

What Should Dentists Know about Medicine...

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Why Bother? (Martin S. Greenberg, 2007)

- The Committee on the Future of Dental Education Published in 1995: "To prepare future practitioners for a more medically based mode of oral health care and more medically complicated patients."

In the decades ahead, the average dentist will treat an increasing number of patients who have complex medical histories that will SIGNIFICANTLY modify the dental treatment plan the population to 25.6%.

- 88% of patients over 65 are taking prescription medications with a majority taking multiple medications.
- Hospitalizations for coronary artery disease more than doubled in the 1990s for patients over the age of 65.
- The number of patients taking immunosuppressive drug therapy to prevent graft rejection and treat autoimmune diseases also increased during the 1990s from under 15,000 per year to over 25,000.

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Why Bother? (Martin S. Greenberg, 2007)

- Integration into the dental school curriculum has been slow.
- Many dental schools face multiple challenges including :
 - Serious financial concerns, which decrease enthusiasm.
 - Pressure to maximize clinic income by increasing patient volume may decrease the time available.
 - Subjects related to new dental technology (esthetics , implants) compete for the limited time available curriculum.
 - A shortage of dentists who are adequately trained in dental treatment for patients with complex medical disorders who will both teach this subject and be strong advocates on dental school curriculum committees for improved educational programs.

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Why Bother? (Martin S. Greenberg, 2007)

- Lectures and even computerized learning alone are no more effective when teaching clinical competence in medicine than prosthetics or periodontics.
- Lectures by physicians and rounds in a hospital are one good method of learning clinical medicine, but this didactic instruction must be followed by clinical experiences in a dental environment under the supervision of trained dentists experienced in providing dental care for patients with complex medical problems.

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What's the Solution?

- Scope of the problem must be defined by encouraging research that studies the rate of complications as a result of a variety of dental procedures performed on patients with specific medical disorders.
- Increase the number of experts in the management of patients with severe medical problems.
- Lectures in medicine must be followed by substantial clinical experiences.

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What's the Solution?

- Dental schools should have clinics primarily devoted to dental treatment of patients with serious medical problems.
- There must be improved coordination between faculty who teach OM, OMFS clinics and faculty who are teaching in restorative, periodontics, and endodontic clinics where a majority of the dental care is provided and a majority of the clinical instruction carried out.

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Learning Outcomes

1. Medical Conditions and Their Impact on Dental Care.
2. Medical Emergency & Resuscitation in the Dental Practice.
3. The Special Care Needs Patient.
4. Geriatrics: Dentistry and the Ageing Patient.
5. Management of the Oncologic Patient.
6. Oral Soft Tissue Lesions, Temporomandibular Disorders and Orofacial Pain.
7. Infections, Infectious Diseases and Dentistry.
8. Nutrition and Oral Health.
9. Clinical & Applied Pharmacology and Dental therapeutics.

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Learning Outcomes

1. Medical Conditions and Their Impact on Dental Care
 1. Cardiovascular Diseases (Hypertension, Ischemic Heart Disease, Warfarin and Antibiotic Cover).
 2. Obstructive Pulmonary Diseases.
 3. End-Stage Liver Disease.
 4. Endocrine Disorders.
 5. Seizure Disorders.
 6. Stroke or Alzheimer's Disease.
 7. Renal Disease.
 8. Pregnancy.

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Hypertension: Dental Management Considerations

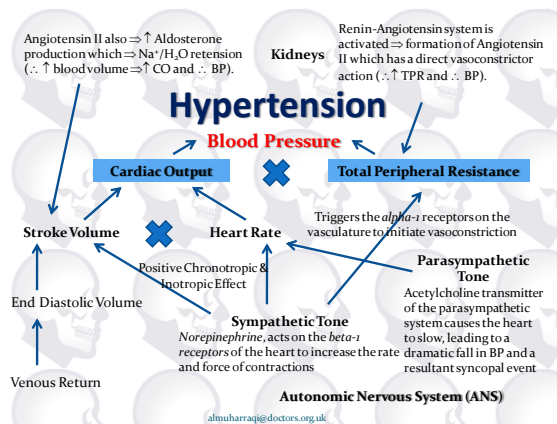
- BP is determined by how much blood the heart pumps (CO) and by the resistance to blood flow (TPR) in the vascular system.
- CO in turn is determined by how often the pump contracts (HR) and by the amount of blood ejected during each beat (SV).
- High blood pressure, therefore, results from either narrow inflexible arteries, an elevated heart rate, increased blood volume, more forceful contractions, or any combination of the above.
- The long-term regulation of BP is controlled predominantly by the kidneys through their variable release of the enzyme renin.

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Hypertension: Dental Management Considerations

- BP is never constant; it peaks right after the ventricles contract (systole) and reaches its low point as the ventricles fill (diastole).
- Mean arterial pressure (MAP) is calculated by multiplying the diastolic BP by two, adding the systolic BP, and dividing by three.
- MAP readings are primarily under control of the kidneys, while fear and stress can provoke the ANS to quickly and dramatically raise values.

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Hypertension: Diagnosis

Adult classification

| Classification | Systolic BP | Diastolic BP |
|-----------------------|-------------|--------------|
| Normal | < 120 | < 80 |
| Prehypertension | 120-139 | or 80-89 |
| Stage I hypertension | 140-159 | or 90-99 |
| Stage II hypertension | > 160 | or > 100 |

Note that a patient with a "normal" systolic blood pressure (less than 120) would be classified with Stage I hypertension if the diastolic blood pressure is 95.

Chobanian AV, Bakris GL, Black HR, et al. National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. National High Blood Pressure Education Program Coordinating Committee. The seventh report of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure: the JNC7 report. JAMA 2003;289:2560-72.

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Hypertension: Diagnosis

- Hypertension is **asymptomatic**. Known as the “silent killer” with symptoms resulting only when **eyes, heart, or kidneys** become damaged.
- Why and how chronic elevated BP can be a problem:
 1. Untreated hypertension ➔ heart works harder ➔ Congestive Heart Failure
 2. Untreated hypertension ➔ Atherosclerosis ➔ nephrosclerosis ➔ heart attacks, strokes, loss of vision, and acute/chronic renal failure
 3. Untreated hypertension ➔ Less sensitive to painful stimulation (electric pulp testing)

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Hypertension: Diagnosis

Dentists should take BP readings on their patients

- Many patients are unaware that they have hypertension – **30%** have **undiagnosed high BP**.
- The dentist may be **first to detect** the problem, thereby **improving the public's health** by informing patients that they have hypertension and referring them for evaluation and treatment.
- Early detection** and treatment **reduces the likelihood** of the serious consequences of hypertension (**cardiovascular disease, retinopathy, renal disease, and strokes**).

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Hypertension: Diagnosis

Dentists should take BP readings on their patients

- Risk Management** – reduce malpractice exposure **BUT...**
- There has been **NO** direct **cause-and-effect** relationship proven linking local anaesthetics in dental care (Massalha R et al., 1996; Kaufman E et al., 2002)
- Astra Zeneca®, for Xylocaine, recommends taking vital signs after each injection.

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Hypertension: Treatment

- 90% to 95%** of all cases of hypertension have no known etiology (**essential hypertension**) – treatment involves medicines, usually
- 1. NSAIDs** raise BP values an average of **5 mm** (McPhee SJ et al., 2006).
- 2. Ideal body weight** lowers BP reading by **5 to 20 mm**.
- 3. Exercise** lowering it an additional **5 to 9 mm** of Hg.
- Symptomatic** or **malignant** hypertension – headaches, changes in mental status, alterations in their retina and fatigue with a BP of 225/125.

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Hypertension: Treatment

- Goals of management to reduce to **pre-hypertension** range (**<140/90**) and to **<130/80** in patients with existing end-organ disease or diabetes.
- Lifestyle Modifications** – initial treatment involves diet restrictions (intake of fruits, vegetables, and low-fat dairy products, with restriction of sodium to less than 2.4 g/day), regular exercise, weight control, and low limits on the use of alcohol.

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Hypertension: Drugs

- 1. Diuretics** (eg, hydrochlorothiazide, triamterene, furosemide).
- 2. Beta-blockers** (eg, propranolol, sotalol).
- 3. ACE inhibitors** (eg, captopril, enalapril).
- 4. Calcium Channel Blockers** (eg, amlodipine, nifedipine, diltiazem).
- 5. Alpha blocking agents** (eg, prazosin, terazosin).
- 6. Direct acting vasodilators** (eg, nitroglycerin, minoxidil).
- 7. Other 'centrally acting' agents** (eg, methyldopa, clonidine).
- 8. Angiotensin 2 receptor blockers** (eg, losartin, telmisartan)

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Hypertension: Drugs

- **Diuretics** (eg, hydrochlorothiazide, triamterene, furosemide) are the most researched class of drugs and work to reduce BP by both decreasing **vascular resistance** and by reducing **blood volume**. For most patients, the **first** drug given for the treatment of high BP is a diuretic.

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Hypertension: Drugs

- **Beta-blockers** (eg, propranolol, sotalol) are frequently prescribed and decrease BP by reducing the **rate and force of contractions**.
- They are often used on patients with coexisting cardiac issues, such as **angina** and **histories of myocardial infarctions**.
- Selective beta-blockers (eg, atenolol, metoprolol) preferentially target and block the beta-1 receptors on the heart, avoiding the beta-2 receptors of the bronchioles.
- These bronchiole receptors react to sympathetic stimulation by relaxing smooth muscles, yielding **broncho-dilation**.
- Nonselective beta-blockers are therefore **contraindicated** in patients with **asthma**, as their inhalers (beta agonists) are "blocked" by their antihypertensive medicine.

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Hypertension: Drugs

- **ACE inhibitors** (eg, captopril, enalapril) work by **retarding the renin-angiotensin system**. They produce **vasodilatation** by interfering with the conversion of angiotensin 1 into angiotensin 2. With a reduction in angiotensin 2, vasoconstriction decreases, lowering BP.
- **Calcium Channel Blockers** (eg, amlodipine, nifedipine, diltiazem) typically **reduce all the variables in BP** by **minimizing calcium influx into smooth and cardiac muscle**. They decrease **total peripheral resistance** and often **slow the heart rate** and decrease the **force of contraction**.

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Hypertension: Drugs

- **Alpha Blocking Agents** (eg, prazosin, terazosin) impede the sympathetic transmitter nor-epinephrine from binding to receptors in the arterioles, leading to **vasodilatation**.
- **Direct acting vasodilators** (eg, nitroglycerin, minoxidil) work independent of the ANS to **relax vascular smooth muscle**.
- **Other 'centrally acting' agents** (eg, methyl dopa, clonidine) act in the central nervous system to **decrease sympathetic nervous system output**.
- **Angiotensin 2 receptor blockers** (eg, losartin, telmisartan), which work by preventing vasoconstrictor in the arterials, thus promoting vasodilatation.

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Hypertension: Drugs

Slowly return patients to an upright position following dental care, and to have them sit on the edge of the chair for 30 to 60 seconds before standing

| | |
|---------------------------|---|
| Diuretic | Orthostatic hypotension, blood dyscrasia |
| Beta blockers | Orthostatic hypotension, blood dyscrasia |
| ACE inhibitors | Orthostatic hypotension, renal failure, neutropenia |
| Calcium channel blockers | Orthostatic hypotension, renal failure |
| Alpha blockers | Orthostatic hypotension |
| Direct-acting vasodilator | Blood dyscrasia, orthostatic hypotension |
| Central-acting agents | Orthostatic hypotension |

Clinically indistinguishable from lichen planus
Switching medicines may help
Biopsy is warranted if the lesions fail to regress
Avoid alcohol-containing mouthwashes

| | |
|----------------------------|---|
| Drug | Effect |
| Diuretics | Dry mouth, lichenoid reaction |
| Beta blockers | Dry mouth, taste changes, lichenoid reaction |
| ACE inhibitors | Loss of taste, dry mouth, ulceration, angioedema |
| Calcium channel blockers | Gingival enlargement, dry mouth, altered taste |
| Alpha blockers | Dry mouth |
| Direct-acting vasodilators | Facial flushing, possible increased risk of gingival bleeding and infection |
| Central-acting agents | Dry mouth, taste changes, parotid pain |
| Angiotensin 2 antagonists | Dry mouth, angioedema, sinusitis, taste loss |

Hypertension: Drugs

Begins to occur after 2 to 3 weeks of daily use of NSAIDs
Indomethacin most likely to reduce BP medication effectiveness

| Drug | Interactive drug | Effect |
|--------------------------------|------------------------------|--|
| Diuretics | NSAIDs | Decreased antihypertensive effect |
| Diuretics | Barbiturates | Orthostatic hypotension |
| Diuretics | Fluconazole | Elevated haematocrit levels |
| Beta blockers | NSAIDs | Decreased antihypertensive effect |
| Beta blockers (nonselective) | Epinephrine | Transient BP elevations |
| Beta blockers | Local anesthetics | Decreased rate of amide metabolism |
| Beta blockers (nonselective) | Bronchodilators | Decreased response to inhaled bronchodilator |
| ACE inhibitors | NSAIDs | Decreased antihypertensive effect |
| Calcium channel blockers | Benzodiazepines | Increased sedation |
| Calcium channel blockers | Parenteral anesthetic agents | Intraoperative hypertension |
| Calcium channel blockers | Aspirin | Increased antihypertensive effect |
| Alpha blockers | NSAIDs | Decreased antihypertensive effect |
| Alpha blockers | NSAIDs | Decreased antihypertensive effect |
| Direct-acting vasodilators | NSAIDs | Decreased antihypertensive effect |
| Direct-acting vasodilators | Opioids | Increased antihypertensive effect |
| Centrally-acting agents | Epinephrine | Transient elevation in BP |
| Centrally-acting agents | NSAIDs | Decreased antihypertensive effect |
| Centrally-acting agents | Sedatives | Increased sedation |
| Centrally-acting agents | Opioids | Increased antihypertensive effect |
| Angiotensin 2 receptor blocker | Systemic antifungal | Increased antihypertensive effect |
| Angiotensin 2 receptor blocker | Sedatives | Increased antihypertensive effect |

Hypertension: Recommendations

- Above what BP values should we not provide dental treatment?
- Should the BP value differ depending on whether we are giving emergency care for a swollen symptomatic patient versus elective care?
- Should we limit the amount of epinephrine for hypertensive patients?

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Hypertension: Recommendations

- Many patients with no prior history of hypertension present with toothache, swelling, and BP in the 190/110 range.
- They are sick, anxious, desperate, and **difficult to turn away just because of their elevated BP.**
- Many such patients have their pressure respond favorably by simple **relaxation techniques** – Sounds, smells, lighting, colors, and the **perception that the doctor is competent.**
- **Sounds of water** decreased the patient's BP while, the sounds of a **dental turbine** increased readings (Mishima et al., 2004).

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Hypertension: Recommendations

- **Pharmacologic Anxiolytic Measures**, (nitrous oxide or oral sedatives).
- **5 mg of diazepam** versus **captopril** for hypertensives presenting to the emergency room with BP readings greater than 190/100 – responded equally well to both treatments, reducing systolic BP by 30 mm Hg, and diastolic values by 25 mm (Grossman et al., 2005).
- If Pharmacologic anxiolytic interventions are not available or if they fail to bring the patient's BP down, what is a dentist to do? A **phone consultation made to the patient's physician for advice! BUT...**

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Hypertension: Recommendations

- Many physicians are not familiar with the doses of epinephrine used by dentists – **“go ahead and treat.... but use no epinephrine.”**
- **“The primary responsibility for the care of the patient rests solely in the hands of the person who performs the treatment, not the one who gives the advice.”** (Malamed SF, 2004)

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Hypertension: Recommendations

- Is **180/110** for the absolute cutoff for any dental treatment? (Aubertin MA, 2004; Steinhauer T et al., 2005; Riley CK et al., 2001).
- **“how healthy is the patient,”** or **“risk assessment,”** is key in determining the likelihood of complications - American Society of Anesthesiologists (ASA):
 - ASA Class I. A normal healthy patient
 - ASA Class II. A patient with mild systemic disease
 - ASA Class III. A patient with severe systemic disease
 - ASA Class IV. A moribund patient who is not expected to survive without the operation

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Hypertension: Recommendations

Questions for the dentist to consider when deciding on dental care are:

No absolute black-or-white cut-off numbers exist. The dentist must decide if the benefits of proceeding with a procedure outweigh any systemic risks.

- Will the procedure be long or invasive?
- What is the health of the patient?
- Is there any advice from the patient's physician?

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Hypertension: Recommendations

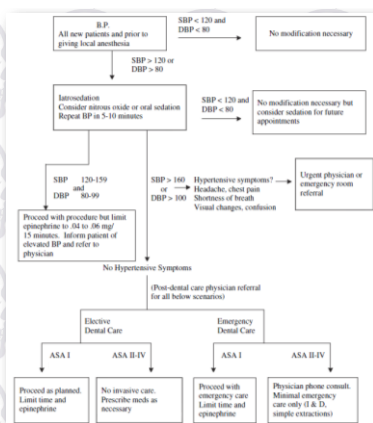
- Little if any cardiovascular change occurs from slow (with aspiration) administration of 2-3 cartridges of local anesthetic with epinephrine 1 : 100,000 – total epinephrine dose .036 – .054 mg (Bader JD et al., 2002; Gungormus M et al., 2003).
- Patients release their own epinephrine and other vasoactive mediators in amounts in excess of this if they are feeling pain during a procedure.
- A stressed patient can release up to 40 times his or her baseline catecholamine level (Knoll-Kohler E et al., 1989).
- Half-life of epinephrine is only 2 to 5 minutes and it is rapidly inactivated by catechol-o-methyltransferase (Yagiela JA, 2003).

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Hypertension: Recommendations

- Dentists should strive to limit the total quantity of circulating epinephrine, which includes that administered by the dentist in the local anesthesia and that released by the patient's adrenal medulla.
- On ALL Compromised Patients:
 1. Use a none-pinephrine-containing gingival retraction cord.
 2. Caution should be taken to avoid direct intravascular injections .
 3. The use of the periodontal ligament syringe with 1:50,000 epinephrine is ill-advised due to potential rapid epinephrine absorption.
 4. Giving injections one quadrant at a time.
 5. BP readings every 10 to 15 minutes throughout the procedure.

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Ischemic Heart Disease: Dental Management Considerations

- Ischemic heart disease (IHD) is the most common medical problem in the general population
- People who reach 40, 49% of ♂ and 32% of ♀ show clinical manifestations of IHD during their lifetime.
- Since IHD is so prevalent, stay up to date.
- Though dentists are not expected to diagnose IHD, heart disease in a patient can jeopardize the safe delivery of dental care.

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Risk factors for IHD

1. Family history (IHD at an early age in a patient's parents significantly increases his risk)
2. Gender (greatest impact between ages 25 and 64 with a M:F, 3:1)
3. Age
4. Total Serum Cholesterol (Total cholesterol ≥ 240 mg/dL) and increased total-to-HDL cholesterol ratio
5. Systolic and Diastolic blood pressure (Systolic BP of ≥ 140 or diastolic BP ≥ 90 increases the likelihood of IHD)
6. Cigarette Smoking
7. Diabetes Mellitus

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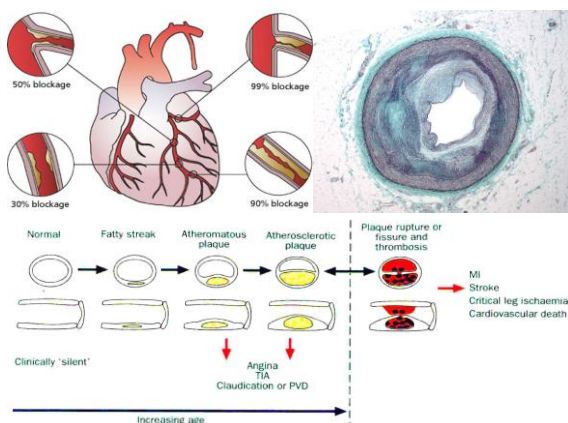
Other Risk factors for IHD

8. Abdominal Obesity
9. Lack of Regular Exercise
10. Lack of Regular Inclusion of Fruits and Vegetables in the diet
11. Excessive Ethanol Use
12. Increased Psychologic Stress
13. Collagen Vascular Diseases
14. Laboratory Findings of either elevated levels of:
 - C-reactive protein (CRP)
 - Cystatin C
 - Homocysteine
 - Micro-albuminuria

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- Sub-sternal squeezing or pressure sensation in the chest.
- Heart rate increases to the point at which coronary artery oxygenated blood **supply** CANNOT keep pace with myocardial oxygen **requirements**.
- Due to **atherosclerotic** lesions narrowing the calibre of coronary arteries.
- In rarer cases coronary **artery spasms** may be the cause (e.g., Prinzmetal's angina)

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- This occurs **no matter what the level of oxygen demand**.
- The ischemia **produces angina**.
- If the ischemia lasts long enough, the affected myocardium begins to **infarct**, usually beginning in the **sub-endocardial** layer that is furthest from coronary capillary blood flow, but not in contact with intracardiac blood.
- If the thrombus **spontaneously dissolves**, is **mechanically removed** by insertion of a stent, or is **pharmacologically lysed with thrombolytic agents** ➡ the **ischemia resolves**.
- At that point, the **duration** of the ischemia determines the extent of **lasting myocardial injury**.

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- **40% atherosclerosis** of the circumference of the intimal layer of the artery must be involved before the calibre of the lumen begins to be **compromised**. Eventually, the lesion is large enough to **obstruct blood flow**.
- **Initially**, this obstruction occurs only at **times of demand** for increased flow, such as when **heart rate increases**, causing anginal symptoms.
- **Over time**, the obstruction can become large enough to **compromise blood flow at all times**, leading to angina even at **rest**.

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- **Angina** ➔ **partial obstruction**, which is why the symptom can come and go without myocardial damage.
- **MI** ➔ **ulceration** or **rupture** of the **fibrous cap** covering the **plaque**.
- Exposed contents of plaque triggers deposition of platelets and clotting of adjacent blood at site of atherosclerotic lesion ➔ a **thrombus** forms.
- If and when the thrombus becomes **large enough**, it **obstructs** blood flow ➔ **myocardial tissue downstream** from the obstruction begins to **suffer ischemia**.

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- Determine the level of each patient's IHD control
 - Stable angina has a predictable quality
 - The activities necessary to cause an anginal event are usually known: a patient knows how many stairs before angina occurs.
 - Once a patient's angina appears it usually stops once the patient ceases the activity that triggers it
 - Nitroglycerin (GTN) is required to relieve the angina - the amount is similar with each event
- Determine any change in IHD risk factors

Patient with stable angina can usually undergo routine dental care safely

- Remember the **usual triggering event** to angina and **how to manage the angina** should it occur

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Stable Angina

- The major instigator of angina in the dental setting is **tachycardia provoked by FEAR or PAIN**

Angina-prone patients who experience greater than normal stress from the thought of dental work benefit from **oral anxiolytics, nitrous oxide and/or intravenous sedation.**

Pain control is critical for lessening the chances of angina in IHD patients – Use profound local anesthesia:

1. Longer-acting anesthetics, **bupivacaine**, or use a **vasoconstrictor. Epinephrine** and **neocobefrin**, can both cause a rise in heart rate. Use them in concentrations of **1:100,000** and **1:20,000**, respectively, or less.
2. Avoid **intravascular** administration with aspiration before injection.
3. Avoid excessive **extravascular** deposits by limiting the amount of vasoconstrictor to **<0.04mg** of epinephrine (about two cartridges containing 1:100,000 epinephrine).

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Stable Angina

- Routine use of oxygen in patients subject to angina **makes little sense.**
- Should not be put into a sedated state that **impairs ability to report angina.**
- Regularly **check patient's heart rate** and **BP** during long appointments.
- Address **associated conditions** e.g., hypertension, congestive heart failure, and diabetes.
- Medication induced **postural hypotension.**

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Unstable Angina (Not Acute Coronary Syndrome, ACS)

- Patients with **'unstable' angina, nocturnal angina** and **recent hospital admissions** due to angina are **RISKY** to treat in a **non-medically supported environment.**
- Determine the level of each patient's IHD control:
 - If it is **changing for the worse** in some parameter.
 - If angina is now occurring more **frequently.**
 - Appears at **lower levels of exertion** or at rest.
 - Requires **larger doses** of nitrates for relief.
 - **Relief** from angina takes **longer** than in prior episodes.
- Immediate **referral** to the patient's physician is indicated

Atherosclerotic lesions worsened, oxygenation of patient's blood compromised, or myocardial baseline oxygen demand has increased e.g., dysrhythmia, AF.

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Myocardial Infarction (MI)

- differs little from that used for patients prone to angina.
- Physicians sought to limit non-cardiac surgical interventions on these patients for at least 6-months.
- If MI is recognized early and rapid interventions are successful, damage can be minimal and there is little reason to delay even elective surgical procedures, **including dental procedures.**

Same considerations should be taken for the MI patient as are taken for angina patients

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Myocardial Infarction (MI)

- Placed on **potent platelet inhibitors** (clopidogrel), extra care needs to be taken when doing surgery likely to cause significant bleeding.
- In those circumstances, extra measures should be taken to promote **local haemostasis.**
- Local haemostasis: pro-coagulant materials (collagen or topical thrombin); applying direct pressure for longer than usual; injecting vasoconstrictor containing local anaesthetic directly into the surgical site; and using sutures to close the wound.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Assess the Patient's Thrombotic Risk:

- 'Low risk' patients** (most patients)
 - Patients with **atrial fibrillation** or **valvular heart disease** which has NOT been complicated by a previous arterial thrombotic event;
 - Patients who have had a **venous thrombo-embolic event MORE than 3 months ago.**
- 'High risk' patients**
 - Patients with **atrial fibrillation** or **valvular heart disease** which HAS been complicated by a previous arterial thrombotic event;
 - Patients who have had a **venous thrombo-embolic event LESS than 3 months ago.**
 - Patients with a **Starr-Edwards (ball and cage) prosthetic heart valve.**
 - Patients with **multiple heart valve replacements.**
 - Patients who are not clearly in the low risk groups above - **contact haematologist or vascular medicine** for advice regarding patient risk group and management of high risk patients.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

General Guidelines:

- If International Normalised Ratio (INR) of **below 4.0**, patients can usually receive dental treatment in primary care without needing to stopping warfarin or adjust dose.
- The risk of **thromboembolism** after temporary withdrawal of warfarin therapy **outweighs the risk of oral bleeding** following dental surgery.
- Patients on warfarin **may bleed more than normal**, but bleeding is usually **controlled with local measures**.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Drug Interactions:

- **Amoxicillin** - there have been anecdotal reports that amoxicillin interacts with warfarin causing increased prothrombin time and/or bleeding, but documented cases are relatively rare. However, a **single three gram dose for endocarditis prophylaxis** has **NOT been shown to produce a clinically relevant interaction**. Patients requiring a course of amoxicillin should be advised to be vigilant for any signs of increased bleeding.
- **Clindamycin** - **does not interact with warfarin** when given as a **single dose for endocarditis prophylaxis**. Clindamycin is restricted to **specialist use for treatment** and should not be used routinely for dental infections due to its serious side effects. **There is a single case report of an interaction between warfarin and clindamycin**.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Drug Interactions:

- **Erythromycin and other macrolide antibiotics** (for example, azithromycin) - **interact with warfarin unpredictably and only in certain individuals**. Patients should be advised to be vigilant for any signs of increased bleeding. If increased bleeding occurs then the patient should be advised to contact the GP or anticoagulant clinic to arrange additional INR testing and dose review.
- **Metronidazole** - interacts with warfarin and should be avoided if possible. If it cannot be avoided, the warfarin dose may need to be reduced by a third to a half, and re-adjusted again when the antibiotic is discontinued. Contact the GP or anticoagulant clinic to arrange additional INR testing and dose review.
- **Non-steroidal anti-inflammatory drugs** - Drugs including ibuprofen, aspirin and diclofenac should not be used as analgesics in patients taking warfarin.

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Managing Patients who are Taking Warfarin & Undergoing Dental Treatment

Dental surgery covered by this advice includes:

- Treatment where the INR **does not** need to be checked:
 - Prosthodontics.
 - Conservation.
 - Endodontics.
- Treatment where the INR **does need to be checked (follow flow diagram)**:
 - Extractions.
 - Minor oral surgery (Fewer than 4 roots being extracted).
 - Periodontal surgery.
 - Biopsies.

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