Medication for prosthetic dentistry

(A Specific review)

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Presents by

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Successful preoperative and postoperative care often depends on systemically administered drugs.

The successful dental practitioner must therefore have a strong background in basic pharmacology and keep the latest basic knowledge in this subject.

Also the practical application based on adequate pharmacological knowledge and this should lead to adequate treatment for the patient, reduce risky or complications and provide good toleration for the patient.

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This review is based on a documented published literatures and deals with the most expected drugs that may be used in treatment planning in prosthetic dentistry.

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• review focal points on the common prescription might be used during treatment planning in dental clinics In order to assist dental practitioners in selecting safe and effective drug therapy.

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The following prescriptions will be involved in this review for their systemic pharmacologic effects:
**Analgesics** (nonsteroidal anti-inflammatory [NSAIDs] and opioids)

Steroids.

Antibiotics & antifungal.

Mouth rinses with anti-infective

Anti-anxiety agents and

Muscle relaxants.

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Although many Analgesic belonging to several different chemical classes, but few of them have been approved by the American Council on Dental Therapeutics.

And

The following table will show these approved drugs:

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<table>
<thead>
<tr>
<th>Generic name</th>
<th>Maximum adult dose (mg)</th>
<th>Dosing interval</th>
<th>Maximum dose/ 24 hr (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salicylates (Asprin)*</td>
<td>325-650</td>
<td>Every 4 hr</td>
<td>4000</td>
</tr>
<tr>
<td>Propionic acids (Ibuprofen)*</td>
<td>400</td>
<td>Every 4-6 hr</td>
<td>3200</td>
</tr>
<tr>
<td>Indole (Ectodolac)*</td>
<td>200-400</td>
<td>Every 6-8 hr</td>
<td>1200</td>
</tr>
<tr>
<td>Pyrrolo derivative (Ketorolac)**</td>
<td>10</td>
<td>Every 4-6 hr</td>
<td>(40 oral); (120 IM)</td>
</tr>
<tr>
<td>Para-aminophenol (Acetaminophen) * #</td>
<td>325-650</td>
<td>Every 4 hr</td>
<td>4000</td>
</tr>
</tbody>
</table>

* Accepted by the Council on Dental Therapeutics, American Dental Association.
** available for intramuscular injection; not recommended for long-term use (>5 days).
# Lacks anti-inflammatory activity.
In addition, Analgesics have anti-inflammatory and antipyretic properties.

They are more effective for the intermittent, sharp pain caused by inflammation (dental pain), and they are not so in dull pain (cancer pain).

They are peripherally acting because their analgesic and anti-inflammatory effects are produced through a peripheral mechanism.

In contrast with Opioids, they have a different action that they have a mechanism of analgesic action exert at the level of the central nervous system (CNS).
The most popular NSAIDs are **Aspirin** and **Ibuprofen**.

They are varying slightly in degree of activity.

But they share **the same mechanism of action, side effects, contraindications, and drug interactions**.

They cause **gastric irritation lead to cause ulceration, blood loss, and occasionally iron-deficiency anemia**.
Gastric irritation is prominent with aspirin but less of a problem with the proprionic acids.

Patients with a peptic ulcer, aspirin is contraindicated.

And the proprionic acids should be used with aware.

However, Gastric irritation may be reduced by taking NSMDs with meals.
The following table shows only two steroid preparations are accepted by the Council on Dental Therapeutics.

*They are limited to topical application for inflammation.*
<table>
<thead>
<tr>
<th>Generic name</th>
<th>Trade name</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hydrocortisone</em></td>
<td>Orabase</td>
<td>2-3 times daily</td>
</tr>
<tr>
<td><em>Triamcinolone</em></td>
<td>Kenalog</td>
<td>2-3 times daily</td>
</tr>
</tbody>
</table>

*Accepted by the Council on Dental Therapeutics, American Dental Association*
Systemic Antibiotics

Bacteriostatic or bactericidal agents, Antimicrobial agents

Antibiotics are used in dentistry either:

1- To treat oral infections, which are caused by:
   - aerobic gram-positive cocci (Staphylococcus aureus) and
   - anaerobic microorganisms (Peptostreptococcus) or

2- As a prophylaxis to prevent bacterial endocarditis caused by hemolytic streptococci.

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Prophylactic regimen for dental patients in prosthetic or surgical procedures are mostly used as a prophylaxis of bacterial endocarditis:

- Penicillin (Ampicillin), Amoxicillin*
- Erythromycin
- Clindamycin* Cephalexin Doxycycline*
- Mimocycline* Cephradine
- Oxytetracycline* Tetracycline*
- Neomycin

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Penicillin causes few adverse side effects.

And

Claims of allergic reactions to penicillin may be exaggerated.
Penicillin V is the first choice in dentistry because it is more acid-stable than penicillin G and is therefore more efficiently absorbed orally. Penicillin is widely distributed in the body and is secreted rapidly from renal tubule.

- Due to possibility of an anaphylactic reaction, careful attention should be given to medical history.

- Otherwise Alternatives to penicillin include
  - Erythromycin
  - Cephalosporins
  - Clindamycin, and
  - Tetracycline.
• **A true allergic reaction usually marked as an irritating rash.**

• Anaphylactic reactions rarely occur, but in patients at risk the reaction occurs within 30 seconds of an intramuscular injection.

Signs and symptoms of anaphylaxis include oral paresthesia, cold hands and feet, bronchospasm and wheezing, circulatory collapse, and unconsciousness.

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• Erythromycin is best given with food because it causes stomach irritation, nausea, and vomiting.

• Specific classes of (Erythromycin estolate and erythromycin ethylsuccinate) can cause a unique allergic reaction clinically expressed as cholestatic hepatitis.

• These two salts are therefore contraindicated in the presence of liver dysfunction.

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Cephalosporins are similar to penicillin, sensitivity occurs in <10% of patients.
Clindamycin's antibacterial spectrum is similar to those of erythromycin, but it distributes well to bone and is therefore useful for osseous infections.

Diarrhea, a common side effect of clindamycin.
• Therapeutically the practitioner would be wise to question the need for antibiotic use rather than at random prescribing a broad-spectrum agent with the hope of attacking the offending organism.

• Little doubt exists that overuse of antibiotics has led to increasing numbers of bacteria resistant to currently available drugs.

• Once having made the decision to use an antibiotic, dose and duration of treatment should be large enough and long enough, respectively, to discourage the development of resistant strains.

• In the case of antibiotic therapy, patients must be recommend to continue taking antibiotics as instructed and not discontinue therapy once symptoms improved.
Alternate prophylactic regimens for dental procedures in patients who are at risk.

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Patients unable to take oral medications, Ampicillin intravenous or intramuscular Administration of 2.0 gm in, 30 min before procedure;

then intravenous or intramuscular administration of ampicillin 1.0 gm or oral administration of amoxicillin 1.5 gm 6 hr after initial dose.
Patients allergic to ampicillin/amoxicillin/penicillin and unable to take oral medications

**Clindamycin** intravenous administration of 300 mg 30 min before procedure and an intravenous or oral administration of 150 mg 6 hr after initial dose.
Patients considered high risk and not candidates for standard regimen Ampicillin,

Gentamicin intravenous or intramuscular administration of amoxicillin and ampicillin 2.0 gm plus gentamicin 1.5 mg/kg (not to exceed 80 mg) 30 min. before procedure, followed by amoxicillin 1.5 gm orally 6 hr after initial dose;

Alternatively, the parenteral regimen may be repeated 8 hr after initial dose.
Patients allergic to ampicillin/amoxicillin/penicillin and considered high risk.

Vancomycin intravenous administration of 1.0 gm over a 1 hr period, starting 1 hr before procedure; no repeated dose necessary
Tetracyclines are widely prescribed by some dentists

But are they Know ........?
• Tetracyclines are the poor choice as an alternative to penicillin because they are bacteriostatic rather than bactericidal.

• Their absorption is incomplete, tetracyclines are useful for intestinal infections.

• Milk and other dairy products are contraindicated with the tetracyclines.

• The use of tetracyclines during pregnancy and in children <8 years of age should be avoided because of permanent staining of deciduous and permanent teeth and retardation of bone growth.

• Other adverse effects include gastrointestinal trouble, hepatotoxicity, and nephrotoxicity.
Topical antibiotics
Three topical antibiotics are used in dentistry:

Polymyxin B (Aerosporin),

Bacitracin (Baciguent), and

Neomycin sulfate (Mycifradin),

* But only bacitracin is accepted by the Council on Dental Therapeutics.

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Bacitracin inhibits cell wall synthesis and is most effective against gram-positive cocci. It is frequently combined with polymyxin, neomycin, or hydrocortisone.

Hypersensitivity reactions to bacitracin are infrequent.
Topical antibiotics used in dentistry are usually applied to the mucous membrane in the form of creams, ointments, or aerosol sprays.

The topically applied antibiotics are not rapidly absorbed when applied to the mucous membrane of the oral cavity, and small amounts are swallowed and are subject to systemic absorption.

Anaphylaxis has been reported after topical application of a bacitracin/polymyxin B combination to abraded skin of the leg, and it can only be assumed that a similar effect could occur after topical application to abraded mucous membrane.
Polymyxin B is effective in treating gram-negative bacteria. The drug kills cells by distorting bacterial membrane to cause leakage of essential cellular components. Bacterial resistance develops to polymyxin B, and super infections have occurred after its topical use.

Neomycin has a broad spectrum of activity and is bactericidal.

Neomycin causes little local reaction when applied topically but is the most toxic of the aminoglycoside antibiotics when systemically administered.

Deafness and renal tubular necrosis have resulted from systemic use and after topical application of excessive amounts to abraded skin?
Antifungal antibiotics
The most common drug used in dentistry to treat fungal infections of the oral cavity is nystatin (Mycostatin).

Nystatin has a fungicide effect on several fungi, including Candida albicans.

C. albicans causes oral moniliasis (thrush) and can also infect **prosthetic devices**.

Because nystatin is not absorbed, tablets are usually held in the mouth for several minutes until they dissolve.

Colonized dentures can be treated by soaking them in a solution of nystatin.
Mouth rinses containing local antiinfective agents
<table>
<thead>
<tr>
<th>Mouth rinse</th>
<th>Antiefective</th>
<th>Ethanol (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betadine</td>
<td>Povidone-iodine</td>
<td>8</td>
</tr>
<tr>
<td>Chloraseptic</td>
<td>Phenol</td>
<td>0</td>
</tr>
<tr>
<td>Listerine*</td>
<td>Thymol</td>
<td>27</td>
</tr>
<tr>
<td>Peridex*</td>
<td>Chlorhexidine</td>
<td>11.6</td>
</tr>
<tr>
<td>PerioGard</td>
<td>Chlorhexidine</td>
<td>11.6</td>
</tr>
</tbody>
</table>

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Mouth rinses contain not only local anti-infective agents, they also have a variety of other ingredients, including:

- Flavorings,
- Sweeteners,
- Dyes,
- Preservatives and
- Wetting agents.
Most mouth rinses tend to be acidic (pH 4.2 to 8.2), and many contain ethanol.

Ethanol is the major local anti-infective agent in many over-the-counter mouth rinses.

Preparations containing phenolic derivatives such as thymol have limited usefulness and objectionable taste.
Hydrogen peroxide, an old but recently promoted agent, has little or no antibacterial activity but be able to loose debris by the physical action of releasing oxygen.
Betadine (Povidone-iodine), is a halogen-releasing compound combined with a surface active agent. It is probably the most effective antibacterial agent. and do not stain as iodine solutions do, but they have an unpleasant taste.

It is accepted at concentrations of 7.5% to 10% (The Council on Dental Therapeutics as a surgical scrub).

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Chlorhexidine, is also used as a surgical scrub, and, in fact, at concentrations of 2% to 4%, is accepted for this purpose.

It is most effective against gram-positive organisms, less effective against gram-negative organisms and fungi, and ineffective against spores and viruses.

Chlorhexidine digluconate, at concentrations of 0.12%, has been approved for the treatment of gingivitis and suppression of the formation of plaque.

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Chlorhexidine binds to hard and soft tissue and salivary protein and is then slowly released.

Undesirable effects include a reversible, altered taste perception, especially to salt, staining of teeth, tongue, and margins of anterior restorations that cannot be removed by brushing and it cause local irritation if applied to abraded tissue.

The therapeutic use of chlorhexidine in general dentistry and for specific problems in prosthodontics has been recently reviewed.

Chlorhexidine-containing mouth rinses are useful adjunct that may facilitate healing after insertion of dentures.
ANTI ANXIETY AGENTS
Anti-anxiety agents are most appropriately used in clinical dentistry for patients who become unusually frightened to the stress of awaiting for dental procedures.

Without question the safest and most popular drugs for such clinical situations are the Benzodiazepines.
Benzodiazepines

A large number of benzodiazepines have been used to treat a variety of disorders in addition to anxiety, including insomnia (sleepless), epilepsy, muscle spasm, and alcohol withdrawal.

Whereas it is generally accepted that most benzodiazepines are pharmacodynamically similar, some may have unique pharmacologic properties.

Alprazolam, for example, is not only an effective antianxiety agent but is also effective for the treatment of some forms of depression.
Diazepam is one of the most popular of the benzodiazepines for clinical dentistry and serves as a sample for the class.
Benzodiazepines, in combination with some CNS depressant drugs, can be lethal.

Alcohol causes possible of the CNS depressant effect of benzodiazepines rather than an additive effect.

Adverse effects of benzodiazepines are minimal In therapeutic doses, they have little effect on cardiovascular function or respiration.

Because they are CNS depressants, they can cause drowsiness and impaired motor function, and patients should be cautioned regarding operation of motor vehicles.
Flumazenil (Mazicon) is a benzodiazepine antagonist available for the treatment of benzodiazepine overdose.

It should be available as an emergency drug if benzodiazepines, especially midazolam, are used clinically.
Benzodiazepines are absorbed well after oral administration.

Diazepam, as well as most other benzodiazepines, oxazepam and lorazepam are simply conjugated and excreted, they are more suitable for geriatric patients or others who may have compromised liver function.

The safety of benzodiazepines, when used alone, is remarkable.
CENTRALLY ACTING MUSCLE RELAXANTS

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Muscle relaxants may act at the level of the CNS or the peripheral nervous system.

Only one peripherally acting agent, **Dantrolene sodium**, has been accepted by the Council on Dental Therapeutics.

It acts by interfering with the release of calcium from the sarcoplasmic reticulum, which prevents excitation coupling.

**Dantrolene** is used to treat spasticity characteristic of multiple sclerosis, cerebral palsy, and malignant hyperthermia.
**Dantrolene** and the centrally acting agents find limited use in dentistry.

All these drugs cause slight sedation that may contribute to their muscle relaxant effect.

**Diazepam is by far the safest** and most useful of the centrally acting agents.

The dose, duration of action, and pharmacologic characteristics of **diazepam** are the same whether it is used as a skeletal muscle relaxant or as an antianxiety agent.
Diazepam relieves spastic skeletal muscle but has relatively little effect on normal muscle tone.

The centrally acting muscle relaxants are sometimes used in treating temporomandibular disorder, but their efficacy is not reliable, or well established.
Baclofen has been reported to be useful in treating trigeminal neuralgia, especially in combination with carbamazepine.
Important notes

- An adequate knowledge needed for the safe administration of drug by dental practitioners.

- Wrong prescription of benzodiazepines may increase risk of being involved in a road accident.

- Risks associated with long-term use of medicines and interaction with other drug.

- Wrong introducing and application may lead to ineffective of drug to act as treatment for some diseases.

- This should be taken into account in the clinical management of dental practices.

(supported by the results from previous published studies).

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Reference;