



اَوْنِيُوْ سِيْتِي تِي كُونُوْ لُوْ كِي مَارَا
UNIVERSITI
TEKNOLOGI
MARA

Local Anaesthesia: Updates and techniques

Dr. Azmeel Mazlee Bin Anuar
Head

Centre of Studies for Oral and Maxillofacial
Surgery

PHARMACOLOGY

What is available?

- **4% Articaine: with epi 1:100,000 or 1:200,000**
- **0.5% Bupivacaine: with epi 1:200,000**
- **2% Lidocaine: with epi 1:100,000 or 1:50,000**
- **3% Mepivacaine: plain, with 1:20,000 levo, or
2% Mepivacaine with epi 1:100,000**
- **4% Prilocaine: plain, or with epi 1:200,000**

WHAT ARE THE SIMILARITIES?
WHAT ARE THE DIFFERENCE?

Classification

Amides

- Articaine
- Bupivacaine
- Lidocaine/Lignocaine
- Mepivacaine
- Prilocaine

Esters

- Procaine
- Chlorprocaine
- Tetracaine
- Benzocaine
- Cocaine

Concentration

Types	Percentage
Articaine	4%
Bupivacaine	0.5%
Lidocaine	2%
Mepivacaine	2% (vc) or 3% (plain)
Prilocaine	4%

Onset of action

Types	Minutes
Articaine	2 - 3
Bupivacaine	6 - 10
Lidocaine	2 - 3
Mepivacaine	1.5 - 2
Prilocaine	2 - 3

Duration of action (approximate; in mins)

Preparation	Maxillary infiltration		Inferior alveolar block	
	Pulp	Soft tissue	Pulp	Soft tissue
lidocaine 2% with epinephrine 1:50,000 or 1:100,000	60	150	75	180-300
articaine 4% with epinephrine 1:100,000 or 1:200,000	60	120-360	75	120-360
prilocaine 4% with epinephrine 1:200,000	40	120	75	180
prilocaine 4% plain	15	60-90	60	150
mepivacaine 2% with 1:20,000 levonordefrin	50	180-300	75	180-300
mepivacaine 3% plain	20	120-180	40	120-180
bupivacaine 0.5 % with epinephrine 1:200,000	60	240-540	180	240-540

Biotransformation

- All amides are metabolized in liver
- Prilocaine is also metabolized in plasma and kidney
 - ✓ Methemoglobinemia potential
- Articaine also has ester group
 - ✓ Ester hydrolysis is more rapid

$\frac{1}{2}$ life (mins)

Types	Minutes
Articaine	~ 30 - 46
Bupivacaine	~ 162 - 210
Lidocaine	~ 80 - 96
Mepivacaine	~ 114
Prilocaine	~ 93 - 96

Local anaesthetic in pregnancy

Drug	US FDA category	Can be used in?	
		Pregnancy	Lactation
Articaine	C	Yes	Yes
Bupivacaine	C	Yes	Yes
Lidocaine	B	Yes	Yes
Mepivacaine	C	Yes	Yes
Prilocaine	B	Yes	Yes

LA selection criteria (duration)

Short

- Mepivacaine plain
- Prilocaine plain

Medium

- Articaine
- Lidocaine with epinephrine
- Mepivacaine with levonordefrin or epinephrine
- Prilocaine with epinephrine

Long

- Bupivacaine

Vasoconstrictors in LA

Epinephrine

Levonordefrin

Functions of vasoconstrictor

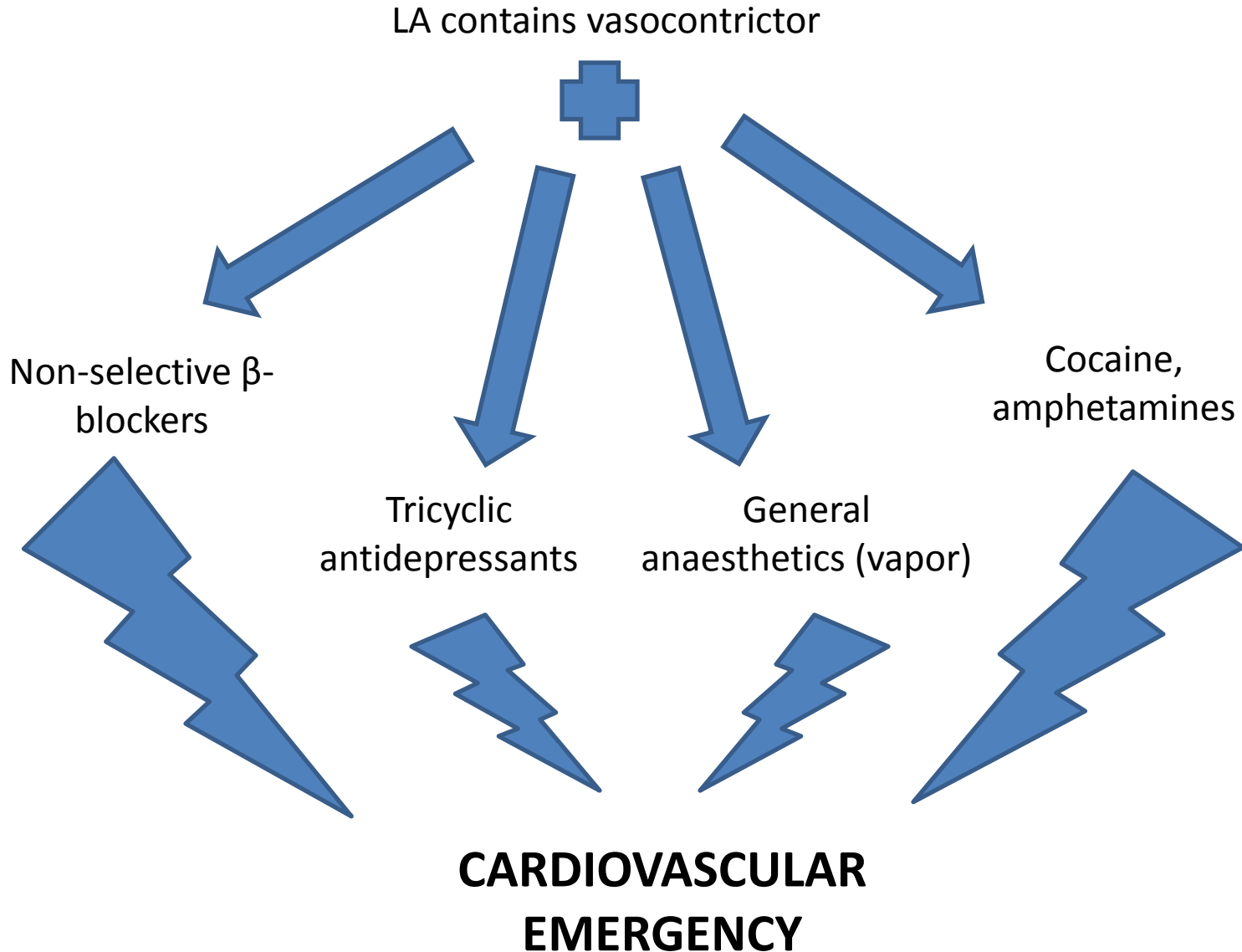
↑ depth of anaesthesia

↑ duration of anaesthesia

↓ systemic toxicity

haemostasis

Important interaction



Complications



Systemic

Psychogenic
reactions

Allergic
reactions

Toxicity

Psychogenic reactions

- Syncope
- Nausea, vomiting
- Alterations in HR / BP
- Hyperventilation
- Mimic an allergic reaction

Allergic reaction

Could it be from?

- local anaesthetic: amide or ester
- vasoconstrictor: epinephrine or levonordefrin
- metabisulfite

Local anaesthetic toxicity

General assumptions:

- Relatively free of side effects if administered correctly
- May be seen if:
 - excessive doses
 - intravascular injection
- Primarily manifests as CNS toxicity
- Rate of injection and rapidity of ↑ blood level alters toxicity

Level	Signs
Low	sedation, analgesia, antiarrhythmic activity
Intermediate	lightheadedness, slurred speech, drowsiness, euphoria/dysphoria, diplopia, sensory disturbances, muscle twitching
High	disorientation, tremors, respiratory depression, tonic/clonic seizures
Lethal	coma, respiratory arrest, cardiovascular collapse

Localized

Trismus

Haematoma

Needle
breakage

Transient
facial paralysis

Infection

Soft tissue
injury

Lesion /
sloughing of
tissue

Ocular
complications

Prolonged
paraesthesia

Recommended max dosage

Drug	Maximum dose
articaine with epinephrine	7 mg/ kg
bupivacaine with epinephrine	2 mg/ kg
lidocaine with epinephrine	7 mg/ kg
mepivacaine plain or with vasoconstrictor	6.6 mg/ kg
prilocaine plain or with epinephrine	8 mg/ kg

How to calculate the maximum dose of LA

- Percent (%) solutions represent grams per 100mL.
- Move the decimal place to the right and this value = mg/mL (e.g. 2% lidocaine = 20mg/mL; and 4% prilocaine = 40mg/mL).
- Each cartridge holds 1.8 mL. (notations on the more newly released formulations may list 1.7mL, which means that there is a minimum of 1.7mL in the cartridge. There are also formulations with 2.2mL)

How to calculate the maximum dose of LA

- Calculation of maximum local anesthetic for a child weighing 20kg with the drug 3% mepivacaine plain.
- Total dose which can be given = $6.6 \text{ mg/kg} \times 20 \text{ kg} = 132\text{mg}$
- Drug selected is 3% mepivacaine = 30 mg/mL
- Total volume which can be given = $132\text{mg} / 30 \text{ mg/mL} = 4.4\text{mL}$
- Each cartridge = 1.8mL
- Therefore $4.4 / 1.8 = 2.4$ cartridges is the maximum of 3% mepivacaine for this child

How to calculate the maximum dose of LA

- Calculation of maximum local anesthetic for an adult weighing 70kg with the drug 2% lidocaine with epinephrine.
- Total dose which can be given = $7\text{mg/kg} \times 70\text{ kg} = 490\text{mg}$
- Drug selected is 2% mepivacaine = 20 mg/mL
- Total volume which can be given = $490\text{mg} / 20\text{ mg/mL} = 24.5\text{mL}$
- Each cartridge = 1.8mL
- Therefore $24.5 / 1.8 = \sim 13$ cartridges is the maximum of 2% lidocaine with epinephrine for the patient

Maximum doses recommended above to calculate the values for the local anesthetics for children weighing 14kg, 18kg, and 23kg

Children age	Maximum number of cartridges #		
	3 years old	5 years old	7 years old
If weight is 50 th percentile for that age	14 kg	18 kg	23 kg
articaine with epinephrine	1.4	1.8	2.2
lidocaine with epinephrine	2.7	3.5	4.5
mepivacaine plain	1.7	2.2	2.8
mepivacaine with vasoconstrictor	2.6	3.3	4.2
prilocaine with epinephrine	1.6	2	2.6

TECHNIQUES

Maxillary techniques

- Nasopalatine nerve block
- Infra-orbital block
- Anterior, middle and posterior superior alveolar nerve block
- Greater palatine nerve block
- Maxillary nerve block

Mandibular techniques

- Inferior alveolar nerve (IAN) block
- Mental nerve block
- Buccal nerve block
- Lingual nerve block

Why do IAN block fail?

- Incorrect technique.
- Inflamed tissue.
- Patient apprehension.
- Intravascular injection.
- Anatomical variability.
- Accessory innervation

Methods overcoming failed IAD nerve block

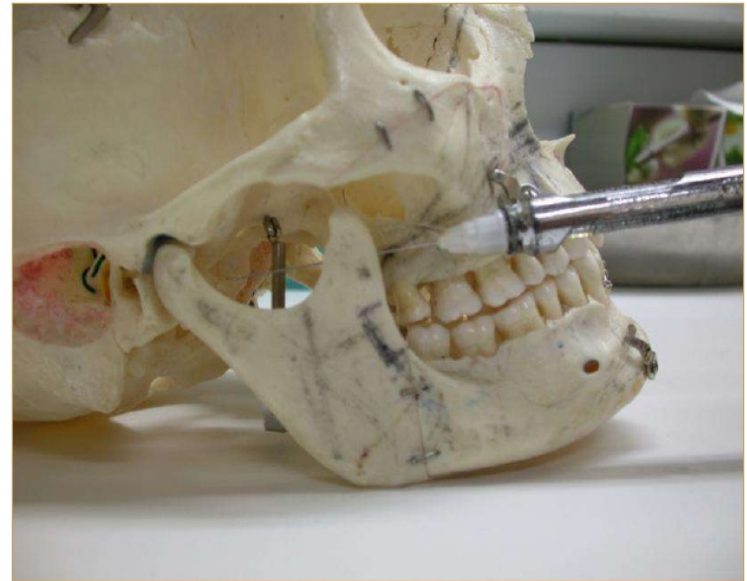
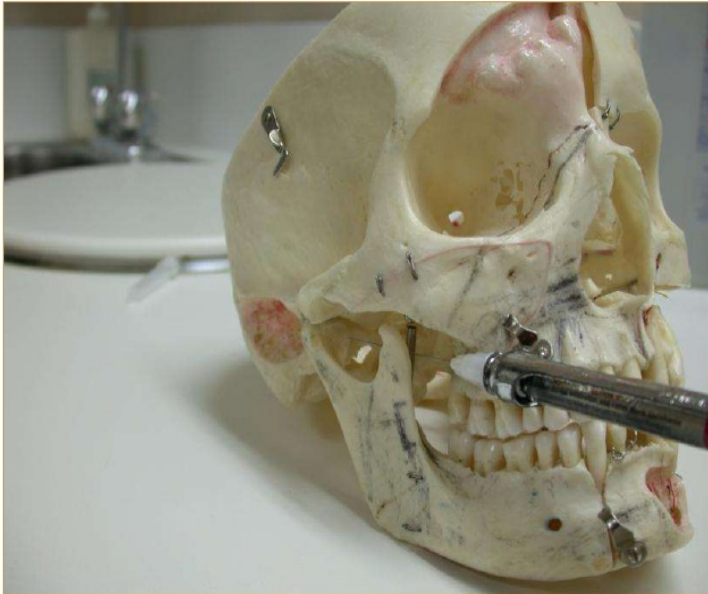
Gow
Gates

Vazirani
Akinosi

Gow Gates technique



Vazirani-Akinosi technique



Adjunctive Strategies for Infiltrations

- [PDL injection](#)
- Subperiosteal injection
- [Intra-osseous injection](#)
- Intrapulpal injection
- [Intraseptal injection](#)

New techniques

PDL injection



Single Tooth Anaesthesia

New techniques

Stabident



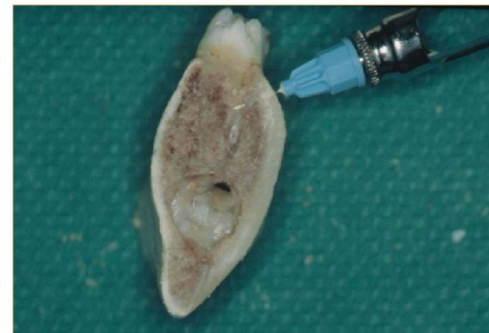
Page • 66

Stabident



Page • 67

Stabident



Page • 69

Intra-osseous injection

New techniques



THANK YOU