

Sialolithiasis and Nonspecific Sialadenitis

Obstruction, bacterial inflammation, morphology, and clinicopathologic reasoning

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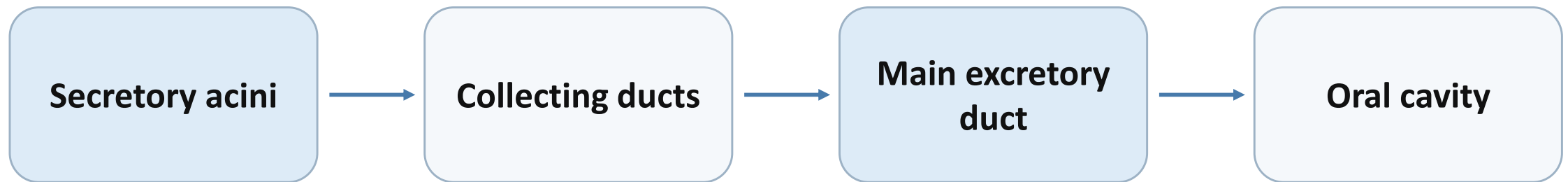
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Learning outcomes

- Explain how salivary outflow obstruction predisposes to infection.
- Relate bacterial invasion to interstitial inflammation and suppurative necrosis.
- Distinguish obstruction, infection, abscess, and major mimics on clinical grounds.
- Apply a staged diagnostic and gland-preserving management approach.

Salivary glands: The relevant functional unit

Secreted saliva must traverse a patent ductal pathway.



Obstruction may occur at a duct or gland orifice; Reduced secretion independently promotes stasis.

Major glands and outflow

Parotid

Parotid gland

Serous-predominant secretion

Stensen duct opens in buccal mucosa

Bacterial parotitis with salivary stasis

Submandibular

Submandibular gland

Mixed, relatively mucinous secretion

Wharton duct opens in floor of mouth

Predominant site of salivary calculi

What is sialolithiasis?

- Formation of a mineralized calculus within a salivary duct or gland.
- The clinically consequential event is impaired salivary drainage.
- Outflow obstruction may be symptomatic without overt bacterial infection.
- Stasis and secondary inflammation can convert obstruction into sialadenitis.

What is nonspecific bacterial sialadenitis?

- Inflammation of a salivary gland associated with bacterial invasion.
- It commonly follows obstruction by a salivary calculus.
- Major salivary glands—including submandibular and parotid—may be affected.
- The histologic response ranges from interstitial inflammation to suppuration.

Obstruction and infection are not synonyms

Obstruction

Primary problem

Restricted salivary outflow

Meal-related swelling can dominate

May occur without purulence

Treatment must relieve blocked drainage

Bacterial infection

Primary problem

Microbial invasion and gland inflammation

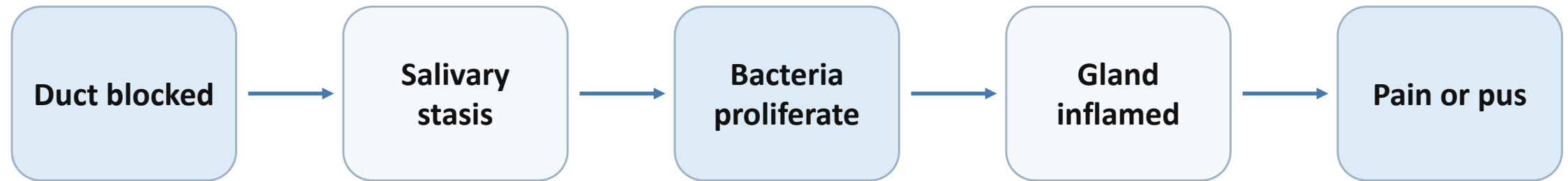
Tenderness and pus may dominate

May progress to abscess

Treatment must address bacteria and source

The central causal chain

Bacterial sialadenitis most commonly to ductal obstruction by stones.



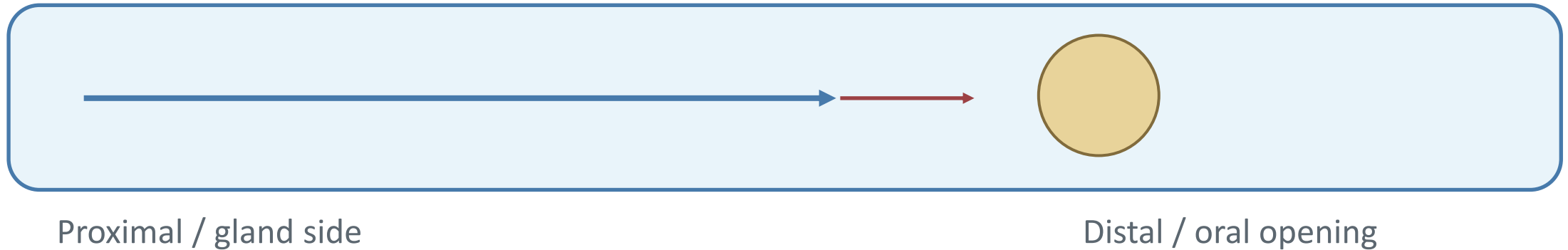
This is a common pathway, not a claim that every salivary stone is infected.

The cause of stone formation is often uncertain

- Impacted food debris may obstruct a gland orifice.
- Local edema after injury may similarly narrow the outlet.
- An identifiable initiating lesion is absent in many cases.
- Avoid assigning a single universal cause to all salivary calculi.

Ductal blockage: The mechanical lesion

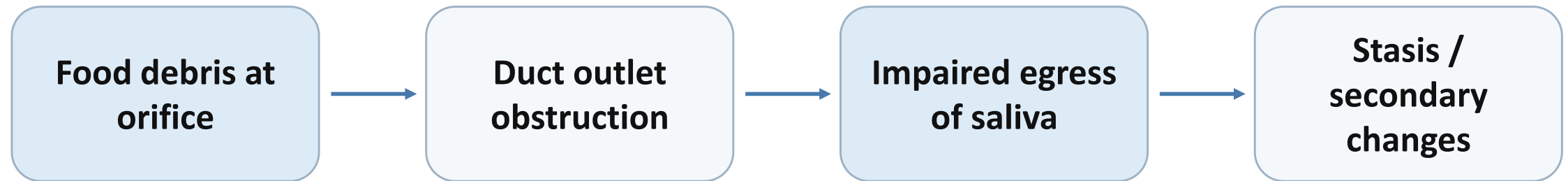
Schematic: Obstructed salivary drainage ^{STONE}



- A calculus physically interrupts the luminal drainage pathway.
- Saliva accumulates proximal to the blocked segment.
- The downstream consequence is pressure and swelling when secretion increases.

Food debris as an initiating factor

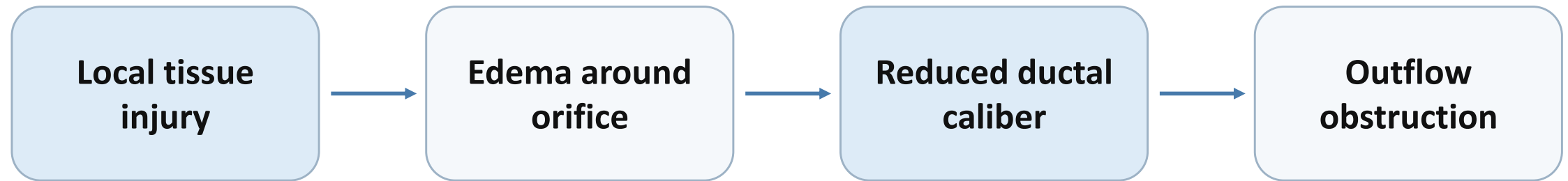
Impacted food debris as one possible precipitant.



This is a possible mechanism, not a proven cause in every patient.

Injury-associated edema as an initiating factor

Injury-related edema may impair saliva drainage.



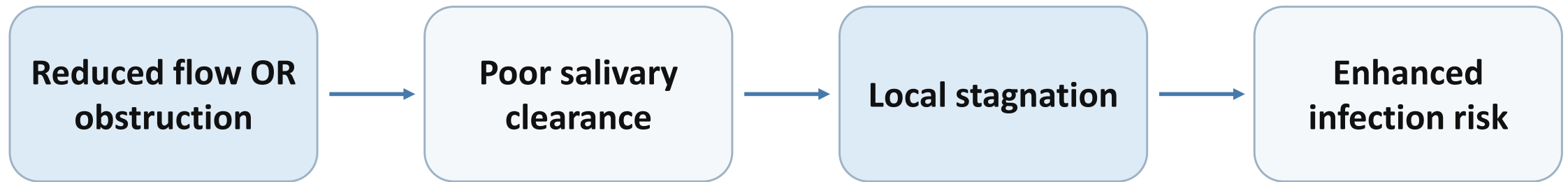
The anatomic effect is luminal narrowing rather than immediate infection.

Why submandibular calculi predominate

- The submandibular gland contributes most clinically recognized salivary stones.
- Its duct is relatively long and has an uphill course.
- More mucinous secretions and calcium/phosphate content contribute to lithogenic conditions.
- Predilection is anatomic and physicochemical; It is not absolute.

Salivary stasis: The common denominator

Two different initiating pathways converge on diminished clearance.



Differentiate low saliva production from mechanical duct blockage.

Reduced secretion without a stone

- Reduced saliva production may predispose to bacterial infection.
- Robbins gives prolonged phenothiazine use as an example.
- A patient may therefore develop sialadenitis without a demonstrable calculus.
- Medication history is relevant when evaluating recurrent infection.

Duct obstruction versus global hyposalivation

Obstructed drainage

Major disturbance

Patency of a ductal pathway

Often focal and meal-associated

Can cause upstream swelling

Stone / stricture evaluation

Reduced production

Major disturbance

Volume of saliva produced

May present with generalized oral dryness

Reduces normal cleansing and clearance

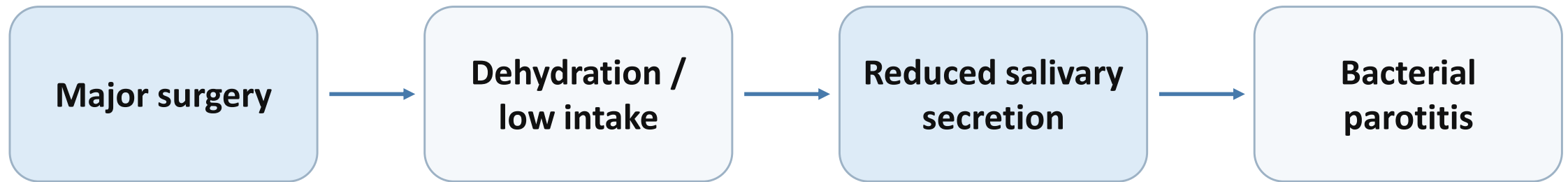
Hydration and medication review

Dehydration increases infection susceptibility

- Insufficient water availability can reduce salivary output.
- Reduced flow weakens mechanical cleansing of the duct system.
- Robbins specifically links dehydration to bacterial suppurative parotitis.
- The association is important in frail and postoperative patients.

Postoperative suppurative parotitis

Elderly patients after major thoracic or abdominal surgery.



This illustrates infection due to salivary stasis, without requiring a stone.

Clinical risk profile in the elderly

- Recent major surgery and dehydration are important contextual clues.
- Reduced oral intake and dry mouth increase suspicion for stasis.
- Acute unilateral parotid pain and swelling should prompt assessment for infection.
- Severe or systemic illness requires urgent evaluation for suppuration or abscess.

Predisposing factors: Mechanism-based sorting

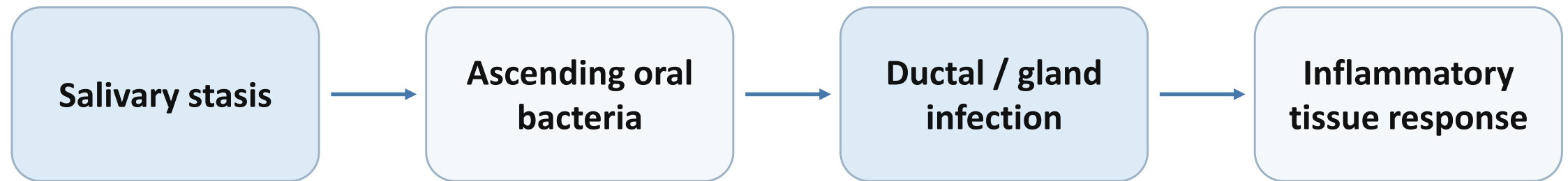
Factor	Immediate effect	Clinical inference
Salivary calculus	Physical outflow block	Obstructive symptoms
Orifice debris / injury	Local outlet narrowing	Potential stone-related process
Phenothiazine exposure	Reduced secretion	Medication-associated stasis
Dehydration after surgery	Reduced secretion	Suppurative parotitis risk

Most important bacterial organisms

- Staphylococcus aureus is a leading cause of acute bacterial sialadenitis.
- Robbins additionally identifies viridans-group streptococci.
- The organisms support a pyogenic pattern of injury in susceptible glands.
- Do not infer bacterial species from swelling alone; Culture purulent drainage when feasible.

Microbial entry and progression

Impaired flow can favor bacterial ascent through the excretory system.



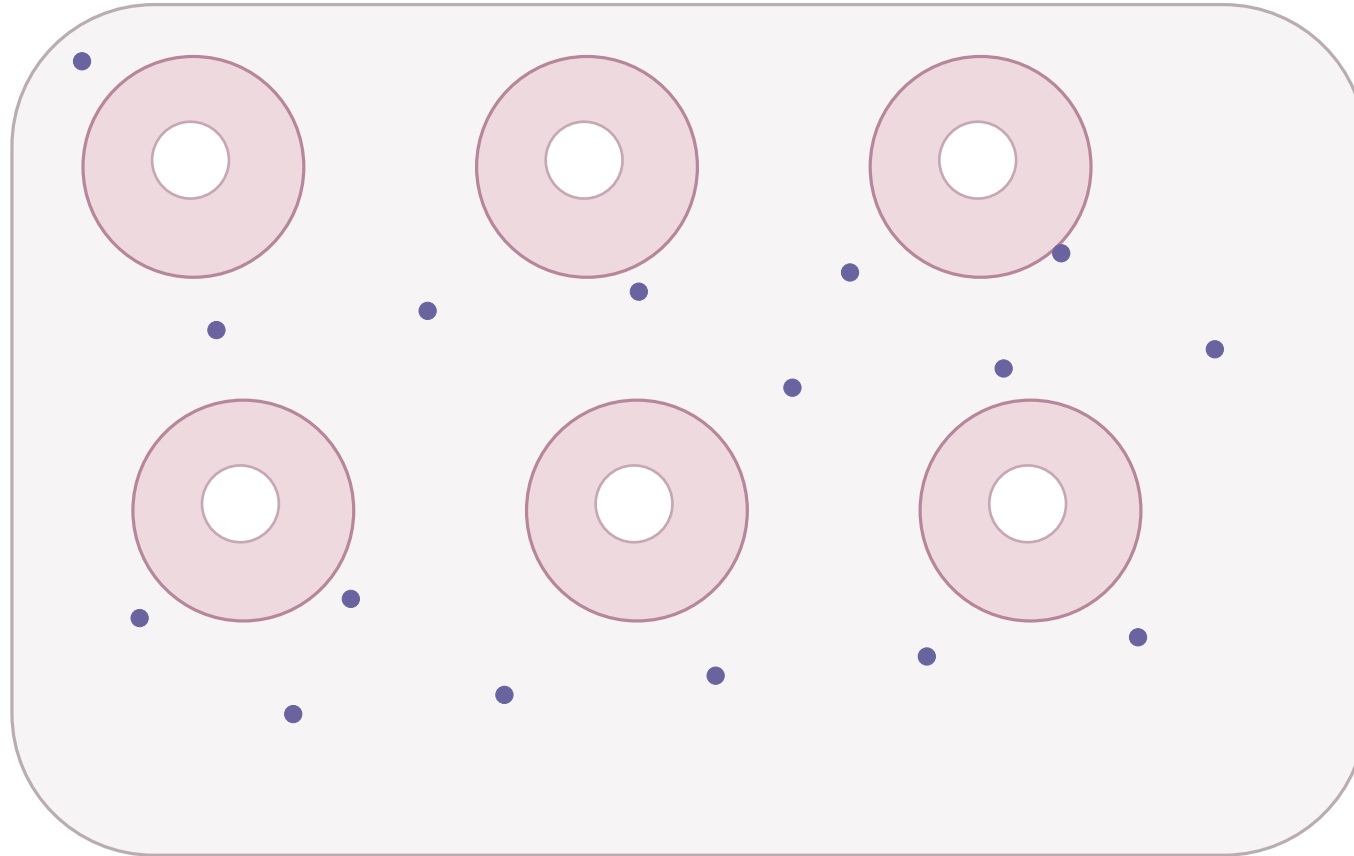
Bacterial infection is a superimposed event in a susceptible gland.

Interstitial inflammation: The initial tissue pattern

- Inflammatory cells accumulate within glandular connective tissue stroma.
- The interstitium is affected without necessarily destroying every acinus.
- Painful swelling reflects inflammation within a confined glandular compartment.
- This as a common morphologic response.

Interstitial sialadenitis: Schematic histology

Schematic illustration — not a diagnostic photomicrograph



Teaching interpretation

Acini and ducts are represented as simplified native PowerPoint shapes.

Inflammatory cells are shown in interstitial spaces.

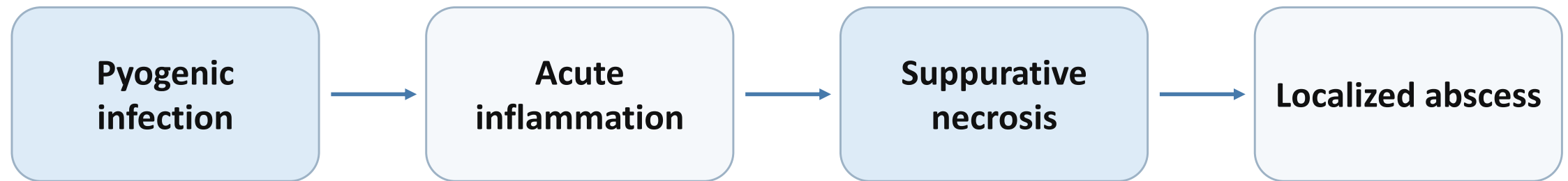
This is not a photomicrograph or a diagnostic histology substitute.

Pyogenic infection can cause suppuration

- Staphylococcal and other pyogenic infections may elicit neutrophil-rich inflammation.
- Tissue injury can progress to suppurative necrosis.
- Focal coalescence of necrosis and neutrophils produces an abscess.
- Suppuration is a complication, not an obligatory feature of all sialadenitis.

From bacterial injury to abscess

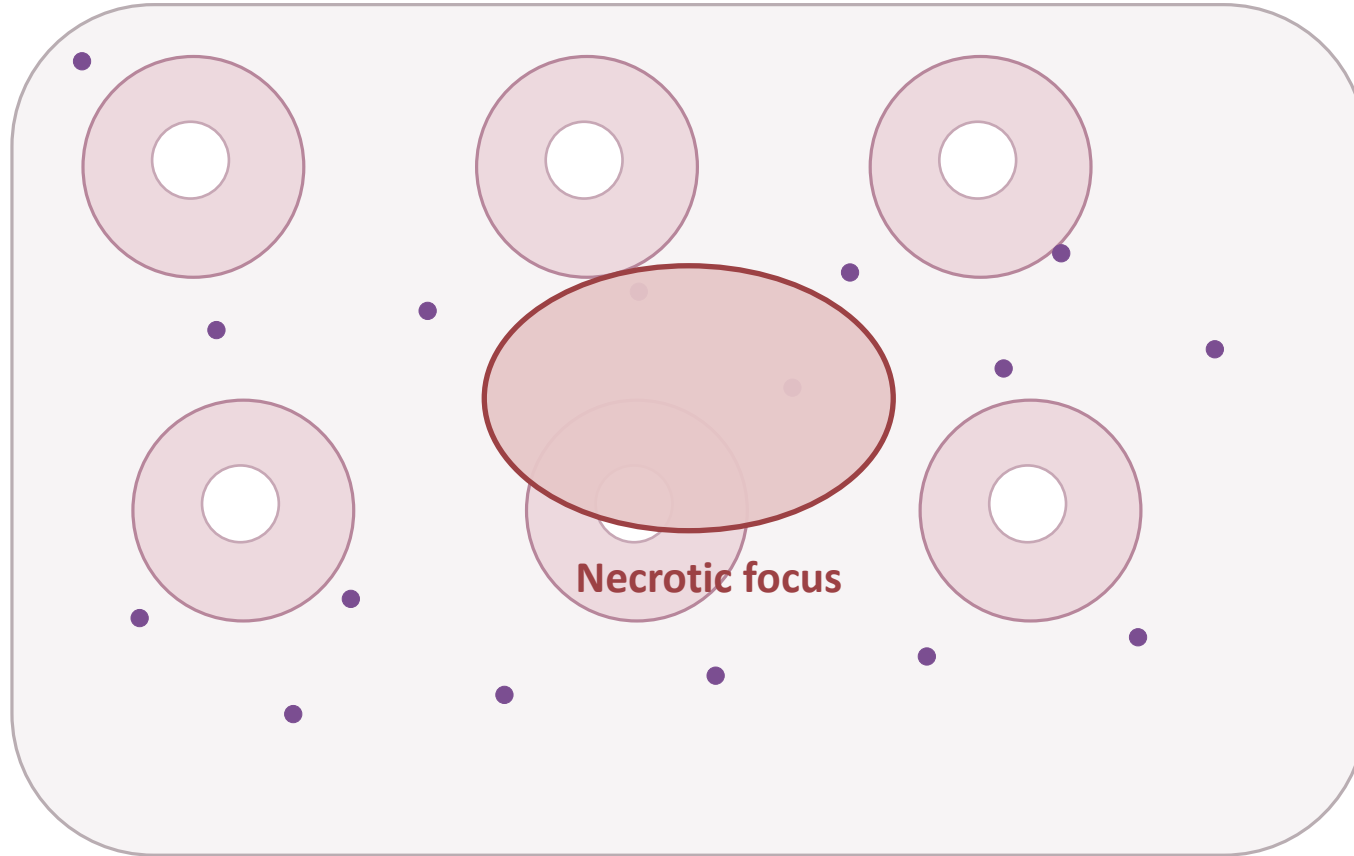
Morphologic progression.



An abscess implies tissue destruction and a localized collection requiring source control.

Suppurative necrosis: Schematic histology

Schematic illustration — not a diagnostic photomicrograph



Teaching interpretation

A central necrotic focus is placed inside an inflamed gland field.

Peripheral gland structures remain to show a localized process.

The native shapes are a mechanism schematic, not actual H&E.

Interstitial inflammation versus abscess

Interstitial pattern

Dominant location

Inflammation distributed in stroma

Architecture may remain broadly preserved

Swelling and tenderness

Treat cause and infection

Abscess pattern

Dominant location

Focal pus / necrotic tissue collection

Local tissue destruction is prominent

Often focal fluctuance or severe tenderness

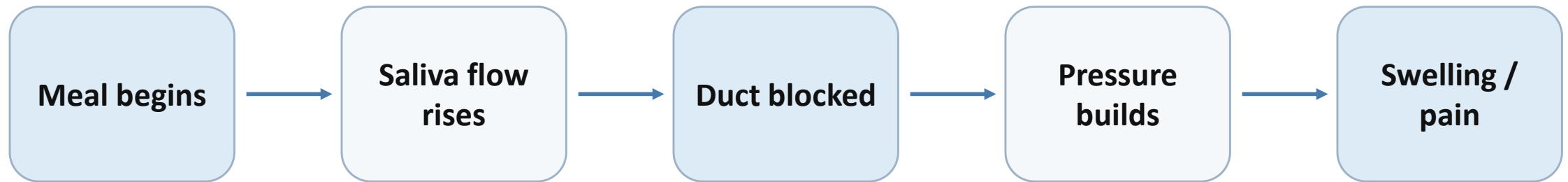
Antibiotics plus drainage when indicated

The characteristic clinical distribution

- Disease is almost always unilateral.
- Usually only one gland is involved in a given episode.
- Painful enlargement is a key clinical presentation.
- Purulent ductal discharge may be present but is not universal.

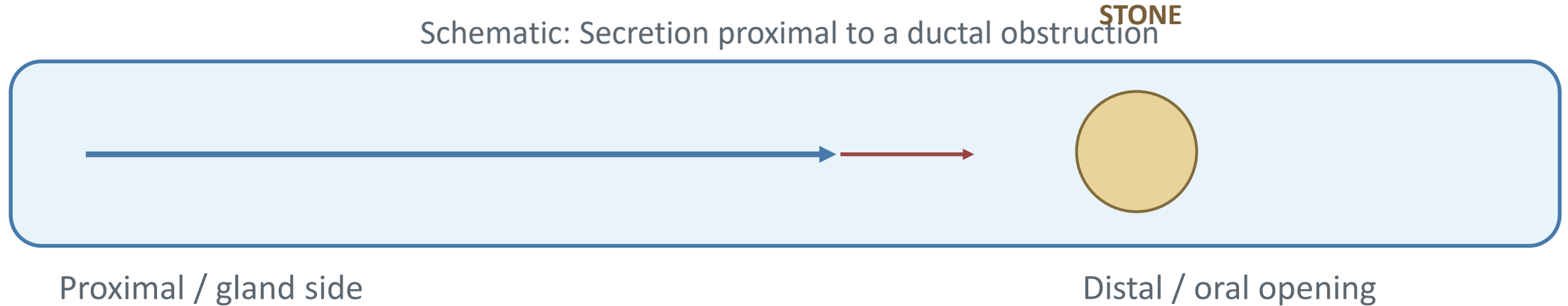
Why meals can trigger symptoms

A meal-related pattern strongly suggests an obstructive component.



The temporal history often distinguishes obstruction from nonobstructive causes.

Meal-associated swelling: Pressure model



- Secretion continues upstream of the obstructing calculus.
- Proximal ductal distension can produce painful swelling during meals.
- Symptoms may settle after secretion declines.

Painful gland enlargement: What it means

- Pain and swelling are a consequence of local inflammation and impaired drainage.
- An acute tender gland raises concern for bacterial infection.
- A repetitive meal-related pattern raises concern for obstructive disease.
- No isolated symptom reliably identifies the precise cause.

Purulent ductal discharge: An important sign

- Pus emerging from a salivary duct supports a bacterial process.
- Gentle gland massage during clinical assessment may elicit ductal drainage.
- Expressed pus is suitable for microbiological testing when available.
- Absence of expressible pus does not exclude intraglandular infection.

Two common clinical scenarios

Obstructive episode

Presentation

Meal-associated recurrent pain / swelling

Calculus or reduced outflow likely

Pus not required

Assess site and degree of obstruction

Suppurative episode

Presentation

Acute tender swelling $\pm$ systemic illness

Bacterial infection likely

Pus may be expressible from duct

Assess for severe infection / abscess

Focused history: Questions that discriminate

- Are pain and swelling provoked by eating?
- Is onset abrupt, recurrent, or progressive?
- Has oral intake or hydration recently been reduced?
- Has the patient had surgery or started a saliva-reducing medication?
- Are fever, purulent taste, or systemic symptoms present?

Focused examination: Gland, duct, and oral cavity

- Identify the affected gland and whether enlargement is unilateral.
- Inspect the ductal papilla for erythema, swelling, or visible calculus.
- Palpate the gland and duct course for tenderness or a focal stone.
- Look for expressible pus and assess the oral cavity for dryness.
- Escalate concern for focal fluctuance, severe illness, or airway symptoms.

Submandibular versus parotid presentation

Submandibular

Typical location

Swelling beneath the mandible

Duct opening in floor of mouth

Frequent ductal stone pathology

Assess Wharton duct

Parotid

Typical location

Preauricular / cheek swelling

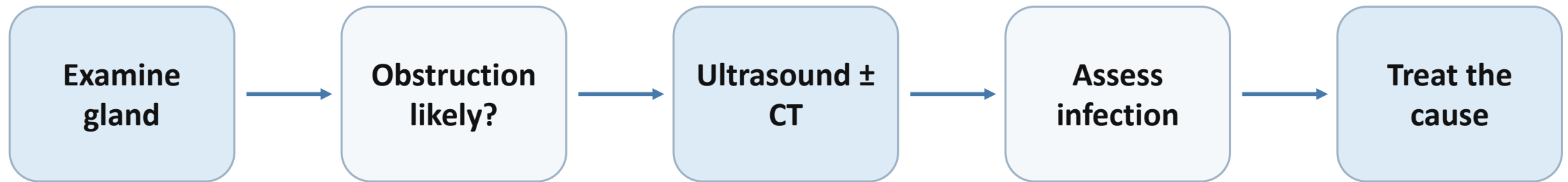
Duct opening opposite upper molar

Suppurative parotitis in dehydration /
postoperative stasis

Assess Stensen duct

Evaluation pathway for focal salivary swelling

Imaging is most useful when obstruction, mass, or abscess is uncertain.



This algorithm is a didactic synthesis of the 2024 AAFP review and MSD Manual.

Ultrasonography: An initial imaging option

- Can identify salivary gland stones and ductal dilatation.
- May show inflammatory change or a focal collection.
- No ionizing radiation; Useful for superficial major glands.
- A negative study does not necessarily exclude a very small or distal calculus.

Computed tomography: When it adds value

- Helps delineate stones when sonography or examination is inconclusive.
- Can evaluate deeper gland anatomy and suspected complications.
- May help assess an abscess or alternative deep-neck process.
- Select imaging according to the clinical question, not as routine for every episode.

Ultrasound versus CT in the diagnostic work-up

Ultrasound

Principal advantage

Accessible, non-ionizing duct/gland study

Good for superficial stones / dilatation

Operator and visibility limitations

Often a first test

Computed tomography

Principal advantage

Deeper anatomic and complication assessment

Useful for difficult stone localization

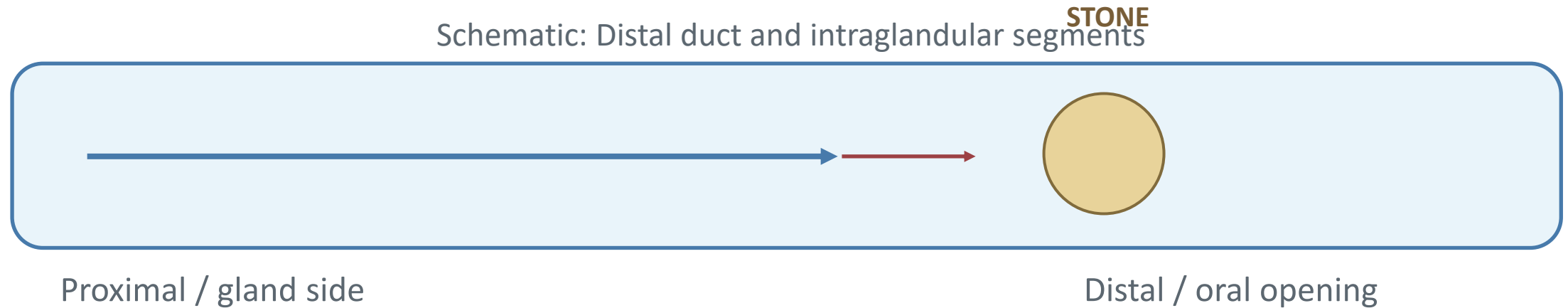
Radiation exposure

Problem-solving or complication imaging

When to obtain microbiologic evidence

- Expressed ductal pus may be sent for Gram stain and culture.
- Culture can guide antimicrobial adjustment.
- Sampling is more valuable in severe, recurrent, or treatment-refractory infection.
- A stone alone does not establish a need for antibiotics.

Anatomic concept: Stone location and intervention



- A distal duct stone may be easier to access than an intraglandular stone.
- The site, size, and number of stones inform procedural planning.
- Imaging and/or sialendoscopy can localize obstruction before intervention.

Diagnostic pitfall: Stone $\neq$ proven infection

- Sialolithiasis describes the calculus, not the bacterial species or inflammatory severity.
- Meal-related pain can occur with sterile obstruction.
- Purulent discharge and systemic features increase suspicion for infection.
- Treat obstruction and infection as related but separable problems.

Bacterial sialadenitis versus mumps

Bacterial sialadenitis

Typical framework

Focal, often unilateral major-gland illness

Purulent discharge may occur

Stone / stasis often predisposes

Bacterial treatment when indicated

Mumps-related sialadenitis

Typical framework

Viral parotitis; May affect both sides

Purulent drainage not characteristic

Viral infection is causal

Supportive management / public health context

Obstruction versus Sjögren-associated disease

Sialolithiasis

Dominant complaint

Focal painful swelling, often with meals

Structural salivary outflow obstruction

Often one gland symptomatic

Stone and duct evaluation

Sjögren-related disease

Dominant complaint

Dry eyes and dry mouth predominate

Autoimmune secretory-gland dysfunction

May involve multiple glands / systemic features

Autoimmune assessment where indicated

Sialolith versus mucocele

Ductal calculus

Key lesion

Solid obstructing calculus

Often major-gland duct

Meal-related gland swelling

Imaging / duct exam

Mucocele

Key lesion

Mucin extravasation or duct-related cystic lesion

Often minor salivary gland, lower lip

Fluctuant bluish lower-lip swelling

Clinical + pathology assessment when necessary

Persistent salivary mass: Do not assume inflammation

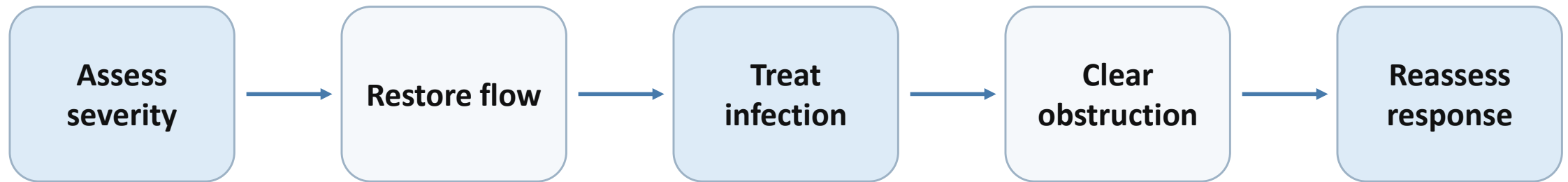
- A discrete persistent or enlarging mass has a wider differential diagnosis.
- A salivary gland neoplasm may require imaging and tissue assessment.
- Clinical features alone cannot reliably rule out malignancy.
- Unexplained persistence warrants specialist evaluation rather than repeated empirical therapy.

Bedside differential: Four separating clues

Finding	More suggestive of	What to check next
Pain mainly with meals	Mechanical obstruction	Duct exam; sonography
Expressible ductal pus	Bacterial sialadenitis	Culture; assess severity
Diffuse xerostomia + dry eyes	Secretory/autoimmune process	Medication and autoimmune history
Persistent discrete mass	Neoplastic or structural lesion	Imaging and specialist assessment

Management begins with the mechanism

Several interventions are complementary, not interchangeable.



Urgent abscess/deep-space concerns must be addressed before routine conservative care.

Conservative measures improve salivary clearance

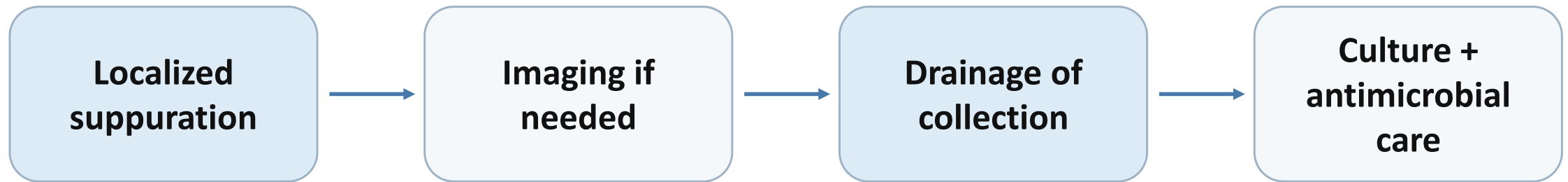
- Hydration and restoration of adequate oral intake.
- Salivary stimulation (sialagogues) when appropriate.
- Gentle gland massage and warm compresses.
- Good oral hygiene and review of medications reducing salivation.

When antibiotics are clinically indicated

- Acute bacterial sialadenitis warrants antibacterial therapy.
- Empirical choices should cover likely oral and staphylococcal pathogens.
- Modify therapy using culture, local resistance patterns, and patient factors.
- Antibiotics do not mechanically remove an obstructing calculus.

Abscess requires source control

Antibiotics alone may be inadequate for a formed abscess.



The site and severity determine urgent specialist management.

Endoscopic stone management

- Sialendoscopy provides direct ductal visualization.
- Selected ductal stones can be retrieved or fragmented using gland-preserving techniques.
- Effectiveness depends on stone size, position, and ductal anatomy.
- Persistent or complex disease may require additional procedures.

Acute treatment versus recurrence prevention

Acute priority

Clinical goal

Relieve active pain and inflammation

Evaluate bacterial suppuration

Hydration, local care, targeted treatment

Drain abscess when present

Long-term priority

Clinical goal

Prevent recurrent stasis and obstruction

Identify persistent stones / stenosis

Medication and hydration optimization

Consider gland-preserving intervention

Case 1: Painful swelling during meals

A 38-year-old has recurrent unilateral swelling beneath the mandible that begins during meals and resolves afterward. No fever or purulent discharge is present.

DISCUSS

Which pathophysiologic mechanism best explains the timing?

Reasoned answer: Salivary secretion increases during meals, but a partially obstructed duct cannot drain normally. Evaluate for submandibular sialolithiasis.

Case 2: Acute postoperative parotitis

An elderly patient develops acute unilateral parotid pain and enlargement following major abdominal surgery, with poor oral intake and dehydration.

DISCUSS

Which predisposing mechanism is highlighted by Robbins?

Reasoned answer: Dehydration-related reduction in salivary secretion predisposes to bacterial suppurative parotitis; Assess for infection and focal abscess.

Case 3: Tender gland and purulent ductal drainage

A patient has a tender, swollen salivary gland. Gentle massage expresses purulent material from the ductal opening.

DISCUSS

What immediate diagnostic and pathologic priorities follow?

Reasoned answer: Bacterial sialadenitis is likely. Obtain purulent material for culture if feasible, assess severity, and exclude an obstructing stone or abscess.

Integrated comparison of the major patterns

Pattern	Mechanism	Key evidence
Obstructive	Calculus impedes outflow	Meal-related swelling; stone / dilatation
Stasis-associated	Reduced secretion facilitates infection	Dehydration / drug exposure
Bacterial inflammatory	Bacterial invasion of gland	Pain, tenderness, sometimes ductal pus
Suppurative / abscess	Pyogenic necrosis and focal pus	Severe focal signs; collection on imaging

Five conclusions to retain

- Sialolithiasis is a common mechanical antecedent of bacterial sialadenitis.
- Reduced salivary secretion is a separate route to infection.
- *S. Aureus*, viridans streptococci, and unilateral involvement.
- Interstitial inflammation may progress to suppurative necrosis or abscess.
- Clinical evaluation should separate obstruction, infection, and persistent mass.

Selected sources

1. Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. 2026. Chapter 16, pp. 678–679.
2. Kim MJ, Milliren A, Gerold DJ Jr. Salivary Gland Disorders: Rapid Evidence Review. Am Fam Physician. 2024;109(6):550–559.
3. MSD Manual Professional Edition. Sialadenitis (professional clinical reference).
4. Clinical management and imaging content supplements—not quotations from—the Robbins subsection.