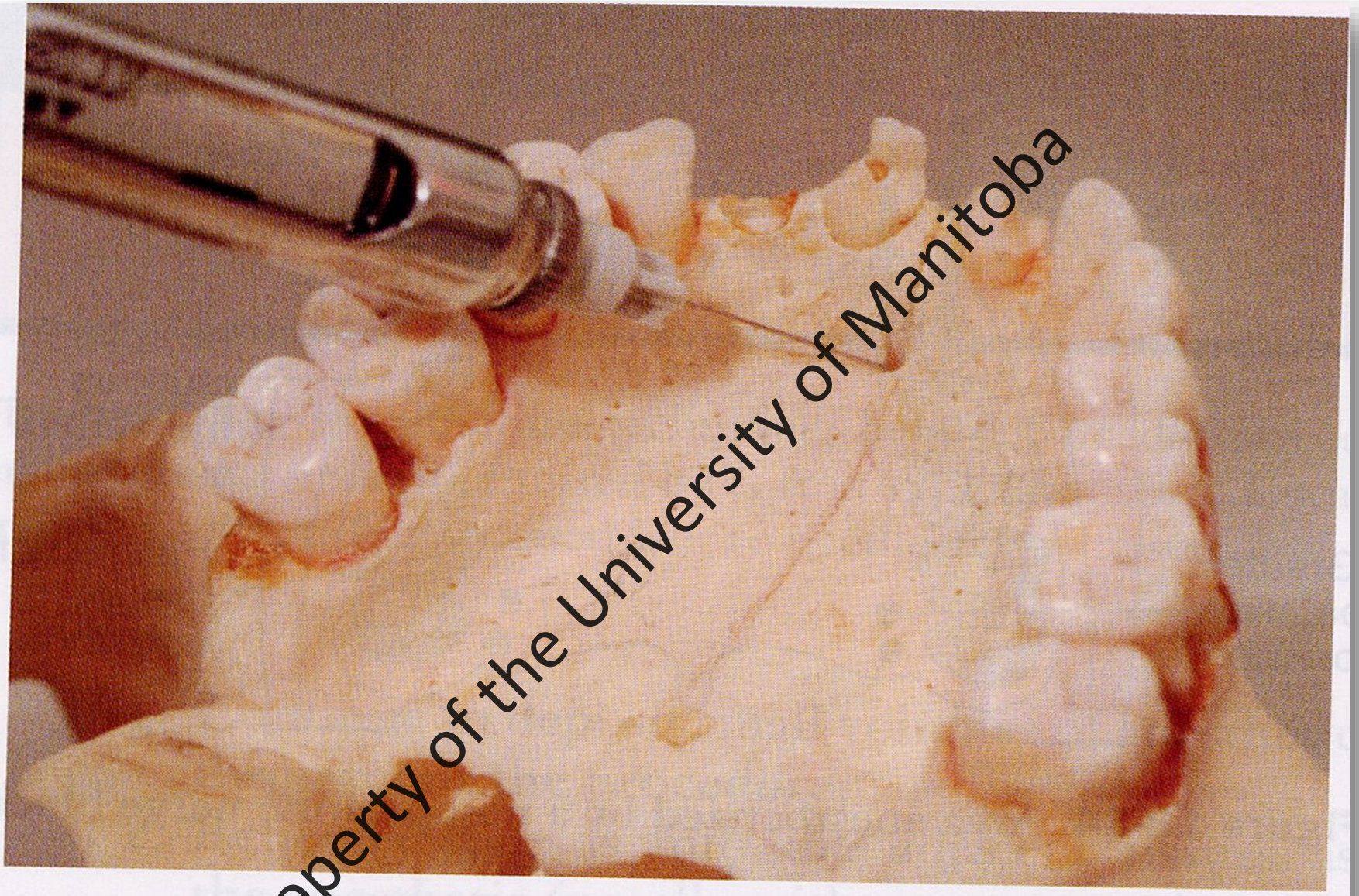


Figure 13-35. Target area for a nasopalatine nerve block.

Figure 13-38. Topical anesthetic is applied lateral to the incisive papilla for 2 minutes, and then pressure is applied directly to the incisive papilla.

Injection

Landmarks:

- Greater Palatine Foramen
- Distal of Second Molar
- Midline between mid-saggital line and gingival margin

Sensation:

- Soft tissues premolars and molars on one side to the midline

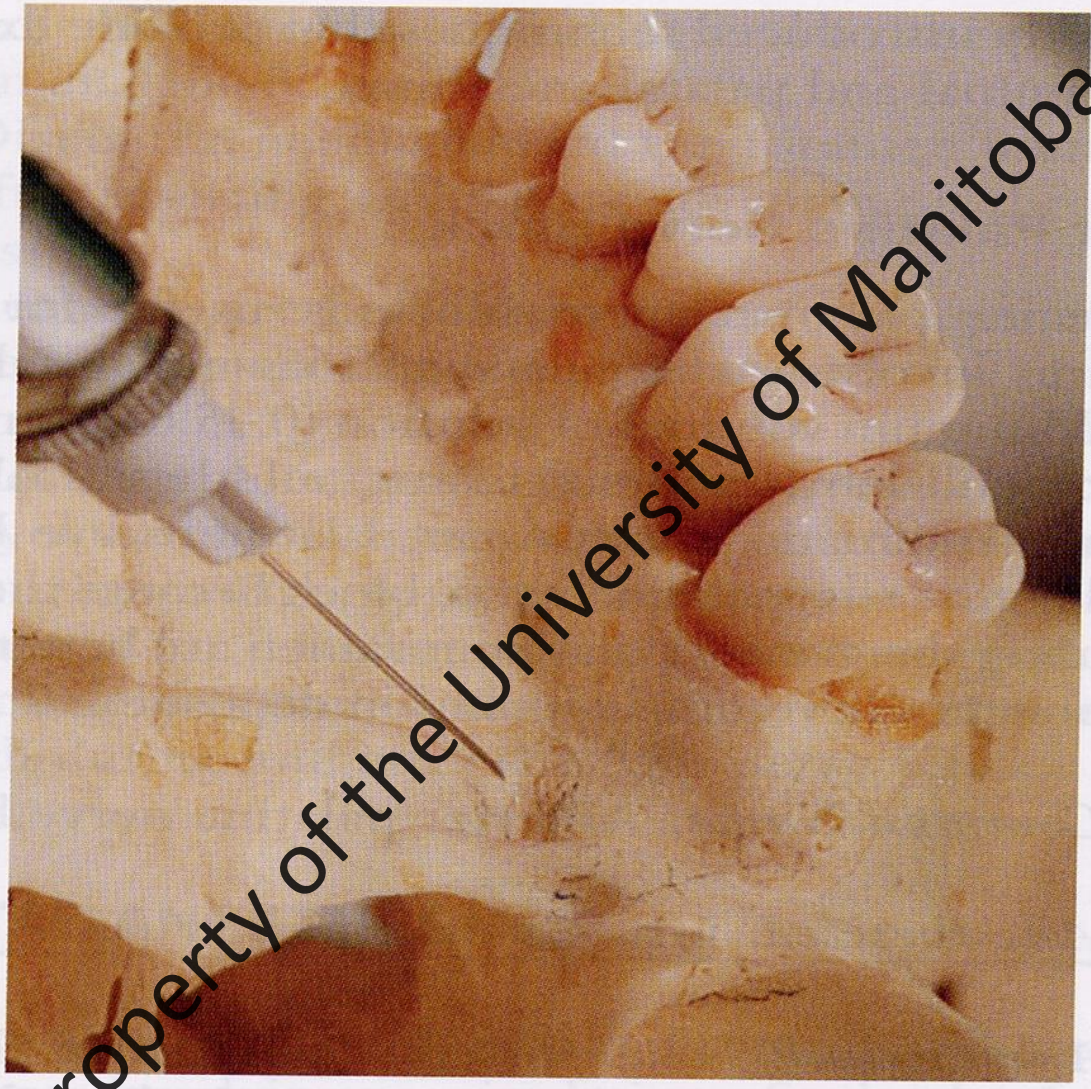


Figure 13-26. Target area for a greater palatine nerve block.

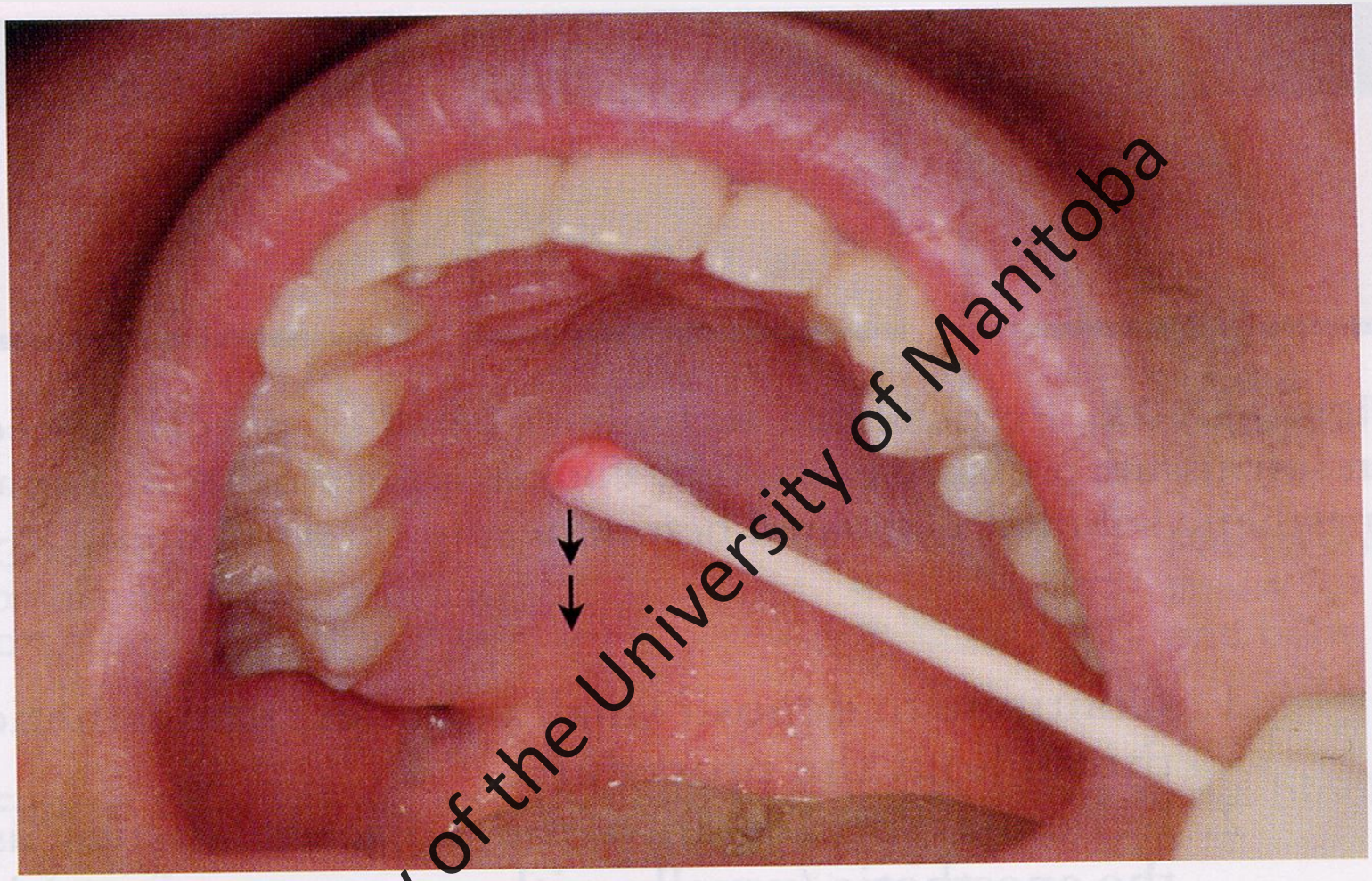


Figure 13-29. A cotton swab is pressed against the hard palate at the junction of the maxillary alveolar process and palatal bone. The swab is slowly moved distally *(arrows)* until a depression in the tissue is felt. This is the greater (anterior) palatine foramen.

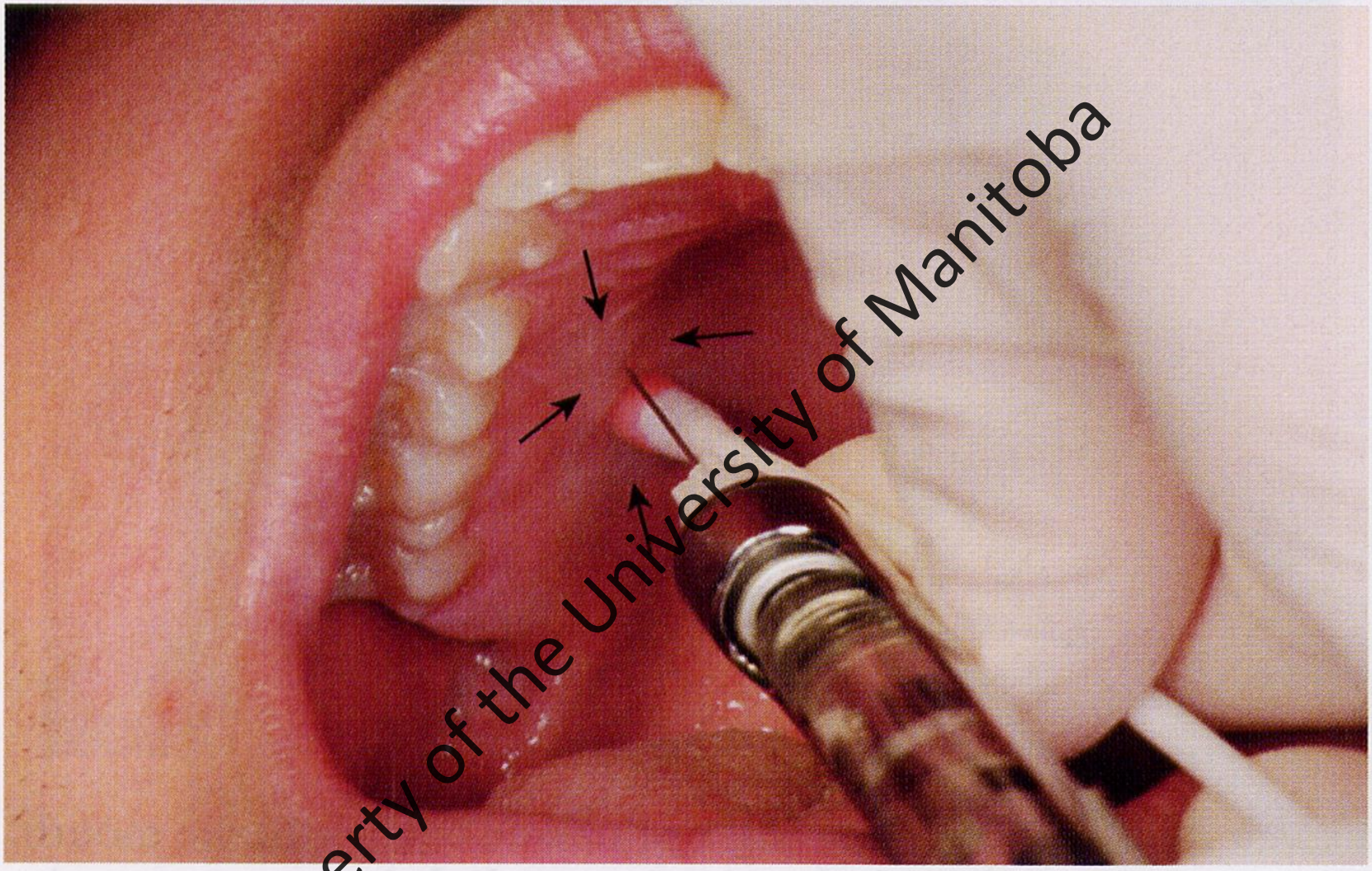


Figure 13-32. Notice the spread of ischemia *(arrows)* as the anesthetic is deposited.

Mandibular Injections

Landmarks for Inferior Alveolar Nerve Block Injection

Pathway:

- Mandibular nerve leaves Trigeminal Ganglion through Foramen Ovale
- Splits into several branches: Mylohyoid; Long Buccal; Lingual and Inferior Alveolar once in the Mandibular canal

Landmarks:

- Coronoid Notch; Pterygomandibular Raphe; Occlusal Plane of the Mandibular Posterior teeth; Internal Oblique Ridge

Sensation:

- All Mandibular teeth in one quadrant to the mid-line
- Facial tissues from central to second premolar

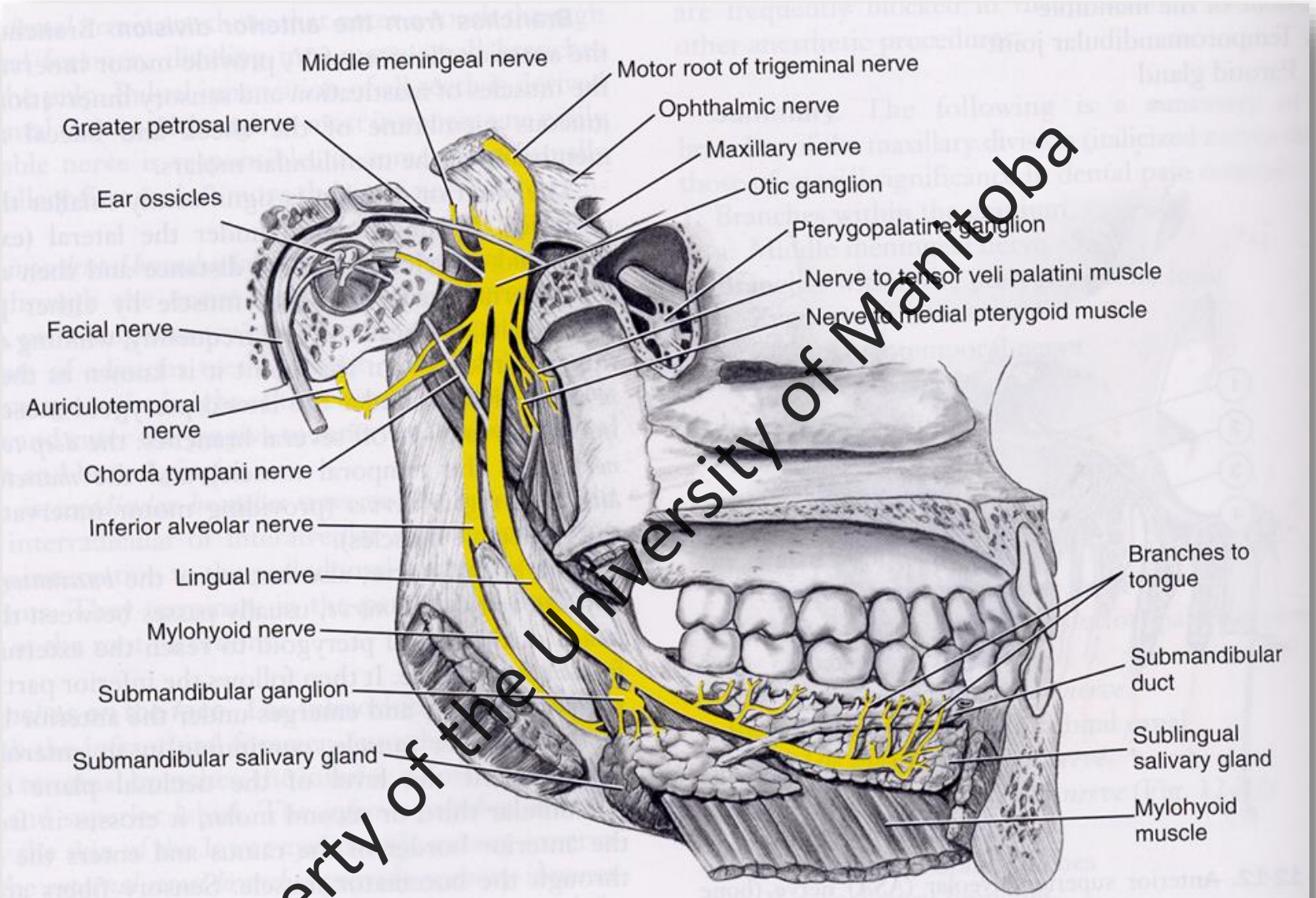
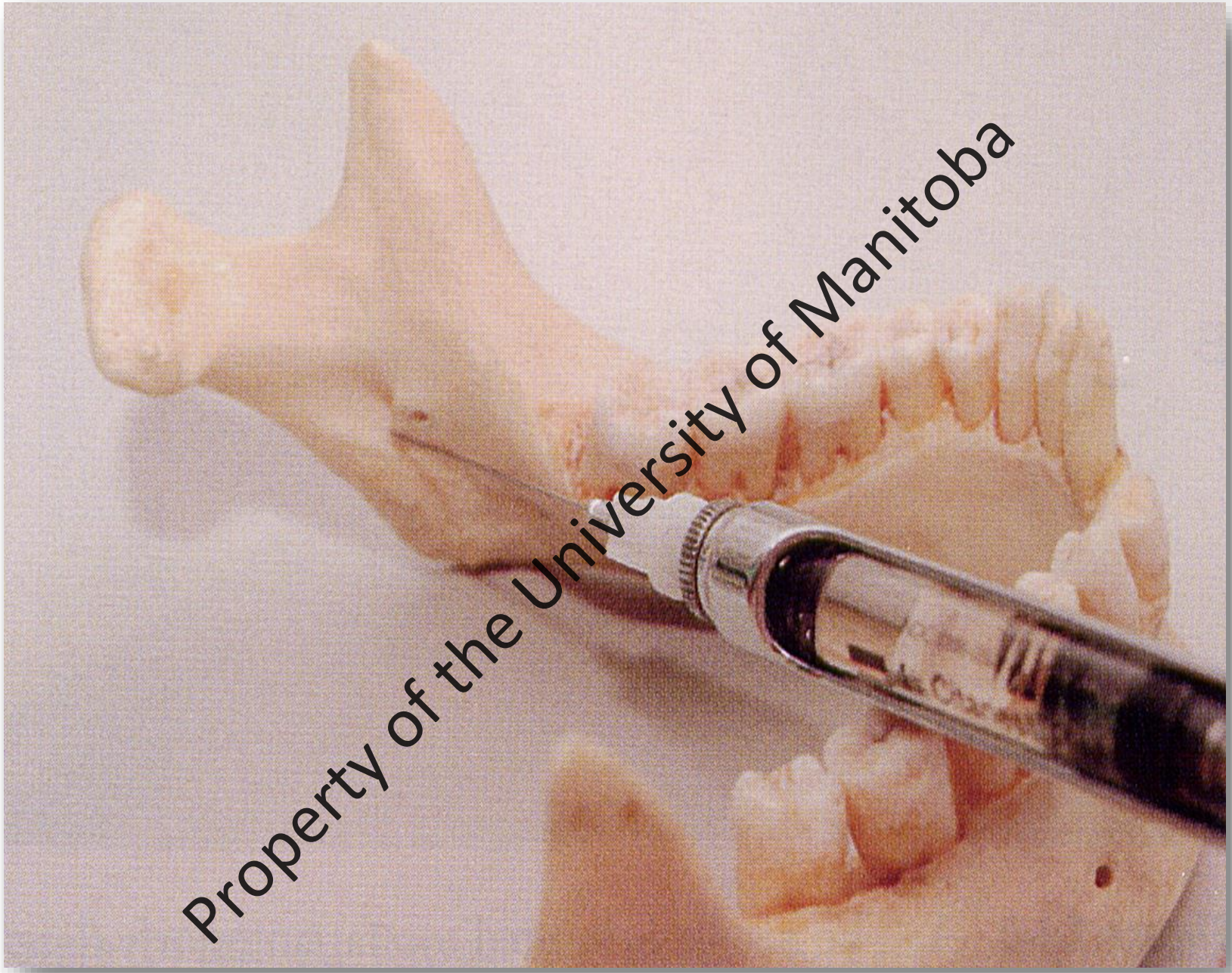
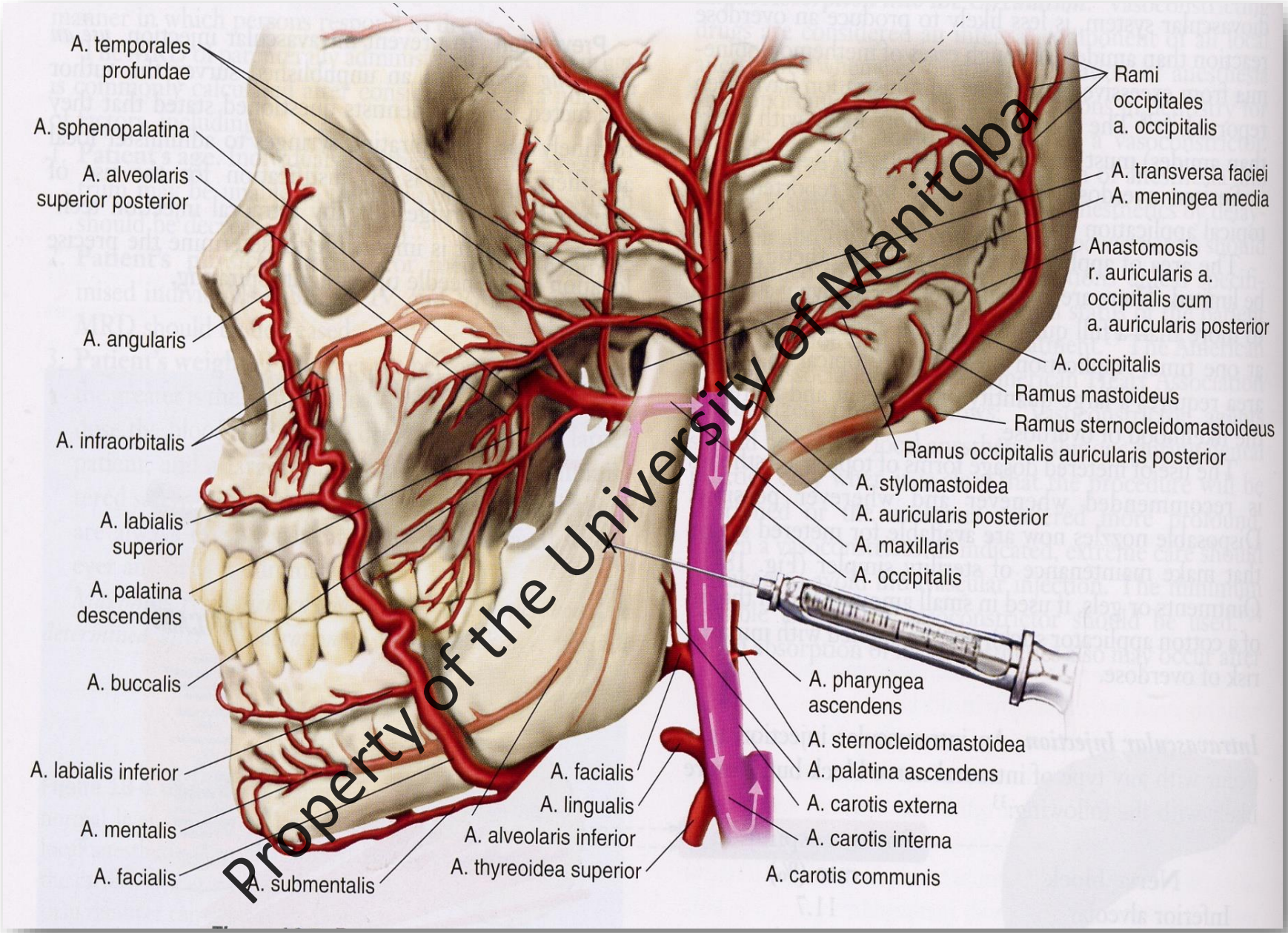
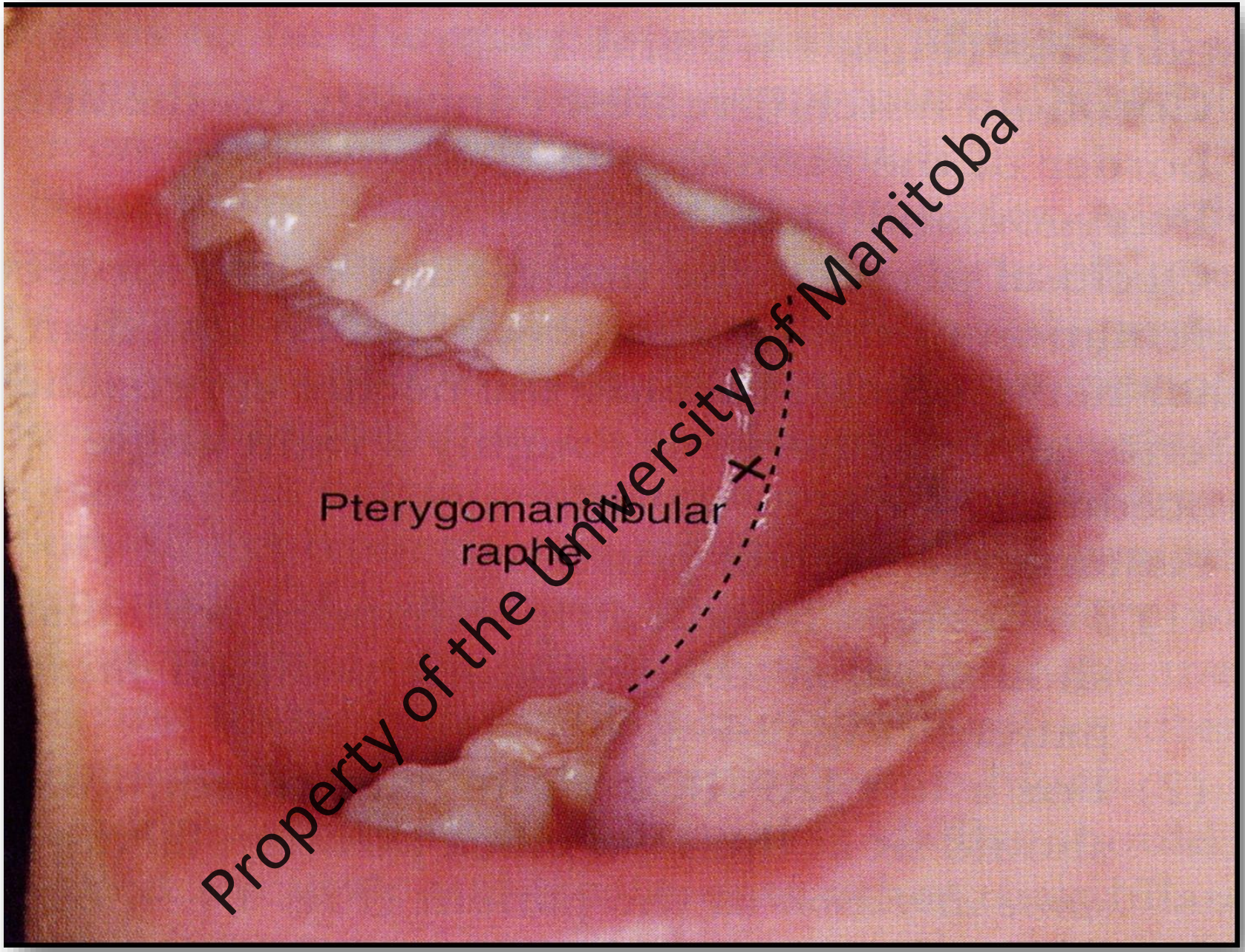


Figure 12-18. Medial view of the mandible showing the motor and sensory branches of the mandibular nerve. (Data from Fehrenbach MJ, Herring SW: *Illustrated anatomy of the head and neck*, ed 2, Philadelphia, 2002, WB Saunders.)







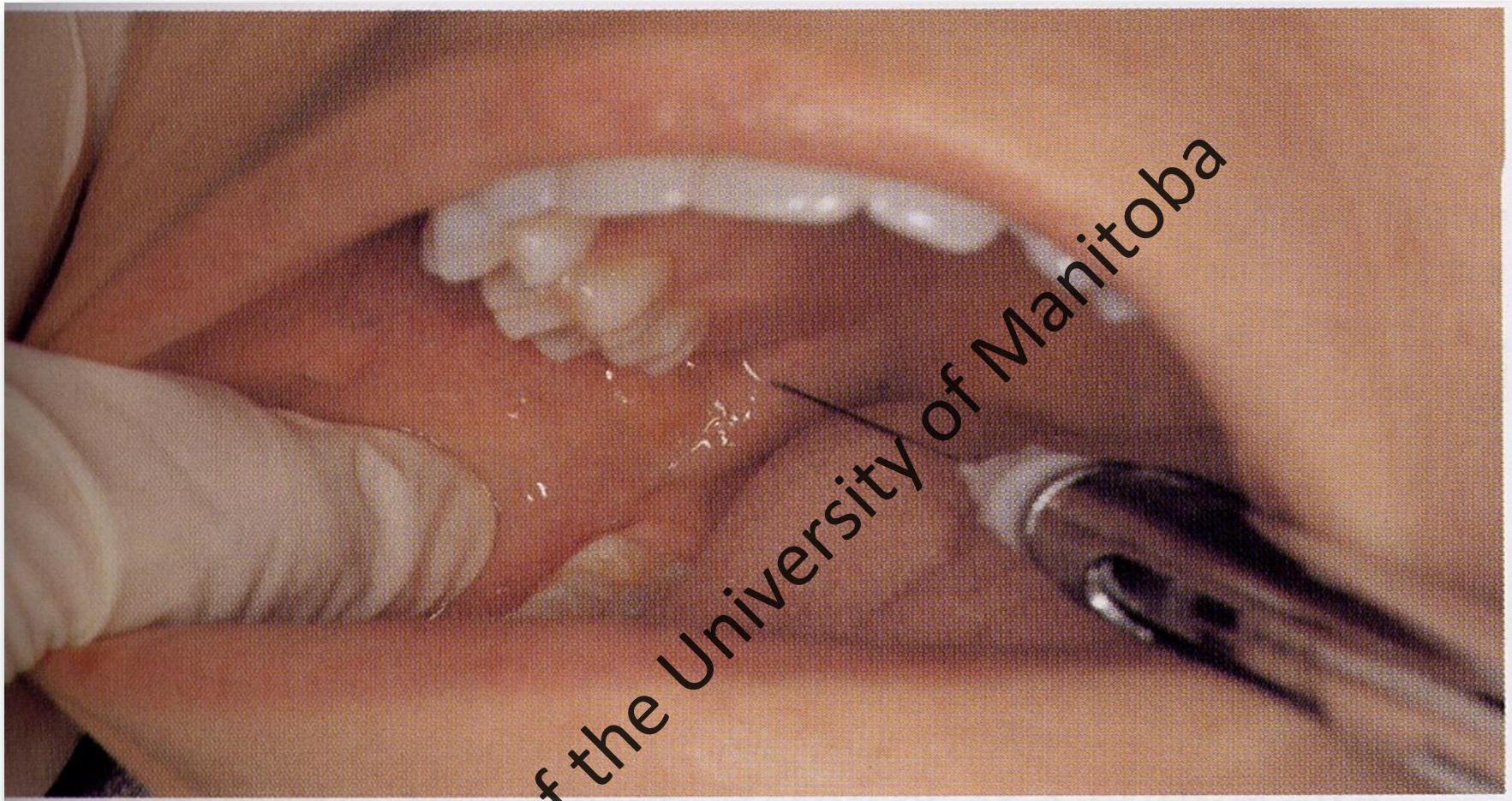


Figure 14-5. Notice the placement of the syringe barrel at the corner of the mouth, usually corresponding to the premolars. The needle tip gently touches the most distal end of the pterygomandibular raphe.

Lingual Nerve Injection

- Same Landmarks as for the Inferior Alveolar
- Not necessary to do a separate injection
- Just pull needle half way out and re-inject

Sensation:

- Provides lingual anesthesia to all tissues up to the midline as well as the anterior 2/3rds of the tongue

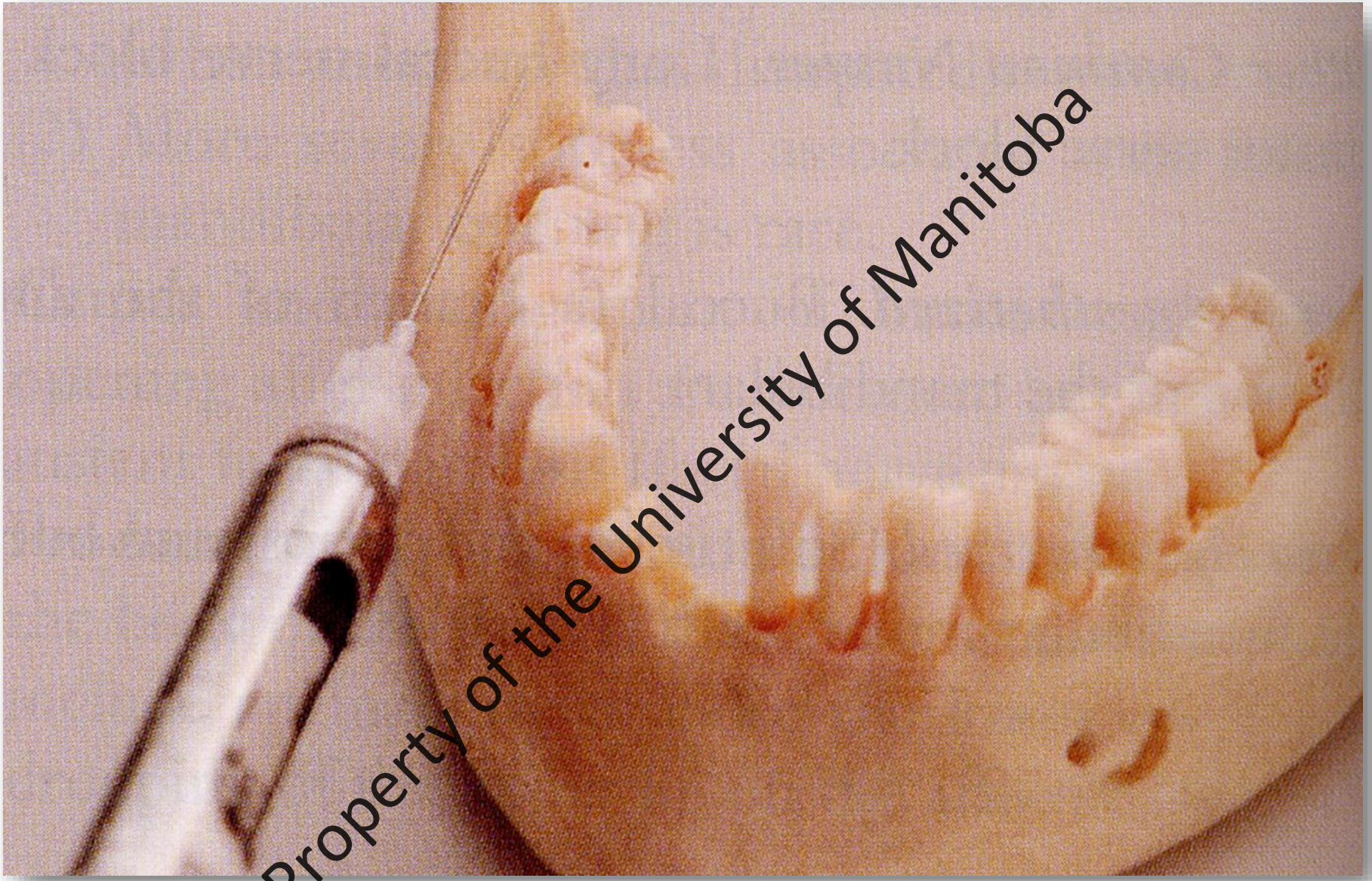
Landmarks for the Long Buccal Injection

Landmarks:

- One cm above the occlusal plane medial to the external oblique ridge
- In the facial vestibule at the level of the buccal cusps just distal to the last molar

Sensation:

The facial tissues adjacent to the three mandibular molars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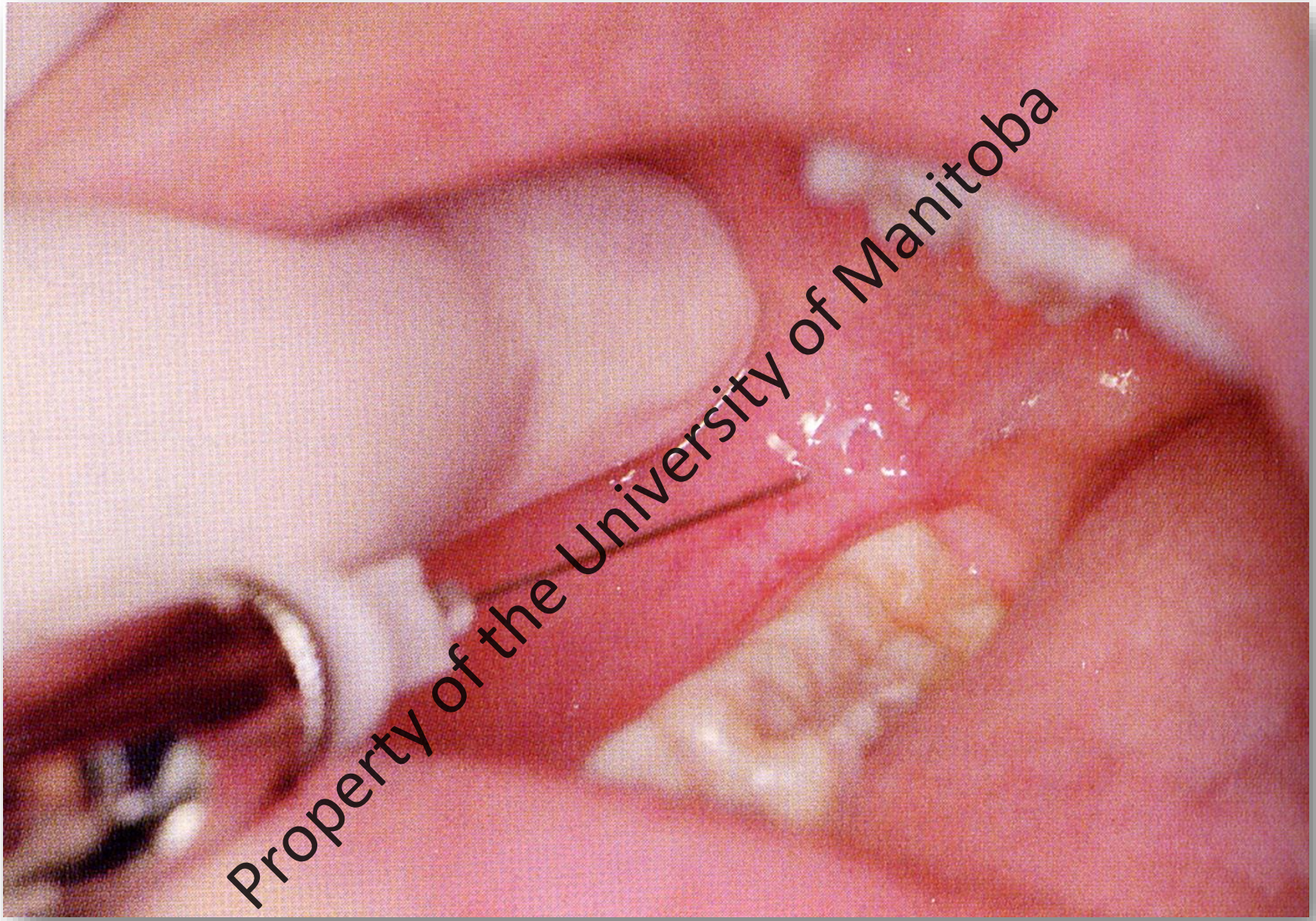


Landmarks for the Mental/Incisive Nerve Injection

Landmarks:

- the two premolars
- Mental Foramen
- Facial Vestibule (mucobuccal fold)

Sensation:

- Only the facial tissues from the premolars to the central incisor
- If you wish the teeth to be anesthetized, you must push anesthetic in with finger over the mental foramen after injection in order to anesthetize the incisive nerve which will then anesthetize the teeth

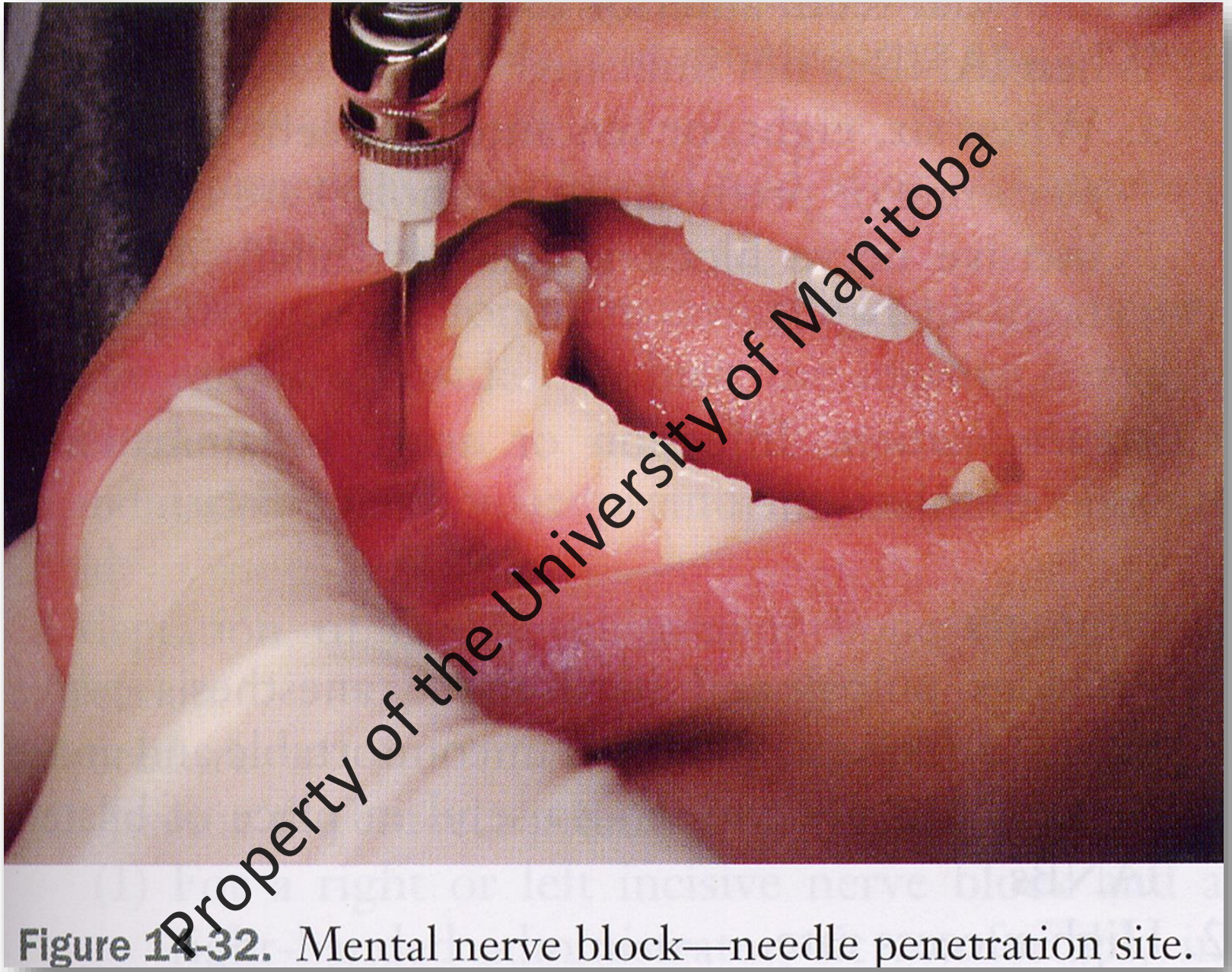
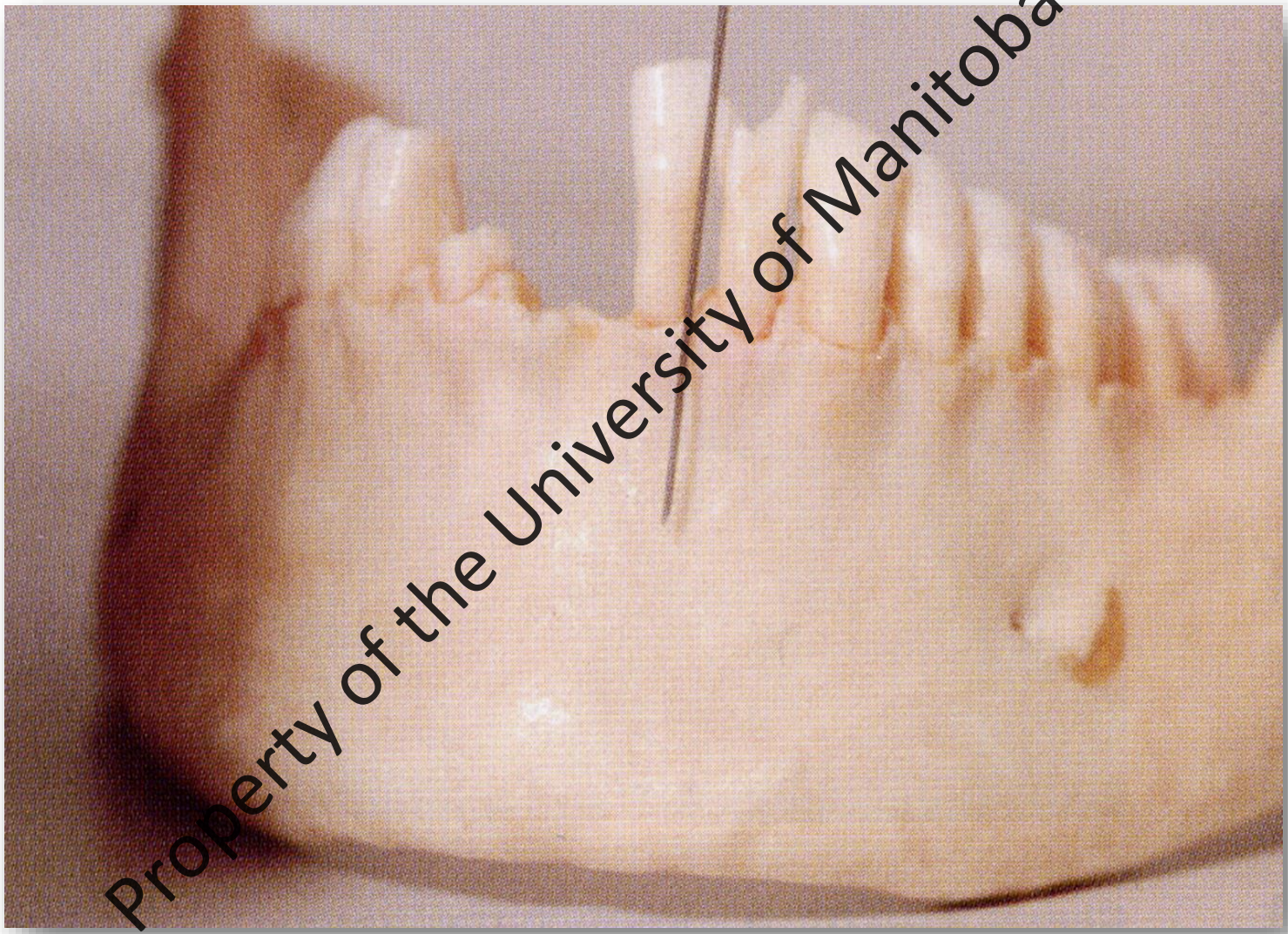
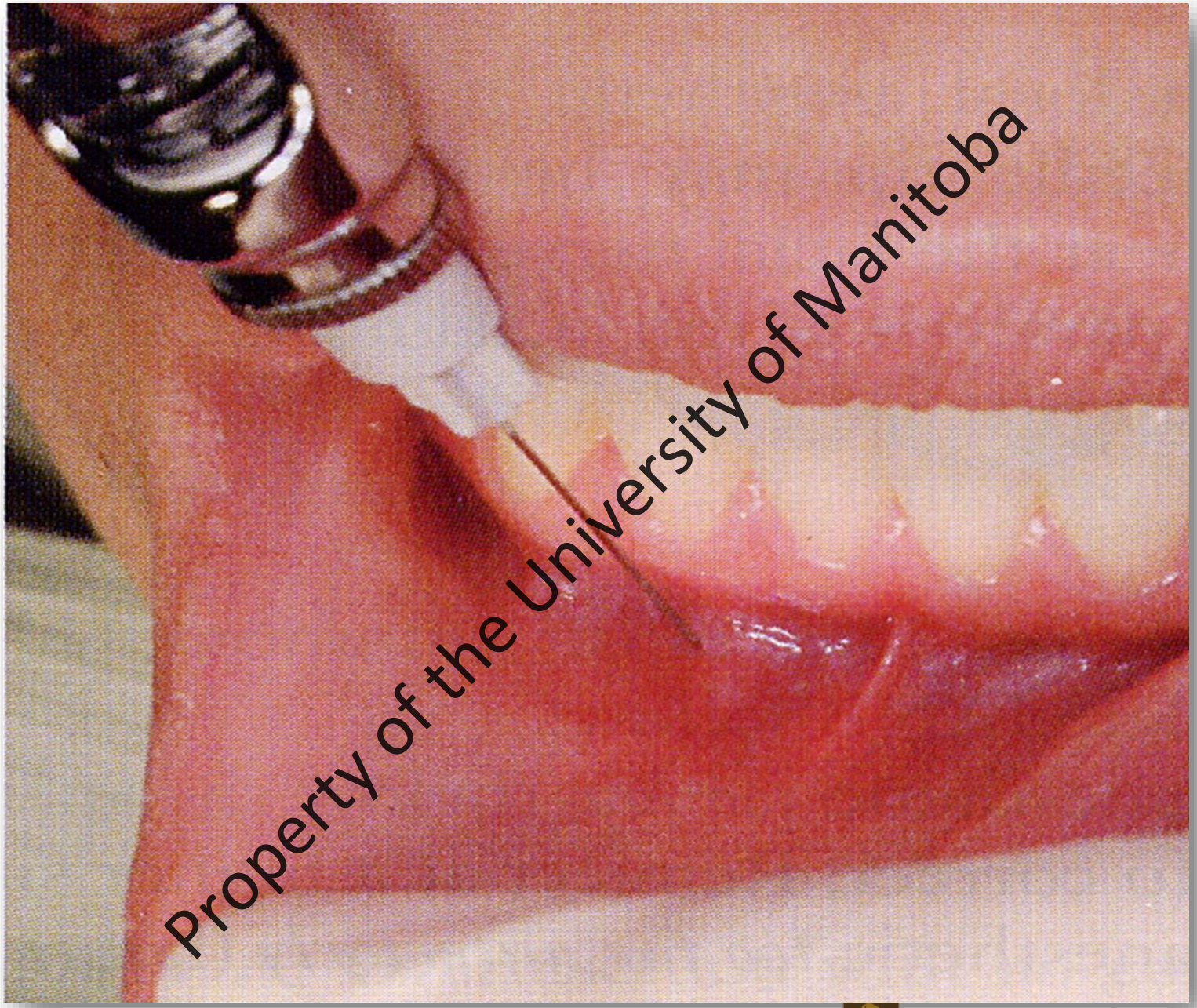


Figure 14-32. Mental nerve block—needle penetration site.

Infiltration

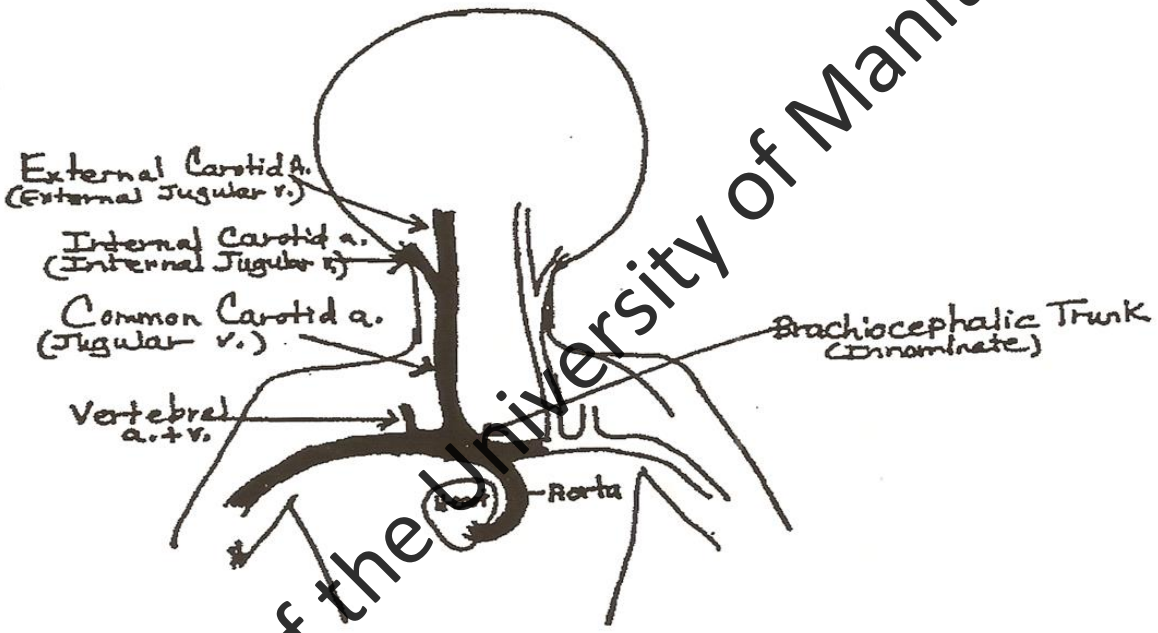
- If only need to anesthetize one tooth
- Landmark is depth of vestibule in the buccal mucosa at apex of target tooth
- One quarter of a cartridge is sufficient for anesthesia of the tooth and soft tissues



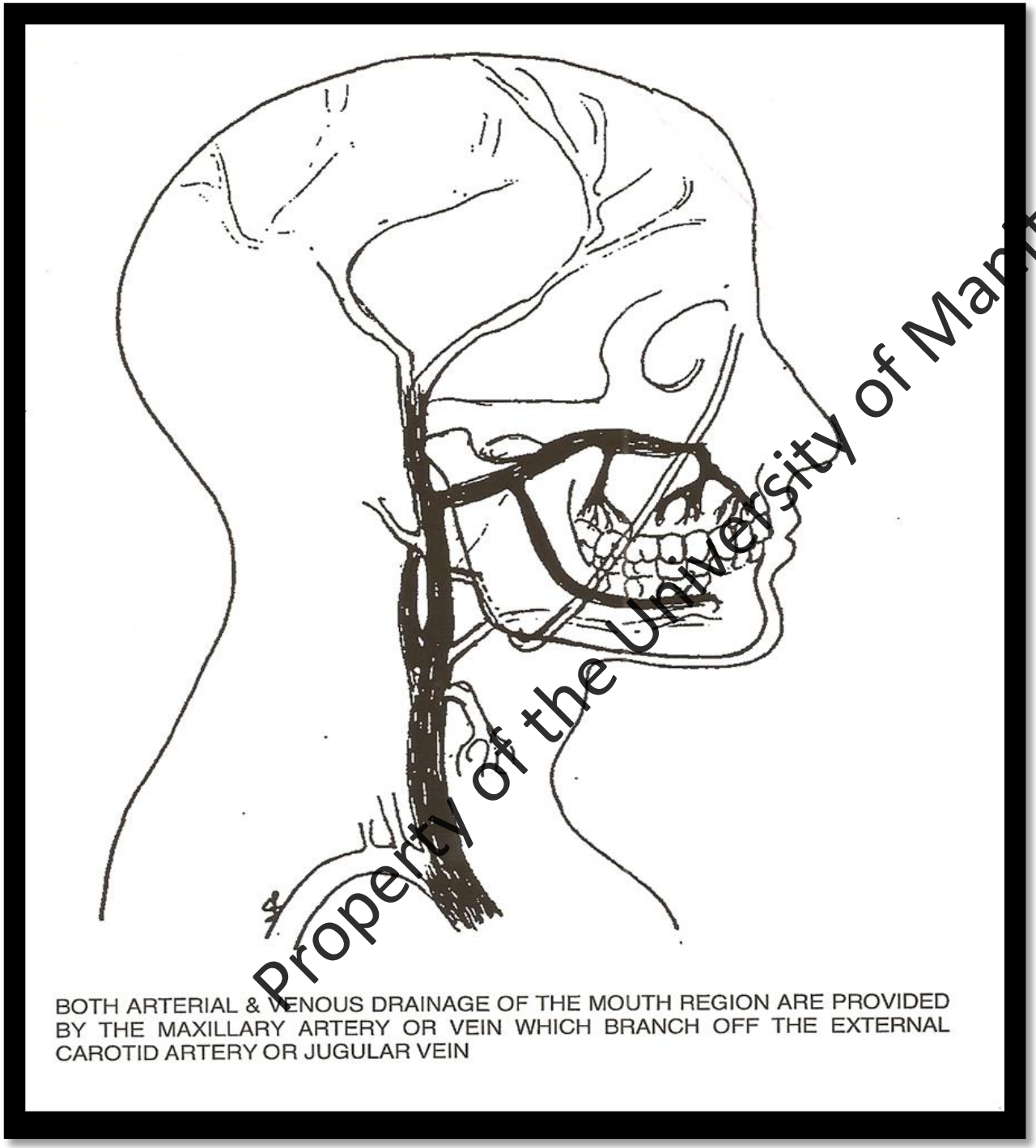


Blood Supply to the Head and Neck

ARTERIAL SUPPLY & VENOUS DRAINAGE OF HEAD & NECK



** BRANCHES OF THE EXTERNAL CAROTID ARTERY & EXTERNAL JUGULAR VEIN PROVIDE ARTERIAL & VENOUS DRAINAGE TO THE HEAD & NECK



BOTH ARTERIAL & VENOUS DRAINAGE OF THE MOUTH REGION ARE PROVIDED BY THE MAXILLARY ARTERY OR VEIN WHICH BRANCH OFF THE EXTERNAL CAROTID ARTERY OR JUGULAR VEIN

Hematoma

"An effusion of blood into extravascular spaces can result from "nicking" a blood vessel during the injection of a local anesthetic"

Injections most at risk for Hematoma:

- PSA
- IA
- M

Significance of Proper Needle Placement

- Solution must cover 8-10 mm of nerve (2-3 Nodes of Ranvier)
- Must landmark accurately & have proper depth of penetration
- Must avoid touching bone or nerve
- Always aware of blood vessels and **must** aspirate on 2 planes
- Always chance of Hematoma (especially with PSA due to venous plexus in pterygoid fossa)

- All Photos and Diagrams were copied from the HYGN 2380 2014 Pain Management Study Guide by Salme Lavigne and Malamed's 6th Edition of the Handbook of Local Anesthesia, 2013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