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DE MEDICINĂ ŞI FARMACIE
„VICTOR BABEŞ" DIN TIMIŞOARA

DENTO-ALVEOLAR SURGERY - A PRACTICAL GUIDE

Editor:
UNIVERSITY LECTURER DR. DIANA FLORINA NICA

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Editor:

University lecturer Dr. DIANA FLORINA NICA

Contributors:

University Professor Habil. Dr. Mircea Riviș

Associate Professor Dr. Ciprian Roi

University lecturer Dr. Adrian Nicoară

University lecturer Dr. Doina Chioran

University assist. PhD student Andrei Urîtu

Editura „Victor Babeş”

Piața Eftimie Murgu nr. 2, cam. 316, 300041 Timişoara

Tel./ Fax 0256 495 210

e-mail: evb@umft.ro

https://www.umft.ro/ro/organizare-evb/

Director: Prof. univ. dr. SORIN URSONIU

Colecția: GHIDURI ŞI ÎNDRUMĂTOARE DE LABORATOR

Coordonator colecție: Prof. univ. dr. ADRIAN VLAD

Referent ştiințific: Prof. univ. dr. COSMIN SINESCU

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Preface

Tooth extraction is one of the most frequently performed procedures in dental practice and represents a fundamental component of undergraduate dental education. For fourth-year dental students, acquiring the knowledge and clinical skills necessary to perform dental extractions safely and effectively is an essential step toward professional competence.

This book has been developed to provide a comprehensive and practical guide to the principles and techniques of dental extraction. It is intended to support students as they transition from theoretical instruction to clinical application, helping them build a solid foundation in oral surgery and patient management.

The chapters are structured to follow the logical sequence of clinical practice. The book begins with the preparation of the patient, emphasizing the importance of medical history, risk assessment, informed consent, and psychological preparation. It then addresses the clinical and radiographic examination required for accurate diagnosis and treatment planning. A detailed presentation of the instruments used in dental extraction familiarizes students with their design, indications, and proper handling. Finally, the book focuses on extraction techniques, describing both basic principles and practical approaches for the removal of teeth while minimizing trauma and reducing the risk of complications.

This volume aims to serve as a reliable educational resource for dental students, providing clear explanations and practical guidance that can be applied both in the classroom and in the clinical setting. We hope that it will contribute to the development of the knowledge, confidence, and professional responsibility required for successful dental practice.

The Authors

1. PREPARATIONS AND ARMAMENTARIUM FOR ORAL SURGERY

The patient preparation for the extraction depends on the type of intervention:

Patient preparation for a simple extraction:

- Antiseptic substances: Chlorhexidine, Hydrogen peroxide
- Patient protection: a single-use drape applied on the chest

Patient preparation for a surgical extraction:

- Strict aseptic conditions
- Antiseptic preparation of the perioral and face skin with: Betadine, Neo Kodane (Isopropyl Alcohol), alcohol, outward or from a clean area to a dirty area
- Antiseptic preparation of the oral cavity with Chlorhexidine
- Patient protection: cover the patient's head and torso with a sterile draping

Fig. 1. Antiseptic solution

Fig. 2. Antiseptic solution for mouth rinse

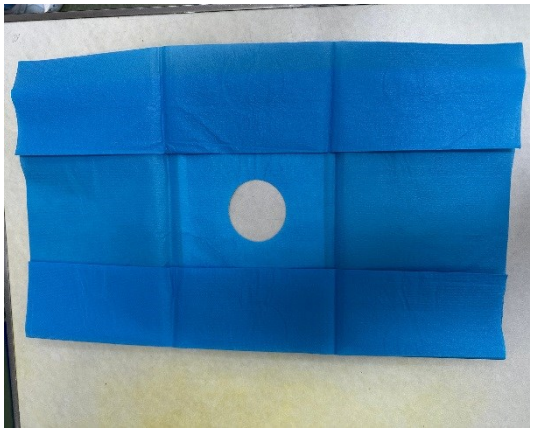

Fig. 3. Sterile drape for face and neck cover

Surgeon and assistant preparation for a surgical extraction:

- mandatory wearing of protective equipment
- for simple extraction: hand washing, antiseptic preparation and use of disposable gloves disinfected with specific solutions or sterile gloves
- surgical interventions: require surgical hand disinfection and wearing sterile gloves

Dental anesthesia equipment and techniques

Dental anesthesia equipment and techniques:

- syringes: disposable or non-disposable- UNIJECT
- needle: the most commonly used in loco-regional anesthesia in oral cavity have a diameter between 25-27G and a length between 20-35 mm
- the ampoule or cartridge containing sterile, isotonic anesthetic solution Attention: the needle used to extract the anesthetic solution from the ampoule should not be used for anesthesia administration

The selection of an appropriate anesthetic technique should be determined by the location of the tooth to be treated. For maxillary teeth, a combination of plexal anesthesia and palatal infiltration typically provides sufficient anesthesia and is generally administered using a short needle with a local

anesthetic agent appropriate to the patient. A peripheral truncal anesthesia is used for superior posterior alveolar nerves when the first upper molar is planned to be extracted.

For mandibular teeth, an inferior alveolar nerve block is the preferred approach, supplemented with a buccal infiltration to achieve complete anesthesia. This technique is delivered using a long needle to ensure accurate deposition of the anesthetic near the nerve, optimizing efficacy while minimizing patient discomfort

Prior to initiating treatment, the patient's pain response should be evaluated by carefully inserting a dental probe into the periodontal ligament space across all surfaces of the tooth and applying gentle pressure. Patients should be advised that a sensation of pressure is expected; however, the presence of sharp or acute pain may indicate inadequate anesthesia and warrants reassessment before proceeding. This step is critical to ensure patient comfort and to prevent complications during the extraction.

Required instruments:

- for examination - mirror, tweezer and dental probe;
- for extraction - forceps and elevators are adequate for the tooth special surgical instruments (required when alveolectomy or alveoloplasty is needed)– scalpel, scissors, periosteal elevator, curette, rongeur (bone cutting forceps), retractors, surgical sutures, needle holder

For simple extraction, instruments will be placed on the table facing outwards.

For surgical tool extraction, sterile instruments are placed on the table covered with a sterile drape.

Prior to initiating treatment, the patient's pain response should be evaluated by carefully inserting a dental probe into the periodontal ligament space across all surfaces of the tooth and applying gentle pressure. Patients should be advised that a sensation of pressure is expected; however, the presence of sharp or acute pain may indicate inadequate anesthesia and warrants reassessment before proceeding. This step is critical to ensure patient comfort and to prevent complications during the extraction.

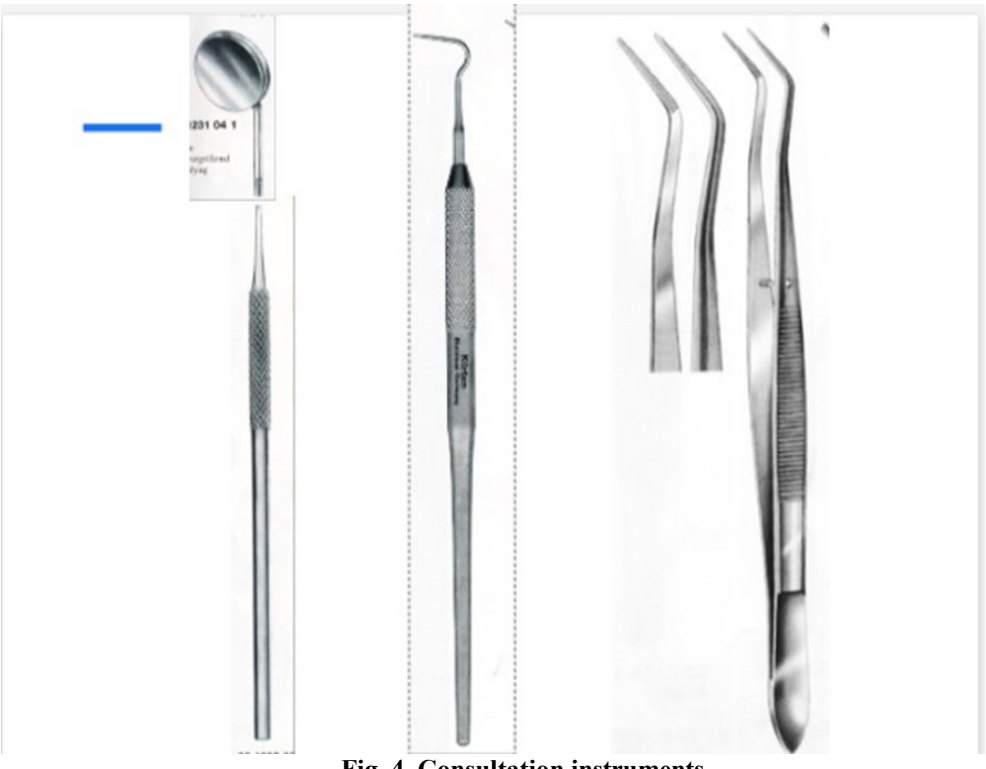

Fig. 4. Consultation instruments

Instruments for incision

SCALPEL

Used for initial incision and cutting tissue. It consists of a blade and a handle.

Surgeons often refer to the instrument by its blade number.

In dentistry, the most frequently used scalpel is the No. 15 blade. Known for its fine tip, the 15-blade is also widely employed for precise skin incisions. Its small, sharp design available as a 15 or 15c blade also makes it particularly suitable for intraoral and perioral procedures, where working in confined spaces requires precision and control.

Fig. 5. Blade handle

BLADES

#10 Blade: used primarily for making large skin incisions or in laparotomy

#11 Blade: used for making precise or sharply angled incision

#15 Blade: smaller version of #10 blade used for making finer incisions, is the most commonly used in oral surgery

Fig. 6. Types of blades

SCISSORS

Scissors are used for cutting tissue, suture, or for dissection. Scissors can be straight or curved, and may be used for cutting heavy or finer structures

MAYO scissors

Mayo – type scissors have a heavy design and are available in multiple varieties. Straight scissors are used for cutting suture ("suture scissors") while curved scissors are used for cutting heavy tissue like fascia.

Fig. 7. Mayo scissors

METZENBAUM Scissors

Lighter scissors used for cutting delicate tissue (e.g., heart) and for blunt dissection. They are called "Metz" in practice.

Fig. 8. Metzenbaum scissors

SYNDESMOTOMS are used for:

- detaching the circular ligament of the tooth → the complete detachment of the gingiva from the neck of the tooth (cervical)
- allows insertion of the forceps beaks under the gingival margin
- by severing the circular and gingival fibers, it allows easier luxation (loosening) of the tooth and minimizes trauma to the gingiva during extraction.

Fig. 9.Types of syndesmotomes

Syndesmotomes consist of a blade and a grip

The blade, made of special steel, must be fine and sharp. The hand grip is ergonomic

How to use the syndesmotome in oral surgery:

- the instrument is gently inserted into the gingival sulcus around the tooth.
- it is circumferentially moved to release the soft tissue attachment.

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ELEVATORS

The elevators may be straight, used for maxillary teeth extraction or curved/ paired, used for mandibular teeth extraction

The roles of elevators are:

- employed to detach the periodontal ligament from the tooth scheduled for extraction.
- utilized to gradually elevate the tooth coronally within its socket, thereby facilitating controlled luxation
- used to mobilize sectioned roots and elevate them out of the dental socket; elevators should be applied perpendicular to the tooth's long axis, with both the blade and the fulcrum supported by stable, hard anatomical structures. This positioning ensures optimal force transmission, minimizes slippage, and reduces the risk of trauma to adjacent soft tissues or teeth. The inner surface of the elevator tip should be applied directly to the tooth targeted for extraction, while the outer surface should rest on the alveolar bone rather than on neighboring teeth. This ensures effective force transmission to the tooth being extracted while minimizing the risk of damage to adjacent teeth or supporting structures.

Fig. 10. Pair elevators

LUXATORS

- look similar to elevators
- are sharp-tipped instruments that should be used along the long axis of a tooth.
- used to cut off the periodontal ligament attachment to the tooth and to gradually widen the alveolar socket.
- progressively advanced apically along a tooth, rotating side-to-side as it advances, allowing for as much apical mobility as possible

The progressive expansion of the alveolar socket provides sufficient room for instrument placement, such as forceps, enabling a more atraumatic extraction. This approach helps preserve the surrounding bone, which is important for potential future implant placement

Fig. 11. Set of luxators

Fig. 12. Straight luxators

FORCEPS

Dental extraction forceps consist of three main parts: the **handle**, the **joint**/**hinge** and the **beaks**.

The beaks are parallel to the handle in maxillary forceps. The beaks are perpendicular to the handle in mandibular forceps.

The morphology of dental forceps beaks is carefully adapted to correspond with the anatomy of the specific tooth targeted for extraction. Their design facilitates secure engagement with either the crown or root surface. For optimal biomechanical leverage and to minimize the risk of crown fracture, the forceps should be applied as apically as possible. Apical placement allows forces to be distributed closer to the center of tooth resistance, reducing stress concentration on the crown and thereby decreasing the likelihood of enamel or crown fracture during luxation and removal.

The beaks of forceps designed for multi-rooted teeth are tapered or pointed to engage securely within the furcation region of the tooth.

The handle of forceps used on upper posterior teeth may have a curve at the end of the handle which allows more axial force to be transmitted to the beaks.

UPPER INCISIVE FORCEPS

- Beak design: the beaks are straight and aligned with the axis of the handles, which provides direct access to the anterior region of the mouth.

- Shape: the internal faces of the beaks are typically concave and rectangular to adapt snugly to the convex vestibular (outer) and palatal (inner) surfaces of the tooth crown and root.

- Engagement: the design allows the dentist to slide the beaks apically (towards the root) below the gum line to secure a firm grip on the root surface.

- Grip: the internal surface of the beaks often features serrations or cross-ribbing to ensure a secure, non-slip grip on the tooth, especially when extracting roots or fractured teeth.

- Handle and hinge: the handles are usually ergonomically designed with grooves (cross-knurling) for a firm, controlled grip; the hinge is designed to distribute force evenly and provide smooth operation.

Fig. 13. Upper incisive forceps

UPPER PREMOLARS FORCEPS

- Slight gap alignment: a slight distance from each other; this gap is wider than that of incisor forceps but narrower than molar forceps.
- Symmetrical concavity: both beaks are mirror images of each other, featuring smooth or serrated concave inner faces; this design allows the beaks to wrap around the ovoid root trunk of the premolar.
- Parallel configuration: the beaks are slightly offset to allow the instrument to reach posterior teeth while maintaining force along the tooth's long axis.
- Curvature and offset: most designs have a slight S-shape or 20-degree bend when viewed from the side; this curvature ensures the beaks can be placed apically (below the gumline) without the handles injuring the lower lip or interfering with opposing teeth.

Fig. 14. Upper premolars forceps

Fig. 15. Upper premolar forceps

RIGHT UPPER MOLAR FORCEPS

Asymmetrical design: unlike premolar forceps, the two beaks are not mirror images of each other. They are purpose-built to fit different sides of the tooth.

- Buccal beak: features a sharp, pointed projection (sometimes called a hook or horn); this point is designed to engage the buccal furcation, the space where the two outer (buccal) roots of the molar meet.

- Palatal beak (the "smooth" side): the opposite beak is smooth and concave. It is designed to wrap around the single, large palatal root on the inner side of the tooth.

- "Beak to the cheek" rule: for the upper right side, the pointed beak is positioned on the patient's right (the buccal or cheek side) when the instrument is held correctly.

- Wide gap alignment: similar to other molar forceps, there is a wide distance

Fig. 16. Upper right molar forceps

LEFT UPPER MOLAR FORCEPS

- Asymmetrical design: the beaks are different from one another to accommodate the distinct buccal (cheek) and palatal (tongue) sides of the tooth.

- Buccal beak (pointed): one beak has a pointed projection or "horn”; on a left-sided instrument, this point is positioned to engage the buccal furcation (the space between the two outer roots) on the patient’s left side.

- Palatal beak (concave): the opposing beak is smooth and rounded; this beak is designed to seat securely against the single, large palatal root.

- Wide gap alignment: when the handles are closed, a wide gap remains between the beaks; this ensures the instrument clears the large molar crown and applies pressure directly to the root structure.

- Side-specific orientation: because the pointed beak must always face the cheek (buccal), these forceps can only be used for the upper left quadrant.

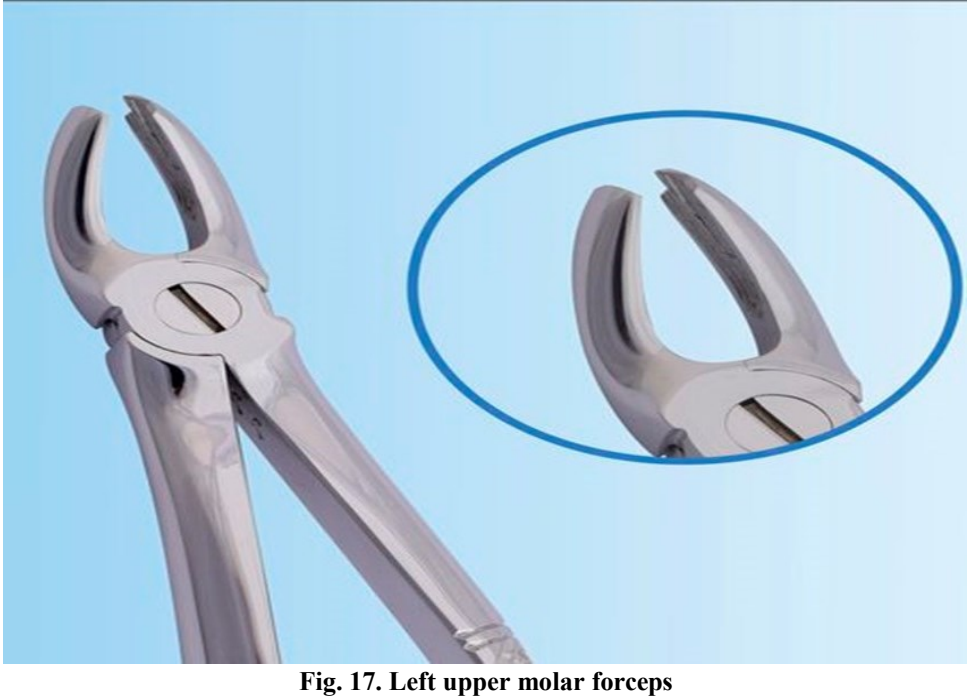

Fig. 17. Left upper molar forceps

UPPER THIRD MOLAR FORCEPS

- Symmetrical design: unlike the first and second molar forceps, these are unpaired and universal; both beaks are mirror images of each other, meaning the same instrument is used for both the upper right and upper left quadrants.

- Smooth, concave beaks: the beaks do not have pointed tips or furcation hooks; they are smooth and concave to adapt to the fused or conical roots frequently found in third molars.

- Bayonet configuration: the beaks are significantly offset from the handle in a "bayonet" shape; this design allows the surgeon to reach the very back of the mouth while keeping the handles clear of the patient's lips and anterior teeth.

- Short and robust beaks: compared to premolar forceps, the beaks of third molar forceps are often shorter and broader to provide maximum leverage and a secure grip on the wide variety of third molar shapes.

- Wide gap alignment: similar to other molar instruments, there is a large gap between the beaks when closed to accommodate the large crown of the wisdom tooth without crushing it.

Fig. 18. Third upper molar forceps

LOWER JAW FORCEPS

LOWER INCISIVE FORCEPS

- In contact beaks: the beaks of lower incisor forceps typically touch or nearly touch when closed; this arrangement is necessary to firmly grip the exceptionally thin roots of the lower central and lateral incisors.

- Parallel and fine design: the beaks are fine, narrow, and parallel to each other rather than concave; this allows them to adapt perfectly to the narrow root anatomy without interfering with the adjacent teeth.

- Right-angle configuration: the beaks are set at a 90-degree angle (perpendicular) to the handles; this allows the dentist to place the beaks parallel to the tooth's long axis while keeping the handles in a comfortable position that does not injure the patient's upper lip.

- Symmetry: these forceps are symmetrical and can be used for both the lower right and lower left central and lateral incisors.

- Serrated inner surfaces: modern designs often feature serrated inner beak faces to enhance grip on the smooth root surface, reducing the risk of slippage during the extraction.

Fig. 19. Lower incisive forceps

LOWER PREMOLARS FORCEPS

- Slight gap alignment: when the handles are closed, the beaks maintain a slight gap; this spacing ensures the instrument clears the premolar crown and applies force directly to the root, preventing tooth fracture.

- Concave symmetry: both beaks are symmetrical; they feature smooth, concave inner faces designed to wrap securely around the conical or ovoid root of the lower premolar.

- Right-angle/vertical bend: the beaks are set at an angle of approximately 90 to 110 degrees to the handles; this allows the dentist to approach the tooth from above while keeping the handles clear of the patient's upper jaw.

- Universal usage: because the beaks are identical and symmetrical, these forceps are unpaired and can be used for both the lower right and lower left premolars.

- Wider beaks than incisors: compared to lower incisor forceps, the beaks are significantly broader to provide a stable grip on the larger root surface of a premolar.

Fig. 20. Lower premolar forceps

LOWER MOLARS FORCEPS

- Dual pointed beaks (hooks/horns): unlike upper molar forceps (which have only one point), lower molar forceps feature a sharp pointed projection on both beaks.

- Furcation engagement: these two points are designed to slide into the buccal and lingual furcation (the spaces between the mesial and distal roots) simultaneously.

- Symmetry: because both beaks have identical points, these forceps are symmetrical and universal; the same instrument is used for both the lower right and lower left quadrants.

- Wide gap alignment: when closed, the beaks maintain a significant gap to accommodate the large molar crown without making contact, ensuring the force is applied entirely to the root bifurcation.

Right-angle configuration: the beaks are set at a 90-degree angle to the handles, providing the necessary vertical leverage to lift the large, two-rooted teeth from the mandibular bone

Fig. 21. Lower jaw molar forceps

INFERIOR MOLAR FORCEPS BENT ON THE WIDTH

- Frontal grasp forceps (bent on the width):

- Design: the beaks and the handle are parallel to the dental arch rather than perpendicular; the "bend" occurs along the width (the flat side) of the instrument's joint rather than its edge.

- Indications: ideal for lower molars when the patient cannot open wide enough to accommodate standard side-loading forceps.

- Disadvantage: they displace the extraction force, making them less efficient than lateral grasp forceps for standard extractions.

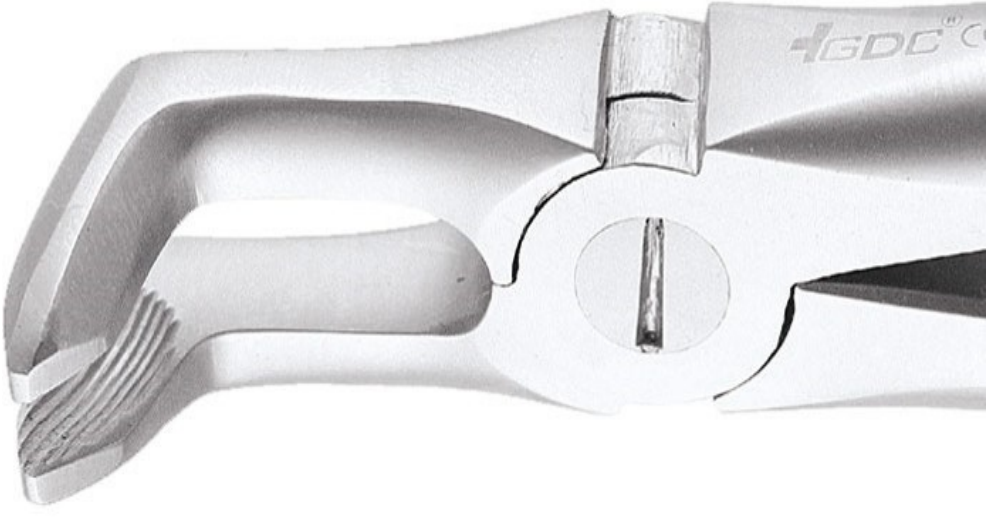

Fig. 22. Inferior molar forceps bent on the width

FORCEPS FOR MAXILLARY ROOTS

This specific instrument is designed for the precise extraction of maxillary molars and root stumps. It features thin, anatomic, and sharp rounded ends to securely grip the root surface with minimal trauma to surrounding tissue. The instrument has a bayonet form in order to reach the posterior areas. The beaks are thin and symmetric without space in-between them.

Fig. 23. Forceps for upper roots

FORCEPS FOR MANDIBULAR ROOTS

Mandibular forceps typically have handles at a right angle to the beaks to accommodate the vertical approach for the lower arch. It features long, slender beaks and often have serrated or diamond-coated jaws to provide maximum grip on delicate or broken root fragments where the crown is missing.

Fig. 24. Lower root extraction forceps

PERIOSTEAL ELEVATORS

Fig. 25. Periosteal elevator

Periosteal elevators are fundamental instruments in oral and maxillofacial surgery, designed to facilitate atraumatic elevation and reflection of the mucoperiosteal flap. These instruments allow a controlled separation of the periosteum from the underlying alveolar bone, thereby providing adequate access and visualization of the surgical field.

Periosteal elevators are fabricated from high-grade surgical stainless steel and are available in a variety of designs, including single- and double-ended configurations. One end is often tapered and sharpened to initiate flap reflection at the gingival margin, while the opposite end is broader and gently curved to continue flap elevation in a smooth, sweeping motion.

In clinical practice, correct use of the periosteal elevator is essential to minimize unnecessary trauma to soft tissues and prevent tearing of the flap. The instrument should be applied with a combination of gentle pressure and controlled movement, maintaining close contact with the bone to avoid damage to adjacent structures.

Commonly employed designs include the Molt No. 9, Freer, and Prichard elevators, each offering specific advantages depending on the surgical procedure being performed. Mastery of periosteal elevator handling is a key component of surgical training, as effective flap management contributes to optimal wound healing and predictable surgical outcomes.

Fig. 26. Molt Nr. 9 elevator

Fig. 27. Freer elevator

RETRACTORS

Retractors are indispensable instruments in oral and maxillofacial surgery, as they provide adequate visibility and access to the operative field while protecting surrounding soft tissues. Among the commonly used retractors are the Farabeuf and Langenbeck retractors. The Farabeuf retractor is a double-ended hand-held instrument that is effective for retracting soft tissues and mucoperiosteal flaps during routine oral surgical procedures. The Langenbeck retractor, with its characteristic right-angled blade, is particularly useful for retracting deeper tissues and maintaining exposure in more complex surgical interventions. The proper use of these retractors contributes to improved surgical precision, reduced tissue trauma, and enhanced patient safety.

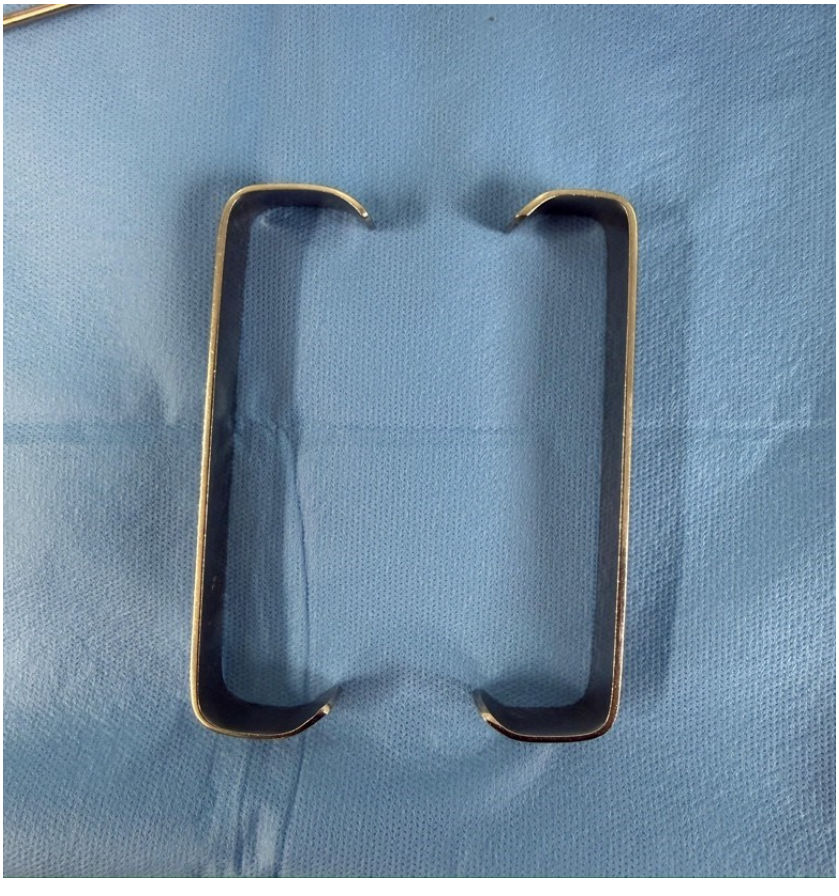

Fig. 28. Farabeuf retractors

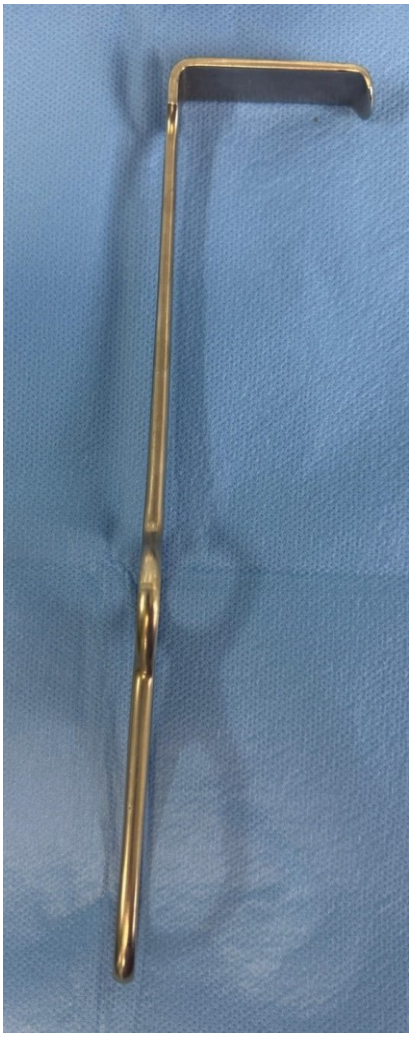

Fig. 29. Langenbeck retractor

Fig. 30. Senn-Miller retractor

SURGICAL HANDPIECE AND BURS

Surgical handpieces, when used with burs, allow for the removal of bone during extractions.

Unlike conventional high-speed air- turbine dental handpieces, surgical handpieces do not exhaust air into the surgical site, which helps reduce the risk of surgical emphysema in patients. Additionally, surgical burs should be used alongside sterile saline to maintain adequate cooling during bone removal.

Surgical burs are generally categorized into two principal types: round burs and fissure burs. Round burs are preferred for the removal of buccal bone due to their ability to create smooth surfaces without generating sharp edges. Fissure burs, in contrast, offer greater versatility, being suitable both for bone removal and for the precise sectioning of tooth crowns and roots during surgical procedures.

SUTURE INSTRUMENTS AND MATERIALS

Suturing is a fundamental procedure in oral surgery used to approximate wound edges, control bleeding, stabilize tissues, and promote optimal healing. Proper selection of suture materials and instruments is essential for successful surgical outcomes.

In oral surgery, sutures are commonly used after:

- tooth extractions
- flap surgeries
- periodontal procedures
- implant placement
- biopsies
- trauma management

The main objectives of suturing are:

- achieve primary wound closure
- promote rapid healing

- minimize infection risk
- control hemorrhage
- stabilize surgical flaps
- reduce dead space
- improve patient comfort

An ideal suture material should:

- be sterile
- cause minimal tissue reaction
- have adequate tensile strength
- be easy to handle
- hold knots securely
- resist bacterial accumulation
- be non-toxic and non-allergenic

Classification of Suture materials based on absorbability:

a. **Absorbable Sutures**: these are broken down by the body over time**.**

Examples:

- catgut
- chromic catgut
- polyglactin 910 (Vicryl)
- polyglycolic acid (Dexon) Advantages

Advantages:

-no need for removal

-useful in deep tissues Disadvantages

-reduced tensile strength over time

Disadvantage: some could induce tissue reaction

b. Non-Absorbable Sutures

These remain in tissue unless removed.

Examples:

- Silk
- Nylon
-Polypropylene (Prolene)
-Polyester

Advantages

- high tensile strength
- minimal loss of strength Disadvantages
- require removal

Disadvantage: can act as foreign bodies

Based on structure

a. **monofilament suture-** single-strand fibers**.**

Examples:

-nylon
- prolene

Advantages

- less tissue trauma
- reduced bacterial wicking

Disadvantages

- difficult to handle
- knot memory

b. multifilament (braided) sutures: multiple fibers braided together.

Examples:

-silk

-vicryl

Advantages

-easy handling

-better knot security

Disadvantages

- higher bacterial accumulation
- greater tissue reaction

Suture sizes

Suture diameter is represented numerically. The common oral surgery sizes are:

- 3-0
- 4-0
- 5-0

Rule:

Higher number of zeros = smaller diameter (example: 5-0 is thinner than 3-0).

In oral surgery:

- 3-0 silk is commonly used after extractions.
- 4-0 or 5-0 is used for delicate mucosal procedures.

Surgical needles

Surgical needles carry sutures through tissues. The parts of a needle are:

- eye or swaged end
- body
- point

Types of needle points

* cutting needle
  - triangular cross-section
  - cuts through dense tissue
  - used in oral mucosa
* reverse cutting needle
  - cutting edge on outer curvature
  - stronger and safer
  - most commonly used in oral surgery
* taper needle
  - rounded body
  - separates tissues without cutting
  - used in delicate tissues

Needle curvature: common curvatures are:

- 3/8 circle
- 1/2 circle

The most oral surgery procedures use 3/8 circle reverse cutting needle.

Instruments used in suturing:

a. **needle holder**: used to grasp and manipulate the needle.

Common types:

- Mayo-Hegar needle holder
- Castroviejo needle holder

Features

- short strong jaws
- ratchet locking mechanism

Fig. 31. Needle holder

b. **Tissue forceps**: are used to hold tissues during suturing.

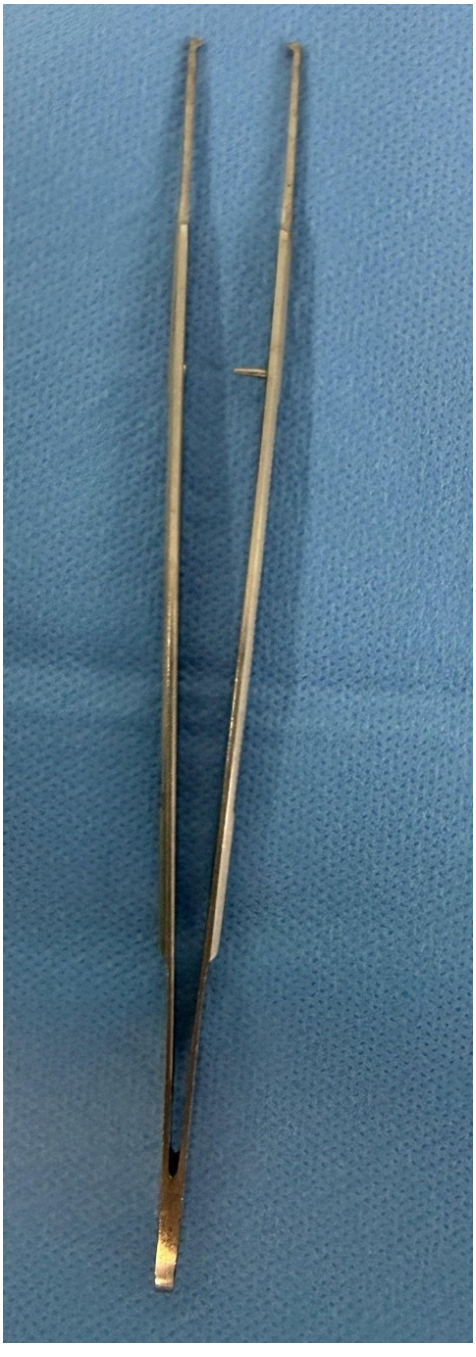

Fig. 32. Tissue forceps

Types:

- Adson forceps
- College tweezers
- Toothed forceps: provide better grip on mucosa.

c. Scissors: are used for cutting sutures and tissues.

Types:

- suture scissors
- Iris scissors
- Metzenbaum scissors

Basic principles of suturing are:

- maintain aseptic technique
- handle tissues gently
- avoid excessive tension
- approximate, do not strangulate tissues
- place sutures evenly
- ensure knot stability

Common suturing techniques in oral surgery are:

- **simple interrupted suture**

Advantages

- easy placement
- good wound adaptation
- failure of one knot does not affect others

- continuous suture

It is a single running suture along wound. Advantages: it is faster and allows tension distribution Disadvantages: entire suture may fail if broken

- Mattress sutures with their two variants:

*****Horizontal Mattress which provides tension relief.

*****Vertical Mattress with good wound edge eversion

- Figure-of-eight suture: commonly used after tooth extraction:

- stabilizing blood clot

- closing extraction sockets

2. PATIENT EXAMINATION

CONSULTATION

A thorough preoperative consultation is essential before undertaking a dental extraction. Ideally, the consultation and the procedure should occur on separate occasions, allowing the patient adequate time to reflect on the information provided, ask questions, and provide informed consent.

During this consultation appointment, a thorough medical history should be taken. This should include any medical diagnoses and conditions, all medications the patient regularly takes along with any allergies. Any subsequent considerations based on this medical history should be explored.

CLINICAL PATIENT EXAMINATION

Perform hand hygiene and put on appropriate personal protective equipment if required.

Introduce yourself by stating your name and professional role.

Verify the patient's identity by confirming their full name and date of birth. Provide a brief, easy-to-understand explanation of what the examination will involve.

Obtain the patient's consent before beginning the assessment. Ask the patient to seat comfortably in the dental chair.

If the patient is wearing dentures or has removable prostheses, request that they take them out for the examination.

Before starting the clinical assessment, ask whether the patient is experiencing any pain.

The clinical examination is divided into three parts: anamnesis, loco-regional examination and the general examination

A. ANAMNESIS covers 4 main subparts

a. personal data

b. reason of presentation or hospitalization

c. medical history

d. personal and medical history

a. **Personal data**:

- registered in the OS/ observation sheet with the signature of the doctors and the patient
- data are confidential
- have medical, legal and scientific value

Personal data required for a patient registration are:

- name, surname
- sex
- date and place of birth
- address
- profession and place of work
- civil status
- telephone number

b. **Reason of presentation/hospitalization** is formulated in all the subjective and /or objective symptoms of the patient.

c. **Medical history of patient's illness**: the patient describes all the subjective and objective complaints from the first signs of onset till the present time of presentation

PAIN is the most frequent initial symptom. Of interest are the characteristics of pain: intensity, frequency, duration

MORPHOLOGICAL CHANGES:

- plague
- tumefaction
- fistula
- ulceration
- tumor

Fig. 33. Labial plaque induced by a home accident

Fig. 34. Hemifacial tumefaction induced by a pericoronaritis

Fig. 35. Submandibular odontogenic fistula

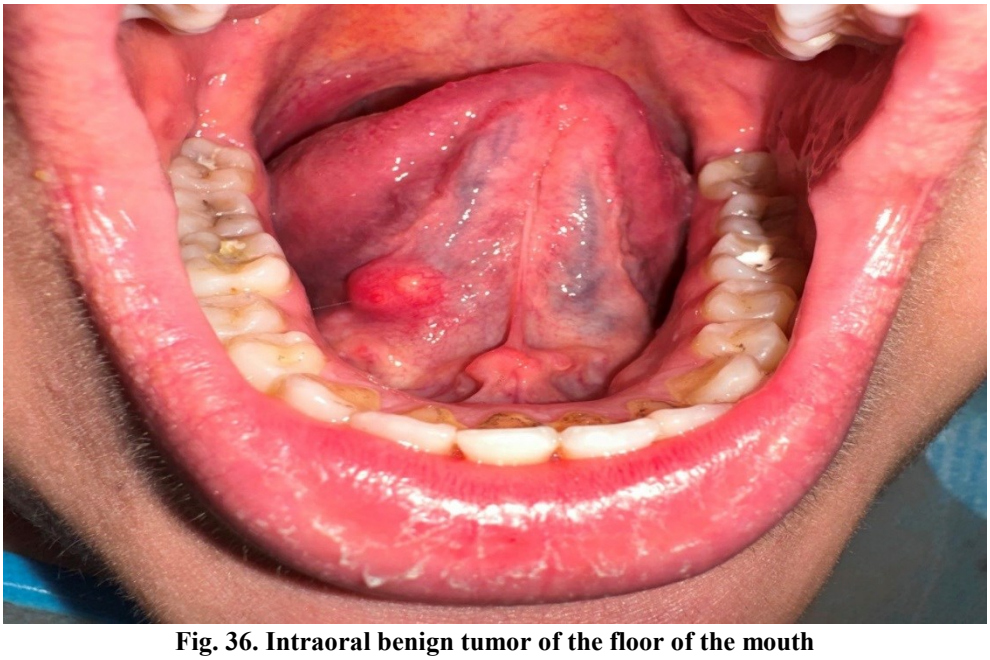

Fig. 36. Intraoral benign tumor of the floor of the mouth

Fig. 37. Intraoral massive malignant tumor

FUNCTIONAL DISORDERS: respiration, mastication, phonation, salivation, aesthetic

HEALTH STATE IMPAIRMENT

- shiver, fever, accelerated pulse, anorexia, weight loss

d. **Personal and medical history** represents a structured record of information about an individual's health, lifestyle, and past medical experiences. Medical history includes:

- Past illnesses: diabetes, hypertension, asthma, tuberculosis.
- Surgeries or hospitalizations: details of operations, injuries, or hospital stay.
- Medications: current and previous drug use, including dosage and duration. Of great interest in our field is the treatment with bisphosphonates which are a class of drugs with a strong inhibitory effect on osteoclast activity and bone resorption, resulting in increased bone density through a reduction in bone turnover. The indications for administration, oral or iv are: osteoporosis, bone metastases, multiple myeloma, Paget disease etc. The effect on maxillary bone is osteonecrosis.

- Allergies: to drugs, food, or environmental triggers. Immunization status: vaccinations received.
- Family history: hereditary conditions like heart disease, cancer, or genetic disorders.
- Gynecological/obstetric history (for women): menstrual history, pregnancies, childbirth, menopause.

Personal History

Demographic details: age, sex, marital status, occupation, education. Lifestyle factors: diet, exercise, smoking, alcohol use, recreational drug use. Habits: sleep pattern, daily activities, stress level.

Environmental exposures: workplace hazards, living conditions.

Social history: support system, relationships, cultural/religious influences. Course of the illness: medical interventions undertaken prior to the current examination

The patient will be asked about the treatments that had been followed, on his own initiative or established by a doctor and their effects.

Which are the factors associated with worsening and improvement of the symptoms? In cases of trauma, of great interest:

- etiology:
- mode of action of the vulnerable agent
- injuries and immediate symptoms
- first therapeutic measures

In cases related with a tumor development:

- when and how it started
- local and general associated symptoms
- duration and mode of tumor evolution

In infectious diseases:

- initial symptoms and mode of installation
- physical condition impairment or nonimpairment
- treatments and evolution

CHRONOLOGY OF DENTAL ERUPTION

The timing and sequence of dental eruption are important because the consistent pattern in which primary and permanent teeth emerge serves as a key biological indicator of a child's growth and development. This information assists dentists in identifying developmental abnormalities, planning early orthodontic interventions such guidance of jaw development, and estimating dental maturity for preventive measures like fluoride therapy. Deviations from normal eruption patterns may indicate underlying nutritional deficiencies, genetic influences, or systemic health conditions.

1. THE OBJECTIVE MEDICAL EXAMINATION

It is based on:

a. ANAMNESTIC DATA (personal and heredo-collateral pathological history)

b. OBJECTIVE GENERAL EXAMINATION

a. ANAMNESTIC DATA consists of the detailed history obtained from a patient through structured questioning by healthcare professionals. It includes information about previous medical conditions, lifestyle factors such as diet and habits, social and family history, developmental and educational background, and the patient's present symptoms. This information provides essential context for making accurate diagnoses and planning appropriate treatment, effectively representing the aspects of a person's life that influence their health. Anamnestic data forms the foundation of clinical evaluation by offering a holistic view that goes beyond observable signs and symptoms, and it plays a vital role not only in medicine and psychology but also in fields such as building and occupational management.

b. For the objective general examination, it will be taken into account:

- CONSTITUTIONAL TYPE
- POWER STATUS
- TIME AND SPACE ORIENTATION
- MENTAL STATUS
- APPEARANCE AND COLOUR OF THE SKIN
- BASIC FUNCTIONS: breathing, phonation, halitosis

B. **OBIECTIVE LOCO-REGIONAL EXAMINATION**

It is divided into 2 major parts:

a. CERVICO-FACIAL EXAMINATION (EXOORAL)
b. ENDOORAL EXAMINATION

a. CERVICO-FACIAL EXAMINATION

The extraoral examination involves a comprehensive assessment of external anatomical structures, particularly the head, neck, and adjacent tissues. This evaluation focuses on aspects such as facial balance, skin integrity, palpation of lymph nodes, sensory response of the trigeminal nerve, and examination of the temporomandibular joint.

In this part of the examination, the elementary lesions will be analyzed:

Discolorations-

- Ecchymosis (bruise) is a purple stain (red-violet), cutaneous or mucous, greater than 1cm, due to the presence of blood in the subcutaneous or submucosal layer
- Hematoma- a collection of blood arising outside the blood vessels.
- Hemangioma- a blood tumor formation developed from the endothelial tissue of the blood vessel

Contusion- a traumatic injury to soft tissues resulting from blunt force, characterized by damage to small blood vessels without a break in the overlying skin or mucosa, leading to ecchymosis, swelling and tenderness.

Abrasion - destruction of the epidermal skin layer

Laceration - wound produced by blunt trauma in which the skin, mucosa or underlying soft tissues are torn, resulting in irregular, jagged wound margins, accompanied by tissue bridging and varying degrees of bruising and swelling.

Wound - lesion of skin or mucosa with interruption - can be traumatic or surgical

Edema - an abnormal increase of fluid into the tissues or occurrence of excessive interstitial fluid; it can have a diffuse or localized character; it is the immediate reaction to trauma, infections or irradiation.

Swelling - an enlargement of tissues or organs caused by excessive accumulation of fluid and the formation of inflammatory infiltrate. The swelling arises as a consequence of vasodilation and increased vascular permeability, accompanied by the extravasation of immune cells including leukocytes, neutrophils, lymphocytes, and monocytes into the interstitial space. These immune elements are mobilized both to combat microbial invasion and to facilitate the clearance of tissue debris generated during the host–pathogen interaction

Circumscribed swelling-the perimandibular abscesses could take this type of appearance

Diffuse swelling - occurs when the inflammatory response is spread over a wide area

Fistula - is an abnormal communication between the oral cavity (or skin of the face/neck) and an underlying odontogenic or non-odontogenic source of infection

Tumor - swelling or lesion caused by abnormal cell growth = neoplasia**:** benign, premalignant or malignant

b. ENDOORAL EXAMINATION

INSPECTION is performed first to evaluate:

- appearance of oral orifice and lips contour

-appearance of oral vestibule

-appearance of oral mucosa: labial, vestibular, gingival, buccal mucosa , tongue, floor of the mouth, palate, oropharyngeal isthmus

- Appearance of oral orifice and lips contour: moist, free of cracking or swelling, with coloration ranging from pink to dark red. The most frequently encountered lesions of the oral orifice are:

- Angular cheilitis: a frequent inflammatory lesion involving the angles of the mouth, with multiple possible underlying causes such as iron deficiency, which may result from conditions like gastrointestinal malignancy or malabsorption disorders.

- Repeated trauma such as lip biting, or chronic irritation caused by sharp tooth edges or ill-fitting dentures may induce benign proliferations such as fibroma or hyperplasia. Clinically, fibroma appears as a smooth, firm, painless lesion that is usually similar in color to the surrounding oral mucosa. It represents a reactive process, comparable to scar tissue, and gradually forms over weeks to months.

- Hyperpigmented macules: characteristic pigmented spots that are strongly indicative of Peutz–Jeghers syndrome, an autosomal dominant inherited condition associated with hamartomatous polyps of the gastrointestinal tract.

- Ulceration: may arise due to local trauma or infections, such as herpes simplex virus, and in rare cases may be associated with malignant disease

- Tumors

Fig. 38. Comisure hyperplasia

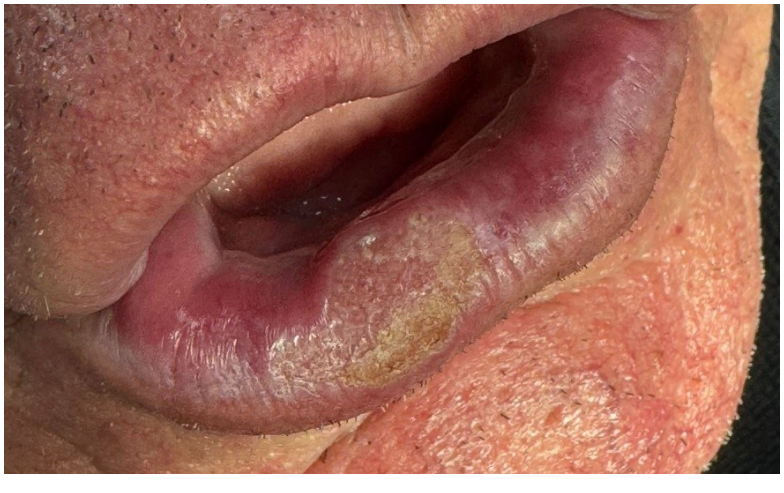

Fig. 39. Lower lip chronic ulceration

Fig. 40. Inferior lip fibroma

- Appearance of oral vestibule which is space between the lips and cheeks externally and the teeth and gums internally

- Appearance of oral mucosa: moist, smooth and shiny with a color that ranges from pink to reddish-purple in people with lighter skin tones; can be brown to black in those with darker skin tones.

Abnormal appearances of the oral mucosa may include dryness, paleness, or unusual spots, are often indicative of an underlying issue.

- labial, vestibular, gingival, cheek

- tongue, oral floor, palate

- oropharyngeal isthmus

Configuration and appearance of:

- dentoalveolar arch
- teeth
- occlusal plane and occlusal relationships

Dentoperiodontal examination

-examination of dental arch

-teeth counting

-teeth health

-periodontal structures

-alveolar process

The alveolar processes within the oral vestibule are examined by gently retracting the lips and cheeks to allow adequate visualization of the buccal and labial mucosa, the mucobuccal fold, and the underlying alveolar ridges. The examiner assesses the contour, height, and symmetry of the alveolar processes, noting any irregularities or swellings.

The color and texture of the overlying mucosa are evaluated for signs of erythema, ulceration, hyperplasia, or pigmentation. Attention is also paid to the depth of the vestibule, the presence of frenal attachments, scars, or mucosal folds, and any lesions or tenderness that may indicate trauma, inflammation, or pathology. In dentate patients, the relationship between the alveolar processes and the teeth is observed, while in edentulous areas, ridge shape and integrity are assessed.

The appearance of the vestibule may provide valuable information about the specific pathologies.

A high frenulum attachment can interfere with a complete examination of the oral vestibule.

Fig. 41. High upper frenulum attachment

A very frequent benign proliferation of the mucosa can be found in association with an ill- fitting complete denture or partial prosthesis. The persistent mechanical trauma and friction on the gingival or alveolar mucosa stimulate hyperplastic proliferation of both epithelial and connective tissue components. Clinically, the lesion manifests as a pedunculated mass on the alveolar ridge mucosa, usually in areas subjected to pressure from the prosthesis. It may be associated with inflammation, discomfort, or ulceration. This type of proliferation belongs to the group of “epulis-like” tumors, more exactly fibroepithelial hyperplasia.

Fig. 42. Epithelio-conjunctive hyperplasia at the mandible

The vestibule can be the origin for various types of tumors. It is important to examine the vestibule, as it can be a primary location for various soft tissue lesions or growths.

Fig. 43. Vestibule benign tumor developed due to chronic irritation

Furthermore, the oral vestibule may represent the site of clinical manifestation of intraosseous neoplasms that, as a result of progressive osteolysis, perforate the cortical plate and subsequently extend into the submucosal tissues

Fig. 44. Maxillary cyst appeared submucosally occupying the vestibule

Palpation is subsequently carried out to evaluate the lesions and abnormalities identified during the clinical examination with the aim of determining the presence or absence of tenderness, as well as their consistency, mobility, and relationships to adjacent, overlying and underlying structures.

TONGUE EXAMINATION

With the patient's tongue at rest, and mouth partially open, inspect the dorsum of the tongue for any swelling, ulceration, coating, or variation in size, color, or texture. Also note any change in the pattern of the papillae covering the surface of the tongue and examine the tip of the tongue. The patient should then protrude the tongue, and the examiner should note any abnormality of mobility or positioning. It is examined IN RESTING AND DYNAMIC position. In this way the mobility and the deviations can be noticed.

Specific maneuvers for the tongue:

- cleaning of the deposits
- mobility in all directions
- digital touch to palpate profound lesions

The risk zones of the tonque which must be in detail examined are:

- ventral face
- pelvilingual groove
- tonsil- groove

Fig. 45. Tumor in the pelvilingual groove (tongue protraction)

Special attention will be given to the dynamic examination of the tongue, observing its symmetry during functional movements. Some interstitial lingual tumor formations or deep infectious processes are difficult to diagnose. Tongue palpation is crucial for identifying deep-seated or interstitial lesions, which can often remain undetected during visual examination. The most frequent pathologies which can be encountered during tongue examination are:

- oral candidiasis: a fungal infection frequently seen in immuno-compromised individuals, marked by removable white plaques that, when wiped off, expose an inflamed, reddened mucosal surface.

- glossitis: a condition characterized by a smooth, red, and enlarged tongue, commonly linked to deficiencies in iron, vitamin B12, or folate, such as those caused by malabsorption in inflammatory bowel disease.

- ulceration: may result from mechanical injury or infectious causes, including herpes simplex virus, aphthous ulcers and malignant lesions.

- hairy leukoplakia: a white, corrugated or “hairy” lesion typically found on the lateral border of the tongue, associated with Epstein–Barr virus infection in patients with compromised immune function

Fig. 46. Aphthous ulcer of the tongue

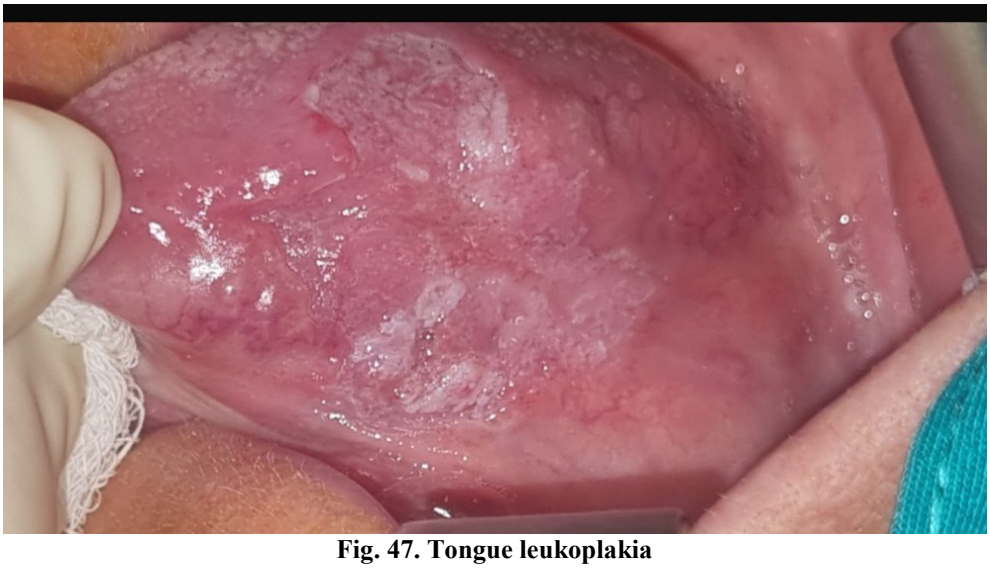

Fig. 47. Tongue leukoplakia

EXAMINATION OF THE FLOOR OF THE MOUTH

The patient is instructed to raise their tongue against the palate to allow inspection of the floor of the mouth for abnormalities, including:

- submandibular gland sialolithiasis: the presence of a calcified stone obstructing the submandibular gland duct, leading to glandular swelling and a more prominent duct. Surrounding redness and possible discharge from the duct may be observed.

- submandibular gland sialadenitis: inflammation or infection of the submandibular gland, most commonly resulting from ductal obstruction by a stone, though viral causes such as mumps may also be responsible; clinical signs can include ductal erythema and purulent discharge.

- ulceration: can occur due to local trauma or infection, such as herpes simplex virus, and in some cases may indicate malignant disease.

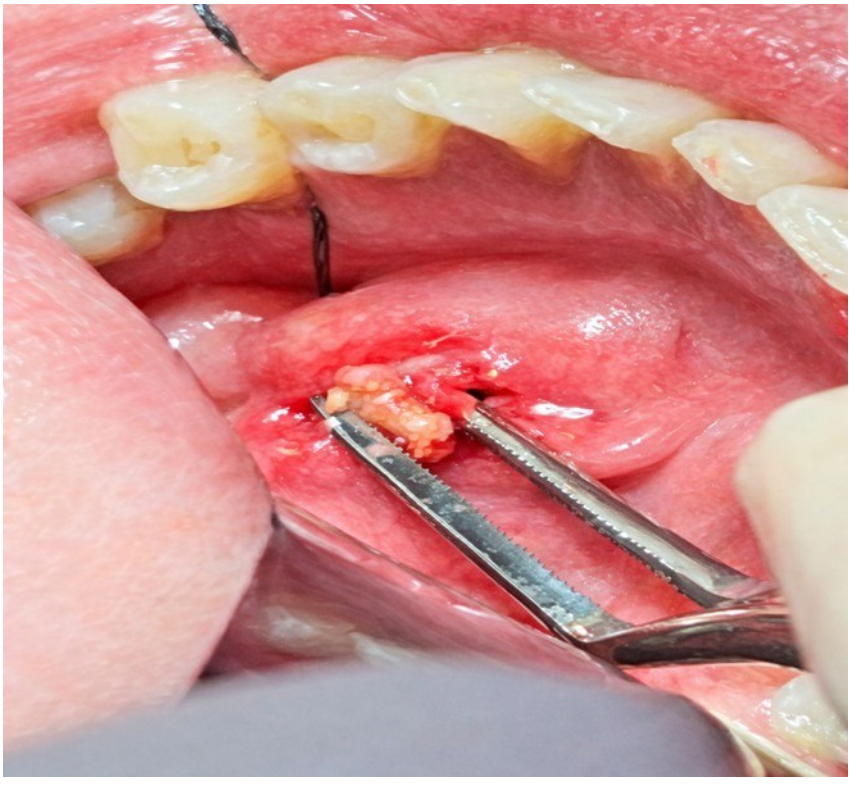

Fig. 48. Submandibular duct sialolithiasis

EXAMINATION OF THE OPENING ORIFICES OF MAIN SALIVARY GLANDS

The clinical examination of salivary gland duct openings, specifically Stensen's duct and Wharton's duct, is a standard part of a comprehensive intraoral assessment to ensure ductal patency and normal salivary flow.

Parotid Duct (Stensen's duct)

Location: the orifice (papilla) is located in the buccal mucosa (inner cheek), typically opposite the maxillary second molar.

Examination technique:

Isolation: retract the cheek and dry the area around the papilla with gauze to clearly visualize the orifice.

Massage: use external pressure to massage the parotid gland (located in front of the ear) in a posterior-to-anterior direction.

Observation: a healthy duct should express a clear, thin, and colorless stream of saliva. Clinicians look for abnormalities like pus (indicating infection), mucus plugs, or grit/stones.

Submandibular duct (Wharton's duct)

The submandibular glands are a paired set of salivary glands situated in the floor of the oral cavity and are major contributors to saliva production. They account for most cases of salivary duct stone formation, likely due to the long, curved, and upward course of their excretory ducts. These ducts open into the mouth on either side of the lingual frenulum at small raised structures called the sublingual caruncles.

Location: the openings are found at the sublingual caruncles, which are two small fleshy papillae on either side of the lingual frenulum in the anterior floor of the mouth.

Examination technique:

Positioning: ask the patient to lift their tongue toward the palate, use a mirror or tongue blade to gently retract the tongue if necessary.

Drying: dry the floor of the mouth with gauze to prevent pooled saliva from obscuring the caruncles.

Bimanual palpation: place one finger inside the mouth along the floor and the other hand externally under the jaw to palpate the gland and duct.

Observation: Similar to the parotid exam, observe for the "upwelling" of clear saliva at the caruncles upon gland massage.

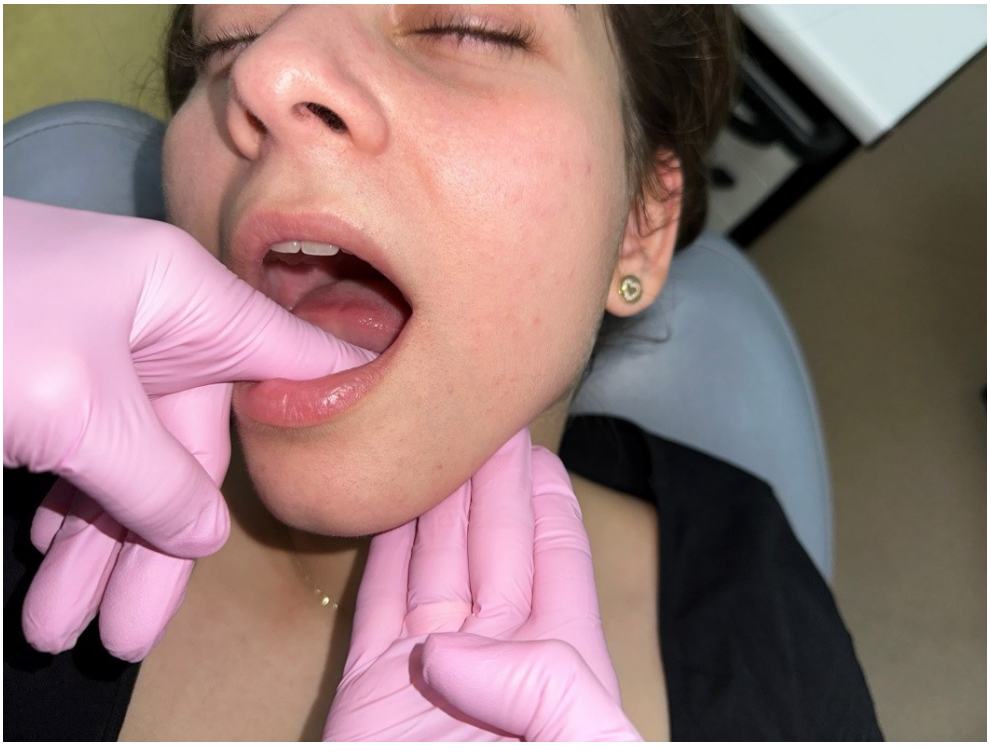

Fig. 49. Examination of the submandibular gland

The sublingual glands, which are also paired, lie in the floor of the mouth posterior to the mandibular canine teeth and contribute to salivary secretion. They are drained by multiple small ducts, typically numbering between eight and twenty, known as the ducts of Rivinus. The largest of these duct merges with the submandibular duct and opens at the sublingual caruncle, while the remaining ducts open along a raised fold of mucosa known as the sublingual plica(plica sublingualis).

TEMPOROMANDIBULAR JOINT

Fig.50. Examination of the TMJ

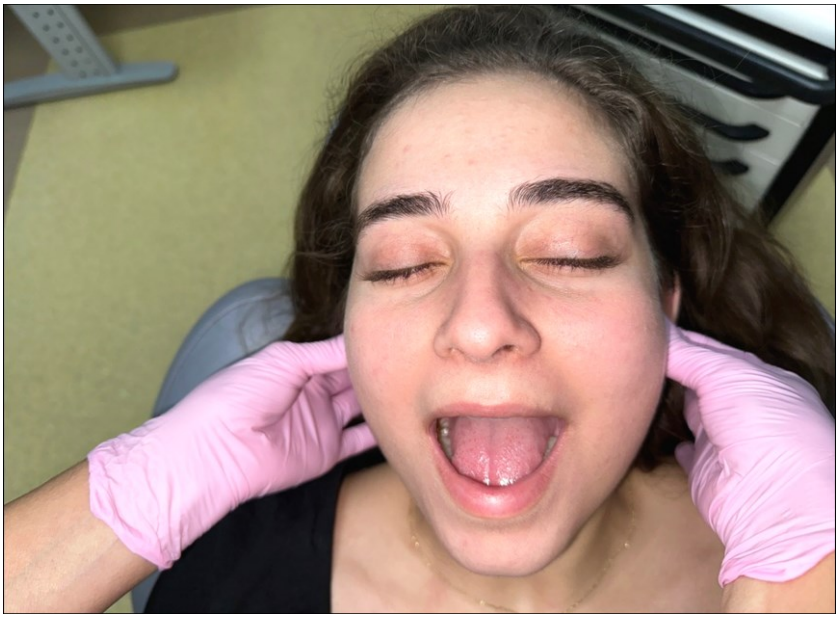

Fig. 51. TMJ movement

Examination of the temporomandibular joint (TMJ) is performed in both static and dynamic conditions. During static examination, the clinician evaluates facial symmetry and palpates the joint region for tenderness, swelling, or other abnormalities. Dynamic examination involves assessment of mandibular movements, including opening, closing, protrusion, and lateral movements, with attention to movement limitations, deviations, joint noises, and pain that may indicate temporomandibular disorders.

C. **PARACLINICAL EXAMINATION**

PARACLINICAL INVESTIGATIONS-AIMS:

- orientation
- establishing the diagnosis
- establishing the etiology
- determining biological status
- finding other simultaneous diseases
- control of disease, outcome and efficiency of a treatment

IMAGISTIC INVESTIGATIONS

Radiology and Medical Imaging

The most commonly used imaging investigations in oral and maxillofacial surgery are:

- plain radiography
- computed axial tomography (CT)
- cone beam computed tomography (CBCT)
- magnetic resonance imaging (MRI)
- ultrasonography (ECHO)
- tomography with positron emission (PET)
- infrared thermography

RADIOLOGICAL INVESTIGATION

- use x rays which are differently absorbed, according to the density and the composition of the material they penetrate

- standard radiography and special incidence

- teleradiographies

- offer a 2D representation

- computed tomography (CT) – generates 3 D reconstruction assisted by computer

PANORAMIC RADIOGRAPHY

Panoramic radiography is a specialized diagnostic tool that captures a comprehensive, two-dimensional view of the entire mouth in a single image. Unlike traditional dental X-rays, which focus on individual teeth from inside the mouth, this extraoral technique uses a rotating arm to scan the upper and lower jaws from the outside

Functionality and Benefits:

- Comprehensive coverage: it provides a broad perspective of the dental landscape, including all teeth, both jaws, the temporomandibular joints (TMJ), and the maxillary sinuses.

- Efficiency and speed: the scanning process is rapid, typically requiring only 12 to 20 seconds of exposure, making it an efficient choice for routine screening and treatment planning.

- Patient comfort: because no equipment or sensors are placed inside the mouth, it is often preferred for patients with a sensitive gag reflex or restricted mouth opening.

- Low radiation: modern digital panoramic systems utilize a minimal dose of ionizing radiation, often exposing patients to less total radiation than a full series of individual intraoral X-rays.

Common Medical Uses

- Treatment planning: dentists frequently use these images to plan for complex procedures such as dental implants, orthodontic braces, dentures, and tooth extractions.

- Pathology detection: it is instrumental in identifying hidden issues like impacted wisdom teeth, jaw fractures, cysts, tumors, and advanced bone loss from periodontal disease.

- General health screening: beyond dental needs, panoramic radiographs can sometimes reveal incidental findings such as calcifications in the carotid artery, which may indicate a risk for stroke or cardiovascular disease.

Elements which must be identified on a panoramic radiography:

a. Dental and bone structures

The most prominent elements are the maxilla (upper jaw) and mandible (lower jaw), which are displayed in a continuous, curved view.

- Teeth: all erupted and unerupted teeth (including wisdom teeth) are visible, allowing for the assessment of crowns, roots, and tooth numbering.

- Mandibular landmarks: key components of the lower jaw include the body, angle, and ramus, as well as the coronoid process and the condyle (part of the jaw joint).

- Maxillary landmarks: visible areas include the alveolar ridge (where teeth are seated), the maxillary tuberosity, and the anterior nasal spine.

- Joints: the temporomandibular joints (TMJ), specifically the mandibular condyle and the articular eminence, are visualized to screen for gross osseous changes or fractures.

b. Air spaces and cavities

Several hollow or air-filled structures appear as darker (radiolucent) areas:

- Maxillary sinuses: located above the upper molars, these are essential for evaluating sinus health or planning dental implants.

- Nasal cavity: this includes the nasal septum, which divides the cavity, and the inferior nasal conchae.

- Pharyngeal air spaces: the nasopharynx and oropharynx air channels are often visible.

c. Neurovascular landmarks

Important pathways for nerves and blood vessels are often identified:

- mandibular canal: a radiolucent tube housing the inferior alveolar nerve.
- mental foramen: the opening where the mental nerve exits the jaw, typically near the roots of the lower premolars.
- incisive foramen: an opening in the front part of the hard palate.

d. Supporting and surrounding structures:

- hard palate: appears as a horizontal white (radiopaque) band above the upper teeth.
- zygomatic arch: the cheekbone structure is visible on the lateral aspects of the image.
- hyoid bone: appears as a "floating" bone below the mandible.
- cervical spine: the upper vertebrae are frequently captured at the edges or as "ghost images" depending on positioning.

e. Potential incidental findings

Radiographs may also reveal abnormalities or variations, such as:

- impacted teeth
- jaw fractures
- cysts
- tumors
- arterial calcifications (like those in the carotid artery) which can be indicators of systemic health risks.
- calculus in submandibular gland

3. DENTAL EXTRACTION

3.1. PERMANENT TEETH EXTRACTION

3.1.A. DENTAL EXTRACTION WITH FORCEPS

This approach is recommended when the clinical conditions make it possible to properly place and stabilize the forceps. It is suitable in situations such as:

- teeth that still have a well-preserved and solid crown structure
- dental roots that are strong and extend sufficiently outside the socket, making them accessible
- roots located at the level of the bone, where access for the forceps can be achieved by first creating a groove around the root using an elevator, another instrument, or a dental bur

In these cases, the anatomy and accessibility allow the forceps to grip securely and function effectively.

The technique of extracting teeth with forceps involves four main steps, which are adapted as needed for each individual tooth.

a. **Syndesmotomy** involves cutting the circular ligament around the tooth to detach surrounding soft tissue. It is performed with thin, sharp syndesmotomes that advance along the root, partially severing alveolar crest fibers. Elevators can also be used, but they mainly act on the circular ligament.

b. **Application of the forceps**. Forceps are applied along the tooth's long axis, ensuring proper adaptation and a secure grip beneath the soft tissue while the other hand stabilizes the jaw. The less visible beak is placed first, then the other one, and both are advanced apically to the bone level. Once firmly seated, the forceps are held in the palm. Correct positioning allows controlled extraction, while improper placement may cause slipping and complications.

c. **Tooth luxation** involves widening the socket and breaking periodontal ligaments using controlled buccal and lingual pressure, sometimes with gentle rotation. Movements are directed toward the area of least bone resistance to avoid fractures..

d. **Final tooth removal** is done after luxation by gently pulling the tooth out along its long axis. If extraction is difficult, it may be due to curved or divergent roots, requiring additional luxation, root separation, or surgical methods. Any soft tissue attachments are carefully released, and the final movement is controlled to avoid injury to the opposite dental arch.

3.1.1. MAXILLARY TEETH EXTRACTION

The maxilla contains abundant cancellous bone, broad alveolar ridges, and a relatively fragile structure, which generally allows tooth removal with forceps. During extraction, the clinician stabilizes the maxilla with the non-dominant hand, placing the thumb and index finger on the palatal and buccal alveolar margins. For left maxillary teeth, the thumb rests on the palatal side while the index finger supports the buccal side and helps retract the upper lip and cheek.

UPPER INCISORS AND CANINE EXTRACTION

FORCEPS

They have straight handles with the blades aligned in continuation; the buccal beak is broad and flat, while the palatal beak is thin and rounded.

TECHNIQUE

The thumb and index finger of the non-dominant hand are positioned to stabilize the alveolar process in the region of the anterior tooth that is to be extracted (Fig.53)

Fig. 52. The alveolary process is stabilized

Syndesmotomy is performed with straight syndesmotomes. These instruments closely resemble elevators, but they are thinner and have a sharper design, allowing them to be advanced along the length of the root. During this apical movement, part of the alveolar crest fibers are cut out. This step can also be carried out using elevators; however, their effect is mainly limited to the circular ligament.

The syndesmotome feature is solid, made of stainless steel. The handle provides a stable, firm and comfortable grip.

The thumb and the index finger provide the primary control for guiding and rotating the instrument.

The side of the middle finger is put on the handle, in this way the instrument grip becomes a stable tripod, giving a better control during syndesmotomy.

Fig. 53. Syndesmotom

Tooth luxation is performed in a buccal -palatal direction

In teeth with round root cross-sections, such as central incisors and canines, this movement may be combined with gentle rotational motions.

The buccal alveolar bone is thin, while the palatal bone is thicker but does not provide direct opposition.

Fig. 54. Forceps adaptation for a lateral incisive extraction

UPPER PREMOLARS EXTRACTION

FORCEPS

The beaks are brought together in close contact.

There is a slight S-shaped curvature when viewed laterally at the joint level.

The beaks are brought together in close contact.

TECHNIQUE

The thumb and the index of the non-dominant hand are placed on the alveolar process to keep tight, under control the extraction site.

The thumb is usually placed on the palatal side (inside). The index finger is placed on the buccal side (cheek side). The roles of these fingers from the non-dominant hand are:

- offer support: it stabilizes the patient's head and jaw.
- offer protection: it acts as a shield for the surrounding gums and cheeks.
- give sensation: it allows the expansion of the bone and the movement of the tooth to be felt by the clinician.

Syndesmotomy is performed in the same manner as in the anterior teeth extraction.

Fig. 55. Position of the non-dominant hand fingers

Tooth luxation is performed in a buccal- palatal direction, and rotational movements are not recommended. The maxillary first premolar has two thin roots, which increases the risk of fracture.

The maxillary second premolar typically presents a single root; if this is confirmed radiographically, rotational movements may be used in addition.

The buccal (vestibular) bone plate is thin, whereas the palatal plate is thicker but does not offer significant resistance.

Fig. 56. Left upper second premolar extraction

Fig. 57. Right upper second premolar extraction

UPPER MOLARS EXTRACTION

FORCEPS

Upper molar forceps are designed with an S-shaped configuration that allows proper access from the side of the mouth. One beak is pointed and adapted to engage the buccal furcation between the two buccal roots, ensuring a firm grip. The opposing beak is broader and rounded, shaped to fit the palatal surface of the tooth. This design accommodates the typical anatomy of maxillary molars, where the buccal roots are often curved and may diverge, while the palatal root is generally straighter and more robust.

For the right upper molars, the pointed beak is positioned so it properly fits into the buccal furcation when used on the patient's right side. Conversely, for the left upper molars, the beak is mirrored to adapt to the left side. This ensures optimal adaptation, better grip, and more controlled force during extraction.

TECHNIQUE

The thumb and index finger of the non-dominant hand are positioned on the alveolar ridge to stabilize and maintain control over the extraction area.

Buccopalatal luxation should be performed gently and in a controlled manner, avoiding abrupt forces.

This gradual movement helps expand the surrounding bone and reduces the risk of root fracture.

For the maxillary first molar, displacement is typically directed toward the palatal side, as the buccal bone is reinforced by the zygomatic alveolar crest.

Following extraction, if there is concern about a possible oroantral communication, the superior wall of the socket should be carefully examined using a blunt probe.

Fig. 58. First upper right molar extraction

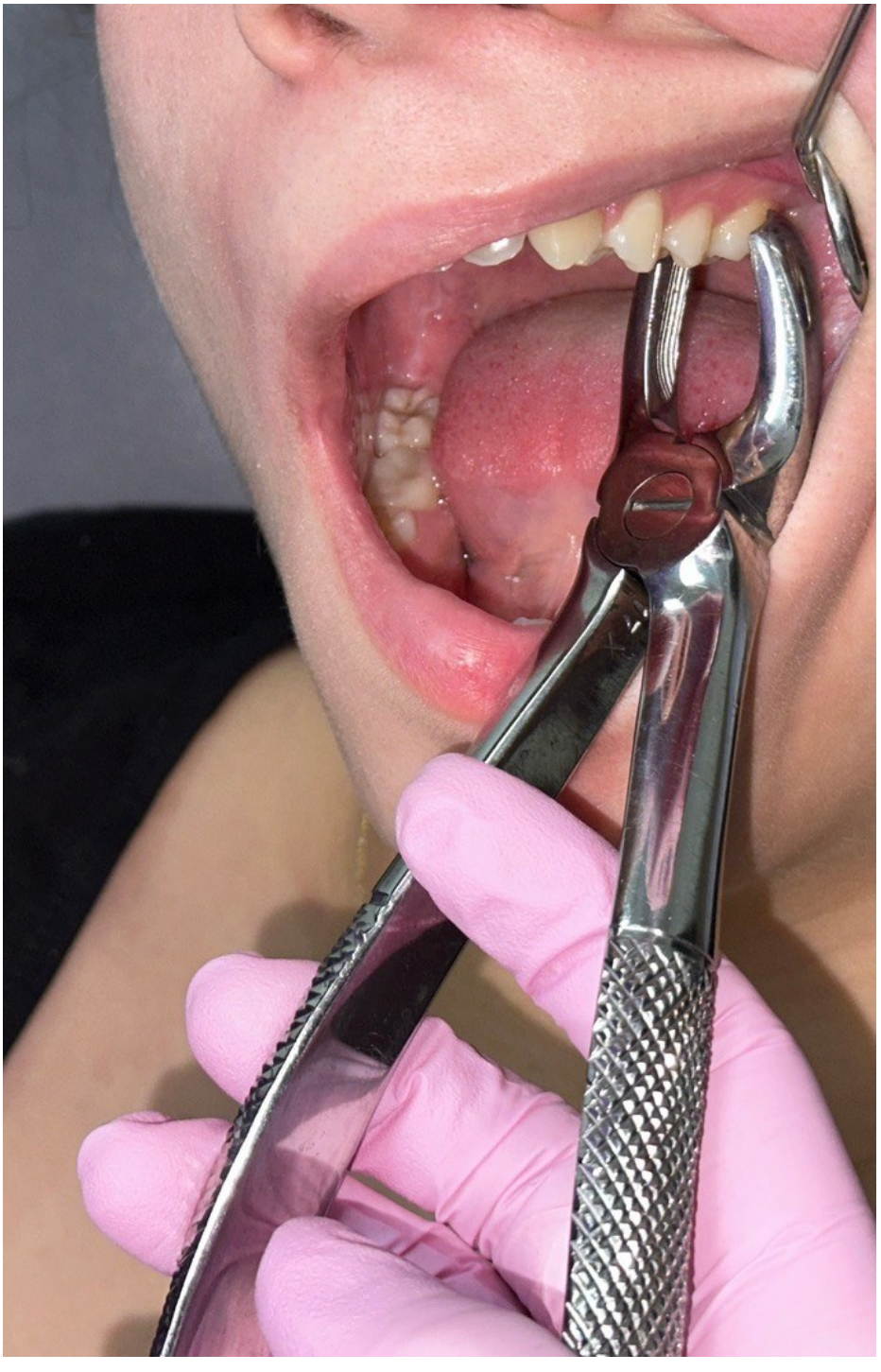

Fig. 59. Left upper first molar extraction

3.1.2. MANDIBLULAR TEETH EXTRACTION

Compared with the maxilla, the mandible is composed of denser and more compact bone. Both the buccal and lingual cortical plates are thick, while the intervening cancellous bone is relatively limited, especially in the region surrounding the mandibular canal. The interradicular septa are usually well developed, providing strong support to the roots. In addition, the external oblique ridge and the internal oblique (mylohyoid) line further reinforce the cortical bone in the molar region.

Because of this increased bone density and reinforcement, extractions of mandibular molars are generally more challenging. Greater resistance is encountered during luxation, and elevators are often required to mobilize the tooth effectively before applying forceps.

From a clinical perspective, these anatomical features also mean that controlled, deliberate force must be used to avoid complications such as root fracture or damage to the inferior alveolar nerve, which runs within the mandibular canal. Sectioning of multirooted teeth is sometimes indicated to reduce resistance and facilitate safer removal.

INFERIOR INCISIVE EXTRACTION

Operator position for extraction: in front of the patient. The nondominant hand retracts the soft tissues, stabilizes the mandible, and provides support for the operator (Fig. 61)

FORCEPS

Inferior incisive forceps are angled over the edge and have narrow, thin, closely set, hemispherical beaks for precise adaptation and secure grip on mandibular incisors

TECHNIQUE

Extraction of mandibular incisors is generally facilitated by the relatively thin buccal and lingual cortical plates, which offer less resistance compared to posterior regions. After proper adaptation of the forceps at the cervical area of the tooth, controlled luxation movements are initiated.

Displacement is performed in a buccolingual direction, with a wider range of movement toward the vestibular side, as the buccal plate is usually thinner and more elastic. These gradual, alternating movements help expand the socket and disengage the periodontal ligament fibers, allowing the tooth to be removed with minimal force and reduced risk of fracture or bone trauma.

Fig. 60. The position of the non-dominant hand prepared for lower incisives extraction

INFERIOR CANINE AND PREMOLARS EXTRACTION

FORCEPS

Are designed with rounded beaks, oblique angled over the edge

TECHNIQUE

Extraction of mandibular canines and premolars is performed using a combination of controlled oro-vestibular luxation movements, often supplemented by gentle rotational movements when the roots are straight and conical in shape.

These motions help progressively widen the socket and weaken periodontal attachments.

In canine extractions, it is often recommended to use lower premolar forceps due to the canine's long and robust root, which requires a more secure and stable grip for effective removal. Careful adaptation of the forceps is essential to ensure controlled force application and to minimize the risk of root fracture.

The final phase of extraction is directed toward the vestibular side, which facilitates removal along the path of least resistance and helps prevent injury to the antagonist teeth. Throughout the procedure, gradual and well-controlled movements are key to reducing trauma to surrounding bone and soft tissues.

During left-sided mandibular extractions, the non-dominant (left) hand plays a key role in stabilizing the mandible, controlling soft tissues, and guiding the operator's force. A commonly used approach is the "three-finger grip," where the middle finger is placed on the lingual aspect, the index finger on the vestibular side, and the thumb supports the mandible from below. This configuration allows effective control of the surgical field while providing tactile feedback during luxation movements.

For right-sided mandibular premolar extractions, the operator is positioned behind the patient, with the left hand encircling and stabilizing the patient's head. This position allows optimal control of both the surgical field and the patient's mandibular movements during the procedure.

The non-dominant hand is used to support and stabilize the mandible using either the "three-finger grip" or the "five-finger grip." In the three-finger technique, the thumb is placed on the lingual aspect, the index finger on the vestibular side, and the remaining fingers are positioned in the submandibular region to provide support and control. In the five-finger grip, the thumb rests on the incisal edges of the lower anterior teeth, while the other fingers are placed beneath the mandible in the mental region, ensuring stronger stabilization, especially useful in more resistant cases.

Once adequate stabilization is achieved, the forceps is held in the right hand and carefully adapted to the cervical region of the premolar. Luxation is then performed with controlled buccolingual movements, gradually increasing amplitude to expand the socket and sever periodontal attachments. The final extraction movement is directed slightly toward the buccal side, which corresponds to the path of least resistance and helps minimize trauma to surrounding tissues.

The non-dominant hand not only stabilizes the jaw but also retracts soft tissues and helps counteract extraction forces, reducing the risk of mandibular movement or injury. Meanwhile, the forceps are held in the right hand, which performs the controlled extraction movements.

Fig. 61. Three finger grip for left quadrant

Fig. 62. Operator s position for 4th quadrant extraction of premolars

INFERIOR MOLARS EXTRACTION

FORCEPS

- Beaks curved over the margin, each with a pointed projection
- Projections engage the tooth bifurcation
- Identical designs for left and right sides
- Angulated shape useful in limited mouth opening (e.g., trismus)

TECHNIQUE

- Buccal (vestibular) bone is dense and resistant
- Luxation is primarily performed in an oro-vestibular direction
- Posterior teeth require increased lingual displacement due to thicker buccal and thinner lingual bone
- Second molars are mobilized more toward the lingual side
- Devital teeth present a higher risk of root fracture during extraction
- Conical roots may allow the use of rotational movements

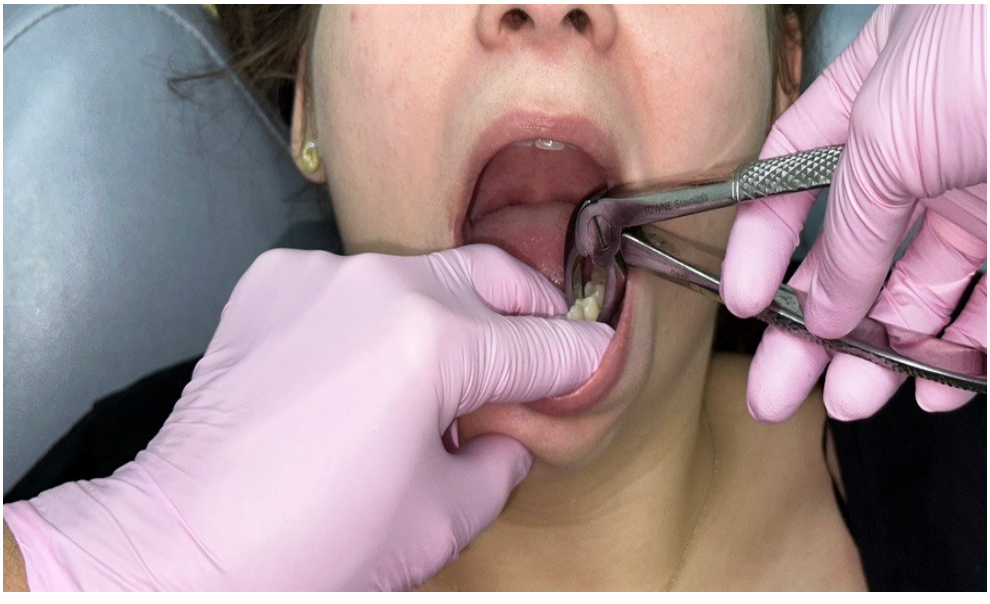

Fig. 63. Forceps position for left inferior molars

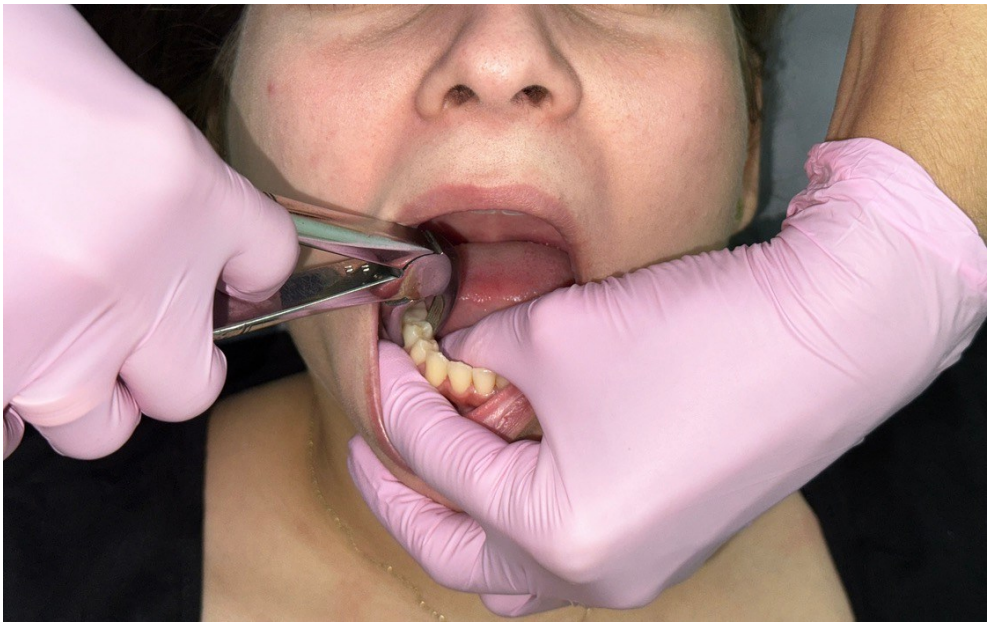

Fig. 64. Operator position and forceps adaptation for right inferior molars extraction

EXTRACTION OF WISDOM TEETH

LOWER WISDOM TEETH EXTRACTION

Anatomical considerations

- Third molars show wide variation in crown shape and root number, length, and curvature
- Surrounding mandibular bone is dense, with a thick cortical plate, especially buccally
- The mandibular canal often lies close to the root apices, increasing the risk to the inferior alveolar nerve
- Limited surgical access and posterior position may complicate instrumentation
- Roots may be divergent, fused, or dilacerated, influencing extraction technique

Radiographic assessment (essential before extraction)

- Relationship between the third molar crown and the distal aspect of the second molar
- Root morphology: number, length, curvature, and degree of development
- Proximity between the roots and the mandibular canal
- Depth and angulation of impaction (e.g., vertical, mesioangular, horizontal)
- Available space in the retromolar area and surrounding bone support

Completely erupted third molars can be extracted:

- Using forceps for lower jaw molars
- In patients with a full dental arch, third molars can be mobilized distally using a straight elevator if their roots show a distal inclination.

Lower wisdom teeth extraction with elevators through distally luxation can be performed in the following conditions:

- Roots curved toward the distal direction
- Adequate space between the distal surface of the third molar and the mandibular ramus
- Presence of a complete molar segment (first and second molars intact); absence of the first molar increases the risk of damage or displacement of the second molar

Technique:

- The elevator tip is inserted interdentally from the buccal side, with the active surface directed toward the third molar
- It is advanced as deeply as possible in an oblique orientation
- Gentle rotational movements are applied to displace the tooth distally
- This maneuver facilitates completion of the extraction
- If marked resistance is encountered, the procedure should be stopped

The risks by using this technique, can be the following:

- With straight roots, there is an increased likelihood of root fracture during extraction in cases of partially erupted teeth, resistance from the distal bone and ascending ramus may predispose to fracture of the mandibular angle

The Lecluse elevator is used for controlled luxation of mandibular molars, mainly as an adjunct in difficult extractions. It is inserted interdentally or subgingivally and works on a lever principle to displace the tooth.

However, its use carries important risks: excessive or uncontrolled force can lead to root fracture, damage to the adjacent second molar, or trauma to the buccal cortical plate. In unfavorable bone conditions, it may also contribute to mandibular fracture, so careful, limited application is essential.

Angulated-over-the-surface forceps are especially useful in cases of limited mouth opening, such as trismus. Luxation is carried out in an oro-vestibular direction, with a wider movement toward the lingual side.

Treatment and post-extraction considerations

Alveolar curettage must be performed cautiously, taking into account the close relationship with the mandibular canal. The surgical site should be carefully inspected, as healing may occasionally be complicated by infection. Due to the presence of thick cortical bone forming the alveolus, the healing process is generally slower than in other regions. Granulation tissue develops progressively over time. Any disturbance in blood clot formation or its normal organization may increase the risk of infection and spread to adjacent anatomical spaces.

UPPER WISDOM TEETH EXTRACTION

The maxillary third molar is usually the smallest tooth in the upper molar group and shows significant anatomical variability in both crown and root morphology. Root forms may include fused roots, divergent roots, or roots with pronounced curvatures in different directions, all of which can influence the difficulty of extraction.

In deeply impacted cases, due to the high posterior position in the maxilla, standard periapical (retroalveolar) radiography may be insufficient or difficult to obtain. In such situations, extraoral imaging is preferred, including panoramic radiography, Waters projection, and lateral cephalometric view. Cone-beam CT may also be indicated when a more precise three-dimensional evaluation of the relationship with the maxillary sinus is required.

The proximity of the maxillary third molar to the maxillary sinus and tuberosity is a key surgical concern. Therefore, careful preoperative assessment is essential to evaluate the risk of complications such as oroantral communication or tuberosity fracture.

When a high risk of maxillary tuberosity fracture or sinus involvement is anticipated, extraction should be performed under controlled conditions, often in a hospital or specialized surgical setting, to allow proper management of potential complications.

FORCEPS

- Straight handle design for posterior maxillary access
- Bayonet-angled beak for improved reach to upper third molar region
- Symmetrical, identical grasping surfaces on both beaks
- Allows stable and uniform tooth engagement during extraction

TECHNIQUE

- In a partially edentulous arch, third molars are usually grasped with dedicated wisdom tooth forceps and luxated. Displacement is performed in an oro-vestibular direction, with a stronger vestibular component.
- When the roots are conical and curve distally, and a complete dental arch is present, distal luxation can be achieved using a straight elevator.
- In cases where radiographic evaluation shows bifurcated roots, it may be indicated to perform longitudinal sectioning of the tooth to facilitate separate removal of the roots.

3.2. DENTAL ROOTS EXTRACTION

RETAINED ROOTS EXTRACTION PERFORMED WITH RETAINED ROOT FORCEPS

INDICATIONS:

- In cases when retained root can still be securely engaged between the beaks of the forceps.

INSTRUMENTS: differ from standard dental forceps by having slimmer, closed, and more delicate beaks designed for better adaptation to root surfaces.

Maxilla:

- Incisor root forceps: straight design
- Premolar root forceps: slightly angulated
- Molar root forceps: bayonet-shaped for improved posterior access

Mandible:

- Mandibular root forceps feature narrow, closed beaks adapted for firm and controlled grasping of root remnants.

TECHNIQUE

When the root margins are located above the level of the surrounding bone, extraction can be performed in a manner similar to that of a complete tooth, using standard forceps adaptation.

If the root margins are at or below the alveolar crest, the attached gingiva and periosteum should first be carefully elevated. A space is then created between the root surface and the surrounding bone using an elevator or a bur, allowing proper insertion and adaptation of the forceps beaks.

In certain uncomplicated cases, once adequately mobilized, the root can be removed immediately without the need for additional bone removal or

extensive manipulation. In other situations, the procedure is more complex and requires additional luxation using elevators, or may necessitate a surgical approach for proper removal.

ROOT EXTRACTION WITH SEPARATION

Root separation is indicated in:

- molars with widely divergent roots, where the interradicular distance exceeds the dimensions of the alveolar socket
- molars with apically convergent roots that encircle the interradicular septum

This technique is considered safer and more conservative than attempting forced root fracture at the furcation level using forceps.

For sectioning, round or fissure burs are recommended. A separation groove is first created along the center of the pulpal floor, after which the division is completed using a fissure bur to fully split the roots for individual removal.

For maxillary molars, the root separation line is typically T-shaped. The first step consists of separating the palatal root from the two buccal roots, followed by a second cut placed perpendicular between the mesiobuccal and distobuccal roots. After sectioning, each root is removed individually, usually with bayonet forceps. The palatal and distobuccal roots are generally extracted using rotational movements, while the mesiobuccal root, being flattened, is removed with bucco-oral luxation movements.

Fig. 65. Maxillary right upper first molar extraction with root separation

For mandibular molars, the separation line is oriented in a bucco-lingual direction. Once divided, the individual roots are extracted using lower incisor forceps or dedicated root forceps, depending on access and root morphology.

Fig. 66. Mandibular molar extraction with root separation

SMALL ROOTS PLACED UNDER THE BONE LEVEL EXTRACTION

Depending on the clinical situation, the following instruments may be used:

- root forceps with narrow, delicate beaks for better access
- endodontic instruments (needles/files) when they can be securely anchored in the root canal, mainly in small root fragments
- small round burs for roots with larger diameters, to facilitate exposure
- fne elevators, used with controlled force to avoid excessive apical pressure

When conservative approaches are insufficient, a surgical procedure becomes necessary.

A partial alveolotomy may be performed while preserving the marginal alveolar bone. After a straight or slightly curved incision at the base of the socket, a limited bone window is created at that level. This allows the root fragment to be displaced coronally and subsequently removed.

In exceptional cases, retention of root fragments may be justified, such as:

- when surgical risks outweigh potential benefits
- when the fragment is very small (approximately under 4–5 mm) and deeply embedded in the socket
- when the fragment is intact, non-infected, and shows no periapical radiolucency

Aggressive removal of all root remnants can lead to significant bone loss and may damage vital anatomical structures such as vessels and nerves. It may also result in complications such as displacement into the maxillary sinus or projection into the mandibular canal or submandibular space.

In such situations, a cautious and controlled approach is recommended:

- the patient must be informed about the risks and treatment options
- radiographic documentation should be performed
- cinical follow-up must be ensured, either scheduled or immediate in case of complications

The preferred strategy is to postpone rather than abandon the procedure until inflammatory signs have completely resolved.

ROOT EXTRACTION USING ELEVATORS

Elevator-assisted removal is indicated for root fragments when forceps cannot be applied.

For maxillary roots, a straight Bein elevator is commonly used, with a trough-shaped or flame-shaped working tip.

For mandibular roots, instruments include:

- paired Bein elevators (right and left)
- triangular elevators with a lateral working edge

Technique involves two main steps:

1. Proper insertion of the elevator
2. Luxation and removal of the root fragment

The elevator is held with a palmar grip, while the index finger is placed near the working end to guide the instrument and prevent slipping.

Mechanism of action:

- the elevator is inserted between the root and the alveolar wall
- it functions as a wedge, displacing the root toward the opposite bony surface
- controlled rotational movements enlarge the periodontal space, facilitating mobilization
- when working in an empty socket, the elevator may be applied through the interradicular septum, which is fractured to allow access and removal of bone debris

Important caution: Excessive vertical force may displace the root into the maxillary sinus or the mandibular canal.

If repeated attempts fail, surgical removal through alveolectomy is indicated.

DENTAL EXTRACTION BY ALVEOLECTOMY

Alveolectomy is a surgical technique that involves controlled removal and exposure of part of the alveolar bone in order to access and extract dental roots.

INDICATIONS

This procedure is indicated in the following situations:

- failure of conventional extraction using forceps and elevators
- aticipated difficult extractions due to thick buccal cortical plate or dense bone, where there is risk of root or bone fracture
- complex root morphology, such as divergent, curved, or “bell-clapper” shaped roots

- teeth with advanced structural destruction
- retained or residual root fragments
- limited prosthetic or dental space caused by tilted adjacent teeth
- close anatomical relationship with critical structures such as the maxillary sinus or mandibular canal

SURGICAL PROCEDURE

1. Flap design and incision

A mucoperiosteal flap is first raised to ensure adequate access and visualization. The flap must be sufficiently large to expose the surgical field and allow later coverage of the defect.

Common flap designs include:

- **envelope flap:** a marginal incision extended to two adjacent teeth, following the gingival contour
- **trapezoidal flap:** a marginal incision combined with two vertical releasing incisions placed at adjacent teeth, including interdental papillae, providing wide access to the buccal bone
- **triangular (L-shaped) flap:** a marginal incision extended mesially to include one or two teeth, combined with a single vertical releasing incision; used when full socket coverage is not required

The trapezoidal design offers excellent visibility of the buccal alveolar bone and allows complete closure of the surgical site, which is particularly useful in cases with risk of sinus exposure or postoperative complications.

2. Flap elevation and exposure

The mucoperiosteal flap is carefully reflected and held with retractors (e.g., Farabeuf or Langenbeck), providing full exposure of the alveolar bone and root structures. Under direct vision, an attempt at controlled forceps application may sometimes be possible.

3. Bone removal and root extraction

Osteotomy is performed to remove the buccal alveolar bone and expose the root fragments. This is commonly done using round burs under copious irrigation at moderate speed, although chisels or rongeurs may also be used.

Bone removal is carried out progressively, typically matching the diameter of the root and extending to approximately half its length. Complete bone removal may be required in cases of severe root deformity or ankylosis.

Once exposed, the root is luxated and removed using elevators or fine instruments. Multirooted teeth are managed by sectioning prior to extraction.

4. Cleaning and wound preparation

The surgical site is carefully debrided to remove granulation tissue and bone debris. Sharp bone edges are smoothed, and the area is thoroughly irrigated with saline solution.

5. Closure

The flap is repositioned and sutured using non-resorbable sutures. In simple extraction sites, partial or complete closure may be left to heal by secondary intention. In more extensive alveolectomies, closure may require advancement of the buccal flap to fully cover the bone defect.

A limited partial alveolectomy technique involving a buccal bone window at the apical level (Cyrzinski–Hönig approach) is now rarely used due to restricted visibility and limited surgical access.

ALVEOLOPLASTY

Alveoloplasty is a surgical procedure performed after tooth extraction that involves reshaping, smoothing, and recontouring the alveolar bone. Its main goal is to create an even, stable bony ridge that facilitates soft tissue healing and improves future prosthetic rehabilitation. By eliminating sharp bony edges and irregularities, the mucosa can be closed without tension, promoting faster healing and reducing postoperative discomfort and bleeding.

Modern literature also emphasizes that alveoloplasty helps reduce the risk of pressure points, mucosal ulceration, and prosthetic instability in complete or partial denture wearers.

INDICATIONS

- single or multiple tooth extractions when ridge regularization is required
- pre-prosthetic surgery to optimize the shape of the alveolar ridge for removable or fixed prostheses
- severe bony irregularities following extraction, trauma, or periodontal disease
- preparation of the alveolar ridge before complete or partial denture placement
- cases where sharp bony spicules or undercuts may compromise healing or prosthetic stability

TECHNIQUE

1. Pre-surgical prosthetic planning

- Impressions of the dental arches are taken before surgery
- study models are prepared, and teeth planned for extraction are removed on the cast
- a surgical or immediate prosthesis is fabricated on the modified model
- this prosthesis serves both functional and protective roles, supporting soft tissues during healing and guiding ridge contouring

2. Surgical phase

- a mucoperiosteal flap is designed and raised to expose the alveolar bone
- extraction of the indicated teeth is performed
- the alveolar ridge is carefully reshaped using bone files, curettes, rongeurs, or rotary instruments under irrigation
- sharp edges are removed and the ridge is palpated to ensure smooth contour
- the flap is repositioned without tension and closed using resorbable or non-resorbable sutures

- an immediate prosthesis may be placed to protect the surgical site, control bleeding, and support soft tissue adaptation

Recent clinical protocols also highlight the importance of minimizing excessive bone removal to preserve ridge height and volume for future implant or prosthetic planning.

3. Post-surgical prosthetic phase

- new impressions may be taken shortly after surgery or within a few days to construct a definitive prosthesis
- the temporary or immediate denture is delivered at suture removal
- periodic adjustments and relining (rebasing) are performed after approximately 5–6 months to accommodate ongoing alveolar bone remodeling and resorption

Alveoloplasty remains a key procedure in pre-prosthetic oral surgery, ensuring functional ridge morphology and improving long-term prosthetic outcomes.

4. DECIDUOUS TEETH EXTRACTION

INDICATIONS

Physiological indications:

- primary teeth showing normal physiological root resorption
- primary teeth with incomplete resorption that interfere with the eruption path of the permanent successor
- in cases of agenesis of the permanent tooth, extraction of a healthy deciduous tooth is generally contraindicated, as it may serve a functional and space-maintaining role

Fig .67. Primary teeth with incomplete resorption that interfere with the eruption path of the permanent incisors

Pathological indications:

- chronic local or systemic pathology affecting the primary tooth
- over-retained deciduous teeth that delay or prevent eruption of the permanent successor
- traumatic injuries such as fractures or luxations involving primary teeth

TECHNIQUE

The extraction of deciduous teeth does not differ significantly from that of permanent teeth and is generally simpler due to progressive root resorption and reduced anchorage.

Preoperative radiographic evaluation is essential to assess the degree of root resorption and the relationship with the developing permanent tooth.

The procedure should be performed under effective local anesthesia, ideally with the assistance of an operator for better control and patient comfort. Forceps are the instruments of choice, while elevators may be used selectively when necessary.

Regardless of the instruments used (forceps, elevators, curettes, or pincettes), extreme caution must be taken to avoid any damage to the underlying permanent tooth germ.

In cases of early extraction—performed more than one year before expected physiological exfoliation—coordination with an orthodontist is recommended to ensure proper space maintenance and eruption guidance.

5. HEALING AND POSTEXTRACTIONAL CARE

The process of extraction socket healing has been extensively studied and documented over the years, as tooth extraction continues to be one of the most frequently performed procedures in dental practice.

During the healing process, the socket walls undergo three-dimensional remodeling and resorption, resulting in marked changes in both hard and soft tissues and ultimately altering the original contour of the alveolar ridge.

The extent of post-extraction bone loss and dimensional changes varies depending on the type and position of the extracted tooth. These changes are particularly critical in the anterior region, where the thin bone plate predisposes to pronounced resorption. In posterior regions, socket healing is strongly influenced by local anatomical factors, especially the morphology of the alveolar process and underlying basal bone. The number and quality of remaining socket walls after extraction play a key role in healing outcomes; reduced wall number or thin cortical plates are associated with impaired regeneration.

It is also important to note that molar extraction sites differ considerably from anterior sites in terms of socket size, cortical bone thickness on the buccal and lingual aspects, and the frequent presence of interradicular septa. Furthermore, differences between maxillary and mandibular extraction sites are influenced by maxillary sinus pneumatization. Evidence shows that spontaneous healing is associated with greater alveolar ridge resorption, particularly in molar regions. In severe cases, lack of ridge preservation may lead to such pronounced bone loss in areas close to the mandibular canal or maxillary sinus that subsequent placement of dental implants becomes challenging or even compromised.

Healing of an extraction socket is a dynamic and time-dependent biological process that begins immediately after tooth removal and continues for several months. While the early phases of healing are typically completed within the first months, evidence shows that bone modeling and remodeling persist well beyond a year. The overall outcome of this process is influenced by a combination of local and systemic conditions, treatment-related factors, environmental influences, and individual variability in healing capacity.

During this healing cascade, the alveolar ridge undergoes progressive dimensional and morphological changes, most commonly characterized by a reduction in height and width. These changes are often more pronounced on the buccal and labial aspects, which can compromise both functional and aesthetic outcomes in future restorative or implant therapy.

Because of these predictable post-extraction alterations, considerable attention in the literature has been directed toward strategies aimed at preserving ridge volume. This has led to the development of socket preservation techniques using various biocompatible materials designed to limit post-extraction resorption and maintain a more favorable bone architecture for subsequent implant placement.

Fig. 68. Vertical and transversal atrophy following extraction

Biological phases of socket healing

Socket repair occurs through a series of overlapping but distinct biological stages: hemostasis, inflammation, proliferation, and remodeling. Although each phase has characteristic events, their timing is not strictly separated, and the overall speed of healing may vary between individuals. In humans, early bone formation proceeds relatively quickly, whereas maturation and long-term structural adaptation of the newly formed bone occur at a much slower pace and may continue for years.

Hemostasis and early clot formation

Immediately after extraction, the socket fills with blood, which rapidly coagulates to form a fibrin-rich clot composed of platelets, red and white blood cells, and a fibrin network. This clot plays a critical role in achieving hemostasis and also acts as a temporary scaffold for incoming cells involved in tissue repair.

Within days, the clot is progressively replaced by granulation tissue rich in vascular structures, inflammatory cells, and mesenchymal elements. Platelets and other cells within the clot release signaling molecules and growth factors that regulate the transition to the inflammatory phase and initiate tissue regeneration.

Inflammatory phase

The inflammatory phase begins shortly after clot stabilization and is characterized by the recruitment of immune cells to the extraction site. Neutrophils arrive first, followed by macrophages and lymphocytes, which collectively help remove debris, breakdown necrotic tissue, and prepare the socket for regeneration.

Macrophages also play a central regulatory role by releasing growth factors that stimulate fibroblast activity, angiogenesis, and early osteogenic responses.

During this period, the fibrin clot is progressively organized and replaced by granulation tissue composed of new capillaries, inflammatory cells, and immature connective tissue. This tissue provides a biologically active environment that supports subsequent bone and soft tissue formation.

Proliferative phase and early bone formation

The proliferative phase is marked by rapid formation of a provisional matrix and the onset of fibroblastic and osteogenic activity. This matrix gradually replaces granulation tissue and remnants of the periodontal ligament.

As vascularization increases, osteoprogenitor cells migrate into the site and begin producing woven bone. This immature bone forms in close association with newly formed blood vessels and gradually fills the socket. Over time, the woven bone becomes the dominant structure, while inflammatory components and provisional tissues diminish.

By the end of this stage, most of the socket is filled with newly formed trabecular bone, although this bone is still structurally immature and mechanically weak.

Remodeling and long-term bone adaptation

The final stage involves the transformation of immature woven bone into mature lamellar bone and bone marrow. This process gradually restores mechanical strength and functional stability to the alveolar bone.

Bone modeling refers to changes in bone shape and external architecture, which contribute to the dimensional reduction of the alveolar ridge. In contrast, remodeling refers to internal structural turnover without necessarily altering overall shape. Both processes occur simultaneously but at different biological levels.

Initially, bone maturation begins in the deeper portions of the socket and later progresses coronally, eventually leading to the formation of a cortical seal. Over time, trabecular organization increases and the bone becomes more structured and load-resistant. However, the extent and speed of this maturation vary widely among individuals, and remodeling activity can continue for extended periods after extraction.

Different studies have shown variability in the proportion of woven and lamellar bone present at various healing intervals, reflecting differences in healing dynamics and biological variability. Eventually, the socket becomes filled with a combination of mature bone and marrow spaces, although residual remodeling may persist long after clinical healing appears complete

POSTEXTRACTIONAL CARE

A gauze pad is placed over each extraction site to help control bleeding, and the patient is instructed to bite down on it for approximately five to ten minutes.

After removal of the gauze, the clinician checks the socket to ensure it is properly filled with a stable blood clot and that the gingival margins adequately cover the alveolar bone. If bleeding persists or if the gingival margins are not properly adapted, sutures are placed to achieve better stabilization and haemostasis.

The intra-alveolar blood clot is typically reviewed after about 24 hours to confirm stability. Sutures, when used, are usually removed after five to six days, depending on the clinical healing response.

On the day of extraction, patients should avoid any mechanical, thermal, or chemical irritation of the surgical site, including vigorous mouth rinsing, consumption of hot foods or beverages, and intake of alcohol or coffee.

Analgesic medication is recommended before the local anesthetic wears off to help manage postoperative discomfort.

Oral hygiene can be resumed the day after the procedure by gently brushing the teeth, taking care to avoid the extraction area. This may be complemented with warm saline rinses to support healing and maintain cleanliness of the surgical site.

6. ACCIDENTS DURING TOOTH EXTRACTION

Preventing accidents and surgical complications is the most effective way to manage them.

This is achieved through:

- good preoperative evaluation
- well-structured treatment planning
- performing only procedures within the clinician's competence
- referring to specialized services when necessary (ethical and medico-legal duty)

Patient communication:

- inform patients about potential risks and complications
- explain how complications would be managed
- document all information in the informed consent (signed by the patient) To reduce accidents during tooth extraction, follow basic surgical principles:
- ensure proper access and visibility
- provide adequate illumination and suction
- achieve sufficient soft tissue reflection
- maintain controlled, precise force (finesse over strength)
- handle tissues atraumatically
- ensure hemostasis and clean the surgical field properly
- follow strict aseptic technique

6.1. DENTAL ACCIDENTS

6.1.1 ROOT FRACTURE

Root fracture during extraction most often occurs due to extensive crown destruction, but it can also result from technical mistakes. Root fractures are more likely in the following situations:

- teeth with severely damaged crowns from caries, large restorations, or fixed partial dentures; fractures may occur when forceps are applied or during initial luxation;if such a risk is anticipated, the patient should be informed in advance
- devital (non-vital) teeth, which are more prone to fracture due to ligament ankylosis and sclerosis of dental tissues, making them more brittle
- teeth with radicular hypercementosis ("bell-clapper" roots), widely divergent roots, or a thick interradicular septum
- decreased elasticity of the alveolar bone, commonly seen in elderly patients
- technical errors, such as incorrect instrument use, excessive force, or poor visibility of the surgical field

Diagnosis of Tooth Fracture During Extraction

Usually easy to identify at the moment of fracture:

- sharp sound heard (distinct from muffled alveolar bone fracture)
- tooth may be easily removed

Clinical inspection:

- fractured root surface: smooth, glossy, with sharp edges

Confirmation:

- Amputated appearance of the root
- Obstruction in the dental alveolus
- Radiographic control

Treatment

- Removal of remaining root via:

- forceps
- elevator
- alveolectomy (if necessary) Procedure may be postponed only if:
  - the patient has poor general health
  - in presence of acute local infection

Fig. 69. Crown fracture during extraction

6.1.2 DAMAGE OF THE NEIGHBORING TEETH

When the surgeon focuses only on the tooth being extracted, nearby teeth may be damaged.

Crown Fracture of Neighboring Teeth

- causes: excessive force, misuse of elevator or dental drill
- often affects teeth with extensive destruction, large fillings, or fixed partial dentures
- management: remove dislocated filling and place a temporary restoration

Crown Fracture of Antagonist Tooth

- Occurs in the final phase of extraction, often in upper premolars, due to striking
- - Prevention: protect the tooth with a finger or compress during lower tooth extraction

Luxation of Adjacent Teeth

- Common during distal luxation of third molars; second molars can luxate if first molars are missing
- Management:

  - luxation (partial displacement): immobilize with a splint

  -total luxation: replant if alveolar bone walls are intact

  -injury to apex: perform endodontic treatment

  -extraction of another tooth (unexpected):

  - if upright: replant immediately
  - if luxated: immobilize immediately or consult orthodontic specialist for a revised plan

6.1.3 .DISLOCATION OF THE TOOTH IN EXTRA ALVEOLAR SPACES

Dislocation of Teeth or Root Fragments into Neighboring Anatomical Areas

Teeth or root fragments can be displaced into areas such as the **maxillary sinus, mandibular canal, nasal cavity**, or **soft tissues**.

Dislocation into the Maxillary Sinus

Causes:

- elevator directed toward alveolar floor instead of the root
- thin or absent sinus floor
- anatomical variations or periapical pathology Clinical considerations:
- if the root disappears from the alveolus but sinus communication is negative, it may be beneath the sinus mucosa and above the alveolus
- radiographic evaluation is essential (periapical, panoramic, or SAF) Treatment:
- high alveolectomy, avoiding perforation or pushing the root further
- management of root displacement into the sinus follows protocols for **oroantral communication**

Dislocation into the Mandibular Canal

Risk: injury to the inferior alveolar nerve and its neurovascular bundle

Management: extraction should **not be attempted ambulatory**; referral to **oral and maxillofacial surgery** is required

Dislocation into the Nasal Cavity

- managed similarly to fragments in the mandibular canal
- referral to a specialist is mandatory

Dislocation into Soft Tissues

- initial management: inform the patient and refer to oral and maxillofacial surgeon
- healing process stabilizes the fragment through fibrosis
- localization: multiple radiographic views + long needle technique for dissection guidance

Dislocation into pathological cavities (cysts,tumors)

- resolution occurs during the surgical procedure addressing the primary pathology

6.1.4. TEETH OR ROOT FRAGMENTS SWALLOWING

This incident may occur due to the patient being in a supine position. Quickly raising the patient's head, providing effective suction, or triggering a cough reflex can help recover a dislodged object from the oropharynx. If the tooth or dental fragment has been swallowed, a diet high in fiber combined with a gentle laxative is recommended.

6.1.5 ASPIRATION OF THE TEETH OR ROOT RESTS

Aspiration into the airways is a serious complication, presenting with **coughing, difficulty breathing, cyanosis, or even asphyxiation**. It most commonly occurs in **sedated or anesthetized patients**, due to suppression of the cough and swallowing reflexes. Immediate management involves transporting the patient in a **supine position** to an **ENT (ORL) service** for **removal of the foreign body using a bronchoscope.**

6.2 BONY STRUCTURES LESIONS

6.2.1 THE FRACTURE OF THE ALVEOLAR PROCESS

Fractures of the alveolar bone can result from **technical errors, improper use of instruments, dental anatomy, or the structure of the alveolar bone**. Common fracture sites include:

- vestibular cortical area of canines

- maxillary molars
- mandibular incisors

Prevention:

- thorough **pre-extraction evaluation** and radiographs
- avoid **excessive or uncontrolled force**
- early decision to use **surgical extraction techniques**

Treatment:

- remove any **displaced bony fragments**
- smooth **sharp edges**
- **reposition** and suture soft tissues
- if a **large bony fragment remains attached to the periosteum**, it maintains blood supply and can be left in place: immobilize with a **splint** to promote optimal healing

6.2.2 FRACTURE OF THE MAXILLARY TUBEROSITY

Prevention:

- avoid **distal luxation of the upper third molar with an elevator** unless specifically indicated
- during forceps extraction:
    - **stop** if resistance is too high
    - switch to a **surgical extraction technique**
    - same principle applies for **root fractures**

Complication: fracture or detachment of the maxillary tuberosity opens the sinus and may cause **massive bleeding**

Treatment:

If bony fragment remains attached to soft tissue it is indicated to:

- reposition fragment with the tooth
- apply **sutures**
- use a **palatal plate** for immobilization (4–6 weeks)
- prescribe **antibiotics** to prevent maxillary sinusitis
- complete extraction **surgically** once healing occurs

If bony fragment is fully detached:

- sinus opening will be covered with a **mucoperiosteal flap**
- apply **sutures**
- prescribe **antibiotics** for protection

6.2.3 ORO-ANTRAL COMMUNICATION

Opening of the maxillary sinus is one of the **most common and serious complications** during extraction and may be associated with displacement of a root fragment into the sinus.

Oro-antral communication occurs most often during the extraction of **"sinusal teeth"** (molars, premolars, and occasionally canines) due to their close anatomical relationship with the maxillary sinus. If the opening is **not promptly treated**, it can lead to the formation of a **chronic oro-antral fistula** and **post-extraction (odontogenic) maxillary sinusitis**.

Prevention:

- pre-extraction **radiographic evaluation**
- **excessive force will be avoided**
- **alveolectomy is considered** if extraction becomes difficult or prolonged

Etiology of Maxillary Sinus Opening During Tooth Extraction
Anatomical factors:

- molars, premolars, or canines separated from the sinus by a thin bony lamella
- in some cases, the lamella is absent and the root is in direct contact with the sinus mucosa

Technical factors:

- excessive force when using an elevator
- intense curettage of cysts or granulomas
- during alveolectomy, a root fragment may be pushed into the sinus by the elevator or drill
- extraction of teeth associated with pre-existing sinus inflammation

Age-related sinus changes:

- sinus volume changes over a lifetime
- absent in newborns
- enlarged in older adults, particularly with alveolar crest atrophy or missing teeth, creating **sinusal gulfs**

Diagnosis of Oro-Antral Communication Clinical Signs:

- **bleeding:** profuse hemorrhage with aerated blood, sometimes **epistaxis** (nasal bleeding)
- **disappearance of root or root fragment**
- **alveolar curettage:** lack of resistance at the alveolar base

Diagnostic Tests:

1. **Valsalva Maneuver:**

Patient pinches nose and exhales as if blowing a balloon

- Positive: air escapes through post-extraction site which confirms sinus opening

-Negative: does not exclude communication (may be blocked by blood clot or sinus polyp, "flip effect")

2. **Exploration with a Blunt Probe:**

- Gently, a probe is inserted into the alveolus
- **positive:** probe passes deeply beyond the alveolar floor

3. **Radiographic Examination:**

- **retro-alveolar X-ray:** evaluates post-extraction alveolus and sinus floor

*May not always show retained root fragments

- **panoramic X-ray or SAF:** assesses sinus health
  - **healthy sinus:** radiolucent
  - **inflamed sinus mucosa:** blurred or opaque

Fig. 70. Oro-antral communication after first molar extraction

Differential Diagnosis

Oro-antral communication should be distinguished from **orocystic communication** caused by a large maxillary cyst. In this case, the probe may pass beyond the alveolar floor, with negative Valsalva probe.

TREATMENT - Management of Oro-Antral Communication

Immediate Closure is recommended in cases:

- if no root fragment is in the sinus and no sinusitis exists, the communication can be closed **during the same session**.
- even small openings require **surgical plasty** due to high risk of sinusitis.
- if a root fragment is visible, it **must be extracted**.
- **suspected root fragment:** X-ray localization is mandatory.

The extraction approaches are:

-Alveolar approach: preferred

-Failure of alveolar approach: use a vestibular window or the patient is referred to oral and maxillofacial surgeon

- **Optimal timing:** within **24 hours**, maximum 48 hours after diagnosis
- **Avoid intra-alveolar dressing**, as it may lead to epithelial migration and chronic fistula formation

Consequences of untreated OAC

- **maxillary sinus infection** → post-extraction **maxillary sinusitis**
- within one week post-extraction, **60 to 80% of patients** develop sinusitis
- radical cure may require **hospitalization and sinus mucosa removal**, which can lead to:
    - Pain and paresthesia in suborbital nerve territory
    - Chronic nasal secretion with alternating obstruction

Preoperative assessment

- identify root fragments in the sinus via **surgical planning and X-rays**
- X-ray signs:
    - root fragment projected in sinus area
    - sinus opacification on SAF indicates sinusitis
    - Pus from alveolus → sign of sinus infection

Operative Techniques

1. OAC without Root Fragment

- **Plasty using vestibular flap or palatal flap**

2. OAC with Root Fragment

- Extract fragment **through alveolus** or rarely via **vestibular window**
- Then perform plasty to close the communication

Plasty techniques

A. Vestibular flap (trapezoidal flap)

*** Incisions:**

- includes **interdental papilla** of neighboring teeth
- **divergent lateral incisions** for tension-free closure

***periosteum sectioning:** horizontal cut to elongate flap

***de-epithelialization:** vestibular and palatal flap margins

***Alveolar preparation:** shorten bony walls and curettage if recent extraction

***Closure:** cover alveolar wound, suture **tension-free** with mattress or separate sutures

B. Palatal flap

***Advantages:** preserves vestibule depth, thick and resistant flap

- **Indications:** large OAC or failure of vestibular flap
- **Disadvantages:** palatal wound causes patient discomfort

***Incisions:**

- Lateral: along palatal gingival margin
- Medial: mid-hemi-palate (include palatal artery)
- Anterior: joins lateral and medial near canine in sharp angle

***Flap handling:** rotated 90° to cover socket without tension

***Closure:** mattress or separate sutures

***Palatal defect:** will be covered with iodoform gauze 10–14 days

***Vascularization:** via **palatal artery**

6.2.4. MANDIBULAR FRACTURE

Incidence: rare, most commonly occurs during **third molar extractions**
Etiology:

- excessive force during **distal luxation of third molars**
- reduced bone resistance due to:
    - Severe atrophy
    - Chronic osteomyelitis
    - Cysts or tumors
- difficult extraction of deeply impacted third molars

Prevention:

- pre-extraction **radiographic evaluation**
- selection of appropriate **techniques and instruments**
- avoidance of **excessive force Treatment:**
- extraction will be completed to prevent infection at the fracture site
- **tight closure** of the alveolar socket
- **reduction and immobilization** of the mandible (prosthetic or surgical)
- **antibiotic therapy** to prevent infection

6.2.5 INJURIES OF ADJACENT STRUCTURES

Cause:

- often due to **inattention** or **uncontrolled force**
- oral mucosa is delicate and requires constant care

Common Injuries & Management:

- **Gingival lacerations**
  - Cause: skidding of elevator or forceps
  - Management: reposition and **suture carefully**
- **Mucosal punctures**
  - Cause: instrument slipping on cheek, palate (upper teeth) or floor of mouth, tongue (lower teeth)
  - Management: prevent infection, allow healing by **granulation and secondary epithelialization**
- **Deep wounds**
  - Cause: instrument skidding
  - Risks: **hematoma** in floor of mouth, tongue, or palate; possible **palatal artery hemorrhage**
  - Management: control bleeding, monitor for hematoma
- **Abrasions or burns of lips/corners of mouth**
  - Cause: use of drills
  - Management: keep area **moist with Vaseline ointment** and **antibiotics**

Lip crushing

- Cause: luxation of upper/lower teeth, pinching between forceps and teeth or hand
- Management: careful positioning of forceps and controlled luxation

Prevention:

- always **attention and controlled force will be mainteained**
- soft tissues protection

6.2.6. INJURIES OF THE NERVOUS BRANCHES

INFERIOR DENTAL ARTERY INJURY

Clinical Sign: hemorrhage from the extraction site

Management:

- **Initial Hemostasis:** application of an **intra-alveolar dressing** with **occlusal pressure** for several minutes
- **Persistent Bleeding:** a **hemostatic sponge** is inserted under dressing for 20–30 minutes

After Hemostasis:

- **alveolar wound suture**
- **antibiotic prophylaxis** if infection is present
- **periodic monitoring** until complete healing

Special Case: root fragment in mandibular canal: removed via **alveolectomy**

INFERIOR DENTAL NERVE INJURY

Clinical Manifestations:

Sensory disturbances ranging from:

- **Hypoesthesia** → mild numbness
- **Transient anesthesia** → temporary loss of sensation
- **Permanent anesthesia** → in case of nerve sectioning

Recovery:

- Sensibility may return **4–6 months**
- Positive signs: reduction of affected area, intermittent paresthesia

Therapeutic Approach:

- **anti-inflammatories**
- **analgesics**
- **B-vitamin therapy**
- **physiotherapy**

MENTAL NEUROVASCULAR BUNDLE INJURY

Clinical Signs:

- Labial and mental anesthesia
- Hemorrhage controlled by **compression or vessel clamping**

Etiology:

- Extraction of **lower premolars with alveolectomy**
- Vestibular **instrument slippage** or fracture of vestibular alveolar wall

Prevention:

- Place **vertical release incision mesial to the mental foramen**
- Carefully **raise flap** to visualize and protect nerve

LINGUAL NERVE INJURY

Etiology:

- Fracture of the **lingual alveolar wall** during extraction
- **Elevator slipping** toward the lingual side of the tooth

Prognosis: rarely regenerates if **sectioned Prevention:**

- Careful technique during **lower wisdom tooth extraction**
- Avoid excessive force or instrument slippage

Treatment: same as for other **inferior alveolar or mental nerve injuries**:

- anti-inflammatories, analgesics, B-vitamins, physiotherapy
- surgical repair if indicated

6.2.7. THE TEMPOROMANDIBULAR JOINT LUXATION

Cause:

- insufficient support of the mandible during extraction
- high force applied on **lower molars**
- poor immobilization of the mandible

Etiology:

- condyle exits the glenoid cavity **unilaterally or bilaterally** due to:
- elongation of capsule or articular ligaments

Symptoms:

- pain in TMJ (unilateral or bilateral)
- inability to close the mouth
- unilateral deviation toward healthy side (unilateral luxation)
- wide anterior opening of mouth (bilateral luxation)
- depression in pretragal area (absence of condyle from joint)

Treatment:

1. Complete extraction if possible
2. Reduce TMJ luxation manually
3. Post-reduction care:
    - articular rest: avoid wide mouth opening
    - soft diet
    - moist heat
    - NSAIDs (Ibuprofen, Ketonal) Supportive Measures:
        - apply mentocephalic immobilization (bandage or frontal support)
        - analgesics and anti-inflammatory medication
        - temporization is contraindicated
        - if manual reduction fails → refer to oral & maxillofacial surgery Manual Reduction (Hippocrate's Method):
        - Positioning: doctor stands in front of the patient
        - Thumb placement: on the occlusal surface of the lower molars
        - Other fingers: placed extraorally under the mandible

1. **Reduction maneuver:**

- Apply downward pressure to **lower the luxated condyle**
- Push condyle **back and upward** until the **condylar head returns to the glenoid cavity**

7. POSTEXTRACTIONAL COMPLICATIONS

7.1. POSTEXTRACTION HEMORRHAGE

7.1.1. PERSISTENT HEMORRHAGE

Post-Extraction bleeding and hemostasis

Normal Bleeding: moderate bleeding which lasts **15–20 minutes** to allow alveolar clot formation

Prevention / Local measures:

- **Atraumatic surgery:**
  - precise incisions, gentle soft tissue handling
  - avoid crushing tissues, which prolongs bleeding
- **Bone smoothing:** prevent mucosal or periosteal injury from sharp bone edges

Curettage:

-removal of the granulation tissue rich in vessels

- care near **maxillary sinus** or **mandibular canal**

Management of persistent bleeding:

After 20 min of pressure with supra-alveolar compression dressing: explore the wound to identify source of hemorrhage.

Soft tissue bleeding:

- big vessels are **grasped with forceps → ligature with resorbable suture**
- minor vessel bleeding are managed by **compression dressing**
- alternative: **electrocautery, laser, cryosurgery**

Bone bleeding:

- localized → **press bone fragment over vessel** with hemostatic forceps
- diffuse → **hemostatic sponges** + supra-alveolar dressing, patient bites for 30 min

Severe bleeding (e.g., inferior dental artery):

- intra-alveolar dressing
- patient transfer to oral & maxillofacial service
- monitor and replace compression dressing until hemostasis

Hemostatic materials:

Resorbable materials for socket:

- Held by sutures or supra-alveolar compression ("eight-suture")
- Remove dressing after 24 hours to prevent infection
- Over 48 hours → necrosis, clot dissolution, bleeding

Common devices: jelly-like sponges: Gelaspon, Gelfoam (may be friable when wet), can be combined with thrombin → converts fibrinogen to fibrin

- oxidized regenerated cellulose: Surgicel
- collagen-based: Avitene (microfibrillar), Collaplug (cone), Collatape (tape)
- biological kits: Human plasma + bovine thrombin + calcium chloride (Tissucol)

7.1.2. EARLY SECONDARY HEMORRHAGE

Definition: bleeding that occurs **after primary hemostasis**, often **during the night**

Common Causes:

- **Patient-related factors:** non-compliance with post-extraction instructions:
    - Suctioning or spitting instead of reapplying compressive dressing
    - Vigorous rinsing
    - Eating hot foods
- **Physiological factors**: vasodilation after effect of **vasoconstrictor wears off**
- **Mechanical factors**: irritation from **foreign bodies**, **bone fragments**, or **sharp alveolar edges**
- **Residual tissue factors**: granulation tissue or retained root fragments

Management

Identifying the cause:

- Anamnesis (patient history)
- Local and general examination
- Check blood pressure

Local hemostasis measures:

- Suction fluids and ensure good visibility and lighting
    - Identify source: mucosa/gingival wounds, alveolar wall fractures, bone fragments
- Radiographic examination to detect retained root fragments or bone lesions
- Block anesthesia preferred over local infiltration:
    - Avoid rebound vasodilation caused by vasoconstrictors
- Apply appropriate hemostatic measures once source is located (compression, sutures, hemostatic materials)

- Wound exploration: alveolar curette is used to remove foreign bodies and granulation tissue
- Alveolar bone smoothin: sharp edges are removed to prevent further bleeding
- Hemostatic application: hemostatic materials in the socket
- Socket closure
- Supra-alveolar dressing
- Patient instructions & monitoring

  -repeat post-extraction recommendations

  - patient observation for **≥30 minutes**

General anti-hemorrhagic measures: Medications (IV or IM):

-Epsilon-amino caproic acid

-Tranexamic acid

-Sodium ethamsylate (Dicynone)

-Adrenostazin

-Vitamin K (Phytomenadione)

Interdisciplinary collaboration for patients with **hypertension, liver disorders, or coagulopathies**

In cases of severe/massive bleeding it is recommended:

- hospitalization in ICU

- compensate blood loss with plasma, macromolecular solutions, and blood transfusion

7.1.3. LATE SECONDARY HEMORRHAGE

Delayed/Secondary hemorrhage (few days post-extraction)

Definition:

- Bleeding occurring a few days after dental extraction, either as a first episode or recurrence
- Often triggered by systemic disorders

Patient Presentation:

-nervous, anxious, sweaty

-pale skin, **tachycardia**, possible **anemia**

-oral cavity: saliva mixed with blood

-post-extraction socket: **friable, "mushroom-like" clot**

Diagnostic Approach:

Local examination:

-cleaning of the oral cavity

- extraction site exploring to identify bleeding source

Laboratory investigations:

-if local measures fail, **systemic hemostatic disorders will be further investigated**

- collaboration with **hematologist** if abnormalities detected

Common systemic causes:

-Hemophilia A or B

-Von Willebrand disease

-Thrombocytopathies

Pre-extraction prophylaxis for known disorders:

-Hemostatic factor replacement: Factor VII or IX transfusion

-Antifibrinolytic therapy:

-Aminocaproic acid (AMICAR) – 10 days

-Tranexamic acid (CYKLOKAPRON)

Management for anticoagulated patients:

-treatment in **ambulatory care** in coordination with **general physician**

-adjust anticoagulation **according to bleeding risk**

Do not interrupt anticoagulants unilaterally (thromboembolism risk may exceed bleeding risk)

-all local hemostatic measures will be applied:

-minimum trauma

-compression, hemostatic agents, proper suturing

- socket suturing

7.2. POSTEXTRACTIONAL ALVEOLITIS

Represent:

- an infectious/inflammatory complication after dental extraction
- most common in **mandibular molars**
- triggered by **clot loss, trauma, infection, systemic factors**

Etiology / Risk Factors

-Local / Procedural

- traumatic extraction
- excess of vasoconstrictor inducing ischemia
- residual fragments: tooth, bone, root fillings
- aggressive curettage / rotary instruments without irrigation

- Patient-related

- smoking
- poor oral hygiene
- systemic conditions: diabetes, immunosuppression, OCPs
- prior history of dry socket

- Microbiological

- Overgrowth of *Fusobacterium* & *Treponema*
- Disrupted microbial balance in the socket

3. Clinical Presentation

Feature	Wet Alveolitis	Dry Socket
Clot	present but infected	Absent / partially dissolved
Pain	severe, throbbing	Neuralgiform, persistent
Gingiva	inflamed, edematous	Pale, atonic
Others	Purulent discharge, halitosis, trismus	Exposed bone, difficult mastication

Other signs: 2–4 days post-extraction, possible radiating pain, regional lymphadenopathy

Prevention

- **Preoperative**
  - detailed anamnesis (prior alveolitis)
  - oral hygiene measures (chlorhexidine rinse)
  - extractions avoidance during oral inflammation
  - minimize vasoconstrictor concentration

- **Surgical Technique**
  - -atraumatic extraction
  - -adequate irrigation
  - -minimal soft tissue damage

Treatment – Stepwise

- **Pain Control**
  - -topical anesthetics, NSAIDs
  - -nerve block if severe
  - - Low-level laser therapy (LLLT) optional

- **Socket Cleaning**
  - - irrigation: warm saline + chlorhexidine/hydrogen peroxide
  - -gentle curettage: remove necrotic tissue, clot debris, bone fragments

- **Socket protection**
  - - PRF or Alvogyl paste
  - -gauze / supra-alveolar dressing 24–48 hrs

- **Adjunct Therapy**
  - - Infrared or laser therapy
  - - Systemic antibiotics **if systemic infection or immunocompromised**
  - -Bio-stimulation (vitamins, general immune support)

- **Follow-up**
  - - Reassess socket 24–48 hrs
  - - repeat cleaning / dressing if needed
  - - reinforce oral hygiene and post-op care

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