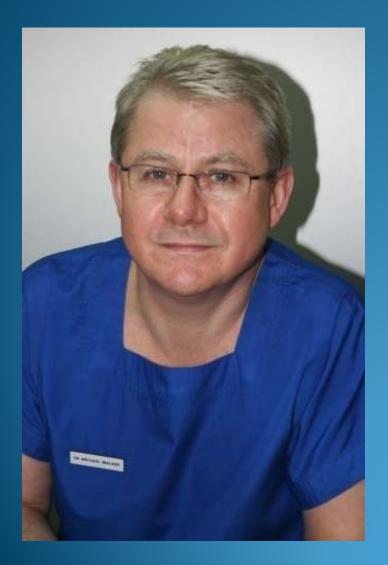
Dr Michael Walker Nitrous Oxide Sedation Singapore 2016

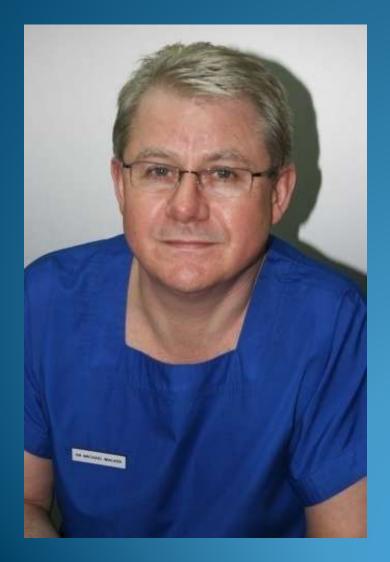




Dr Michael Walker BDS FPFA Dip.Clin.dent.[oral Implants]Syd.

- -Senior clinical associate Uni. of Sydney[teaching undergraduates and postgraduates]
- -External Examiner and Tutor to the Diploma of Conscious Sedation University of Sydney [the only APHRA endorsed Sedation Course in Australia]
- -Australian Society of Dental Anesthesiology Past
 President and current Treasurer
- -Private Practitioner In Waterloo Sydney providing
 GA, IV, RA to anxious and difficult to treat patients.

Visiting Dental Officer Sedation & Pain Management WESTMEAD HOSPITAL



Dr Michael Walker BDS FPFA Dip.Clin.dent.[oral Implants]Syd.

Private Practitioner In Waterloo Sydney providing GA, IV, RA to anxious and difficult to treat patients.

So I provide Nitrous Oxide sedation in my practice every day.

Sydney Australia







Nitrous Oxide /Relative Analgesia Training Program for Australian Society of Dental Anesthesiology for Australia.





PowerPoint will be available at my web site use Patient contact form ,saying Singapore 2016 RA apply for access and your details.

www.drwalker.com.au

Australian Society of Dental Anesthesiology ENDORSED Postgraduate Course

Relative Analgesia Certificate Program

Nitrous Oxide /Relative Analgesia Training Program /tutors for BLS instruction. ASDA Postgraduate Trainers



Dr Robert Turnbull



Dr Greg Mahoney



Dr Michael Walker



Dr Angelo Preketes

I need your help!

I don't know the local customs or styles in Dentistry in Singapore. So if I say anything that is not consistent with Singapore Dentistry or cultural things let me know

Who's used Nitrous Oxide before?

If anyone pregnant let me know and do not use the N2O.

How the day will run

- ☐ Nitrous oxide review.
- Lets reset the stage ,case examples
- Morning tea or FAQ, depending how we are running.
- Equipment review
- Review of practical hands on
- Real example ,need a volunteer
- Lunch
- Practical sessions
- Afternoon tea
- More practical sessions
- Rap up review questions ,review RA sheets.
- End [please ask lots of questions]

Lets set the stage



Lets set the stage



As Dentist all we want to do is help and so treat patients

- Approximately 15 % of the population decline dental treatment primarily because of fear.
- Specifically the fear of oral injections.
- The fear of pain constitutes one of the greatest obstacles to the acceptance of dental services by much of the population.

• The proactive use of nitrous Oxide assists to build practices by helping patients do the dentistry they need to do.

- Fear and Anxieties associated with dentistry are greatly reduced.
- Patients are more relaxed during treatment.
- Your patients become more manageable, so your stress levels diminish.

- For the Dentist ,the promise of sedation/analgesia for the patient assists in attracting more patients in these competitive times.
- Also the Dentist can operate more efficiently, hence reducing chairside time and also more treatment can be accomplished per visit if required

 More treatable patients and efficiency is good for the Patient and good for the Dentist too.













Nitrous Oxide Sedation is also called Relative Analgesia RA







Nitrous Oxide Sedation is also called Relative Analgesia RA

What is Nitrous Oxide Sedation?







Variable %

Variable%

Nitrous Oxide Sedation is titrated



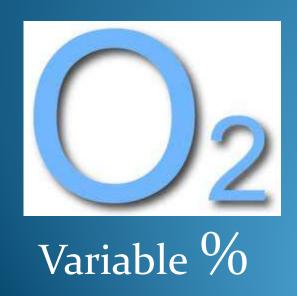




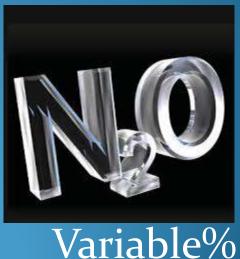
Variable %

Variable%

Titration is the slow addition of one drug /or gas of known concentration to an another drug / or gas







Titration of Nitrous Oxide allows you to individualize the dose to sedate the patient to the appropriate clinical level



+



Variable %

Variable%

Titration of Nitrous Oxide can range from 10% to 70% to achieve sedation







Variable %

Variable%

Why do I want to use RA/Nitrous oxide in my practice?



Proof of a modern dentist

- He's got the latest new drill
- He's got a white coat [infection control]
- He's got magnification and head light[quality work]
- He's a happy Dentist

Why do I want RA/Nitrous oxide in my practice?

- Anything you can provide to encourage Patients to have regular treatment is fantastic for them.
- Nitrous oxide sedation is sometimes called happy gas



So to review

Nitrous Oxide Sedation



Relative Analgesia =RA,I may interchanges these terms today, that why I am emphasizing this.

When you use nitrous oxide you get sedation



When you use nitrous oxide you get analgesia



Nitrous Oxide Sedation and Analgesia







Nitrous Oxide Analgesia, the injection does not hurt or hurts a lot less



History

Pharmacology

Affects on body

Indication/contraindications

Complications

Signs and symptoms of RA

Records



+



History

1771: Joseph Priestly discovered O₂

1772: Joseph Priestly discovered N₂O

1798: Humphrey Davy experimented with N₂O and nicknamed it "laughing gas"

Coincidentally, Davy was suffering from periocoronitis and noted that the pain was relieved by inhaling the gas By the way Australia was discovered in 1770,so N₂O has been around a long time.

History

In 1800, Davy wrote:

"As nitrous oxide in its extensive operations appears capable of destroying physical pain it may possibly be used with advantage during surgical operations in which no great effusion of blood takes place"

History

- Dr. Horace Wells (a dentist) attended a science sideshow. He noted that a volunteer, intoxicated with N₂O, did not realised that he had injured his leg whilst running around.
- 1844: Horace Wells demonstrated the value of N₂O as an analgesic
 - 1868: Edmund Andrews had the ingenious idea of giving N₂O with 20 percent O₂

History

- 1847: Dr John Belisario, a Sydney dentist became the first person to use it in Australia
- 1940's: Dr Harry Langa (New York dentist) developed and refined the technique as it is now practiced world wide

History

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4



Pharmacology

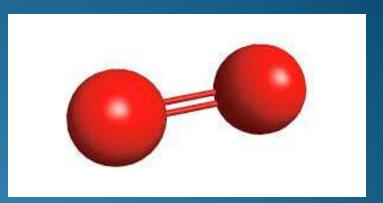
2 gases

Oxygen and Nitrous Oxide





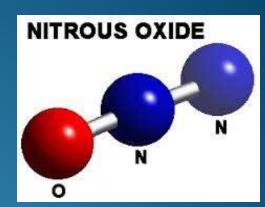
Pharmacology



- Oxygen
- Colorless, odorless gas.
- Compromise 21% of the atmosphere.
- Not flammable but supports combustion.
- Stored in white cylinders[in US it is stored in green cylinders]
 - Contents are in the gaseous state.

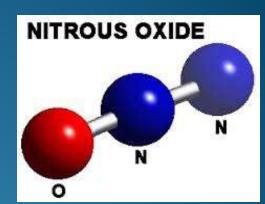
Pharmacology

- Nitrous Oxide
- A colourless, non-irritating gas with a slightly "sweet" smell.
 - Non flammable and non explosive but can support combustion
 - Supplied in white cylinders with blue necks?
 - A full Nitrous oxide cylinder has approximately 95% in liquid form and the balanced gaseous.
 - As N_2 Ois transported in the blood as a free gas ,it does not combine with haemoglobin.
 - Nor does it undergo biotransformation.



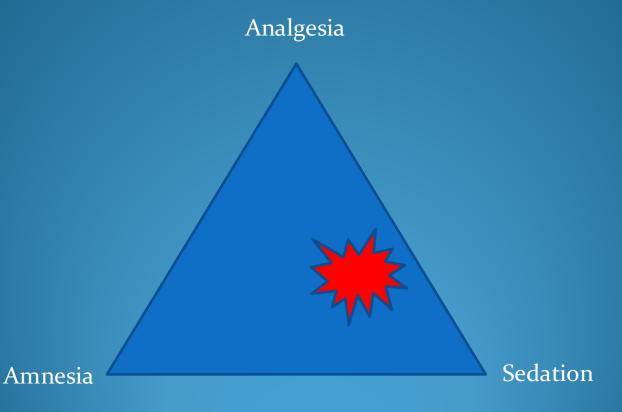
Pharmacology

- Nitrous Oxide
- Exact mechanism of action unknown.
- The analgesic properties of N₂O can be reversed with naloxone [Narcan]. So it works like a narcotic on opiate receptors
- It is non-allergenic and is the least toxic of all the inhalational anaesthetic agents.



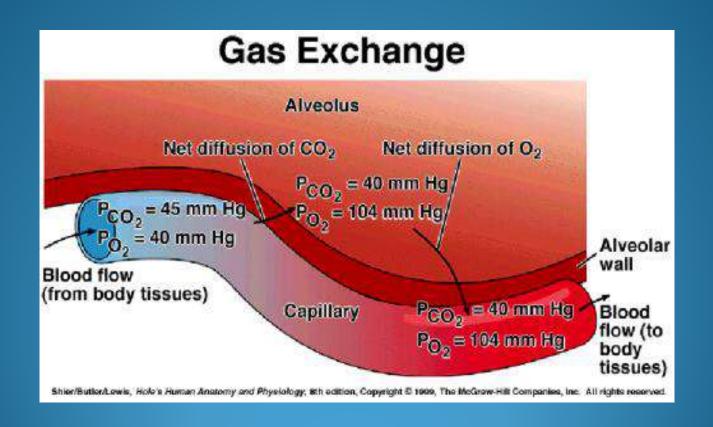
Efficacy

Nitrous oxide sedation= 10mg Morphine



So How does it all work?

Gases are absorbed because there is a pressure gradient



A Word of Caution

The blood gas partition coefficient of nitrous oxide is 30 times greater than that of nitrogen. When a patient's inspired gas mixture is switched from air containing approximately 78% nitrogen to 70% nitrous oxide, the nitrous oxide will enter gasfilled spaces more than 30 times faster than nitrogen can exit the space. As a result, the volume or pressure within such a space will increase.

So

- Nitrous Oxide enters gas-filled spaces more rapidly than nitrogen can exit. Gas volume and pressure can become dangerously high within the middle ear if patency of the Eustachian tube is compromised by inflammation. i.e. middle ear infection children
- Pain also may be experienced in patients with a sinusitis.
- Expansion of gas bubbles in the eye following retinal surgery may lead to severe consequences.

So Nitrous Oxide may be a hazard after retinal surgery, BMJ 2002

■ Expansion of gas bubbles in the eye following retinal surgery may lead to severe consequences, article suggests leaving for 3 months, Sydney Ophthalmologist think 6 weeks.

History

Pharmacology

Affects on body

Indication/contraindications

Complications

Signs and symptoms of RA

Records



4



Affects on body

Blood pressure
Heart rate
Tidal volume
Respiratory rate
Net ventilation

Affects on body

Blood pressure
Heart rate
Tidal volume
Respiratory rate
Net ventilation

Affects on body

Respiratory and Cardio-Vascular System effects - Nil

- ☐ Can be used with Atherosclerosis, Angina ,Hypertension, Bleeding disorders.
- Can be used with Parkinson's disease, epilepsy, stroke patients.
- □ Can be used with Central nervous system depression ,therefore depression medications OK [seems to be a lot of people on antidepression medication these days].

Affects on body

General body

- Kidney: No clinical effects, safe to use.
- Skeletal muscular ,no effects.[relaxation]
- Endocrine system.-no negative effects.-OK

Affects on body

Pregnancy N₂O

- Incidence of spontaneous abortion is increased amongst women working in operating rooms. No cause and effect relationship has been proved.
- Decreased fertility in long term ? 7000 dental assistants-retrospective study and volunteers.
- □ All drugs should be avoid in first trimester. Pregnancy is not an absolute contra-indication but should be avoided.
- Seek medical advice from obstetrician.

History

Pharmacology

Affects on body

Indication/contraindications

Complications

Signs and symptoms of RA

Records



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Indication/contraindications

Indications

- Any patient
 - Anxiety
- Medically compromised patients
 - Gagging patients
- ☐ Uncomfortable procedures eg oral surgery ,scaling and cleaning
 - Pediatric patients

Indication/contraindications

Contraindications

- Physical/Patient who is unable to breath through nose.
 - Mental/patients who can not tolerate nasal mask
 - Pregnancy ??.

Contraindications

Patients who unable to breath through their nose

Patients who can not tolerate nasal mask.

- Patients with URI
- Deviated nasal septum
- Nasal polyps
- Allergic rhinitis
- Severe sinusitis
- Severe pulmonary conditions
- Recent ear/eye surgery

- Patients with a compulsive personality
- Severely phobic
- Cognitive impaired
- Uncooperative and/or crying paedo patient
- Psychiatric patients
- Claustrophobic patients

Pregnancy

ASDA RA Course 57

History

Pharmacology

Affects on body

Indication/contraindications



Complications

Records



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Signs and symptoms of RA

Early to ideal sedation

- Feeling of warmth.
- Light headiness/dizziness[but pleasant]
 - Tingling or numbness of extremities
- Feeling of lightness/heaviness of extremities.
 - Relaxation of skeletal muscles.
 - Feeling of vibration ?.
 - EUPHORIA

Signs and symptoms of RA

Heavy/Over sedation

- Hearing distant sounds more acutely.
 - Laughing /crying.
 - Visual disturbances/room spinning.
 - Sleepiness.
 - Dreaming.
 - Sweating.
 - Nauseia/vomiting.
 - Loss of consciousness.

History

Pharmacology

Affects on body

Indication/contraindications

Signs and symptoms of RA

Complications

Records



+



Complications

- Shivering[cutaneous vasodilation].
 - Mouth breathing/talkers.
 - \square Hysteria[N_2O % to high].
 - Sexual phenomenon.
 - Hypnosis and deep trace.
 - Nausea.
 - Failure.

Complications

Chronic toxicity

- □ Nitrous oxide has been implicated to adversely effect individuals who are chronically exposed.
 - Infertility and spontaneous abortion ?.
 - Blood dyscrasias and peripheral neurophathy.
- Methionine and thymidylate synthetase are inhibited, this affects DNA and myelin synthesis.

Complications

Chronic toxicity avoidance

- Nitrous oxide should be scavenged/you need some sought of scavenging system, is essential.
 - Check for leaks in equipment.
 - Check surgery ventilation.
 - Exhaust of scavenging so be outside
 - Minimize patient conversation
- □ Diffusion hypoxia to the patient at end of treatment, always give 3-5 minutes 100% oxygen.

Complications

Chronic toxicity avoidance:

Scavenging in the surgery[slow speed suction].



Complications



Diffusion hypoxia: as I reflect on the mistakes I make:

- Exact mechanism unknown, but high concentrations of partial pressure of nitrous oxide in the blood tranfers nitrous oxide back to the alveoli in the lungs rapidly which in turn dilutes the oxygen partial pressure leading to hypoxia.
- ☐ Use 100% oxygen for more than 3 minutes and this will not happen.

Complications

Important Imbortant

Always at end of treatment:

☐Use 100% oxygen for 3-5 minutes

History

Pharmacology

Affects on body

Indication/contraindications

Signs and symptoms of RA

Complications

Records



+



Records

- Singapore item number?
- Flow rate[volume of gas]L/min.
 - \square % of N_2O
 - Time[1/2 hour increments]



Safety





So lets set the re-stage ,why are we here?



To learn how to use RA to treat our patients

Having endured death by PowerPoint, then before morning tea, some case examples.





Pediatric patient[paediatric]



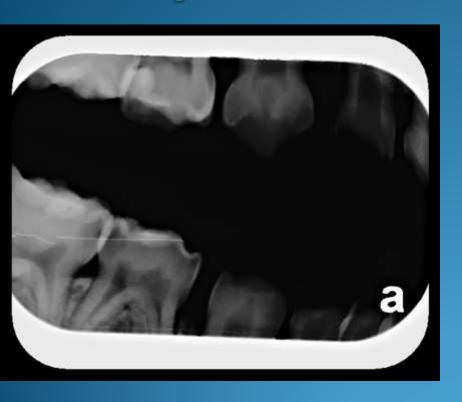
5 year old with 8 fillings needed .No dental experience. 4 of the filling potential pulp exposures.

Pediatric patient RA over GA



5 year old with 8 fillings needed .No dental experience.4 of the filling potential pulp exposures.

X-rays

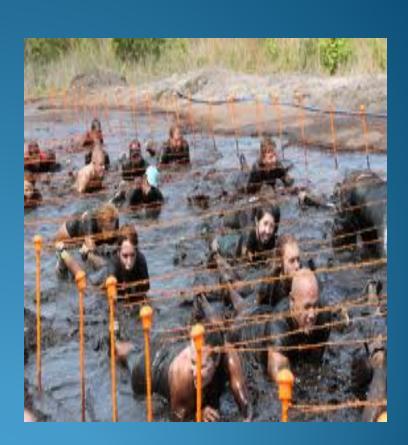




Radiographs

Tough job





5 year old with 8 fillings needed .No dental experience . 4 of the filling potential pulp exposures.

ASDA RA Course 76

Introduce Circuit and nose piece to Patient



Titrate RA to effect



No treatment today.

Next visit titrate RA to effect.



■ Next visit return to recorded levels slowly

Treatment successful



The TOUGH patient is now treated and happy. Next appointment you can do more because of previous success



Patient 2 years later with correct circuit



The most important thing is that patient is easy to treat now. If they had a GA at age 5 for treatment now would be harder to treat at age 7, now its easy for him and easy for me.

Phobic patient who is a gagger/needs RCT



ADULT CASE/long treatment appointment

Anxious patient who does not like needles fractures LL7 requires root canal therapy, gags and can not tolerate dam.



Tritrate RA to effect.



Must breath through nose.

Adapts - Ada

BREATHE



Patient is sedated



RA =sedation + analgesia so addresses fear/gagging +needle phobia

Rubber dam on gagger.



ASDA RA Course 88

Protective Eye ware should be worn as in normal practice.

- □ Slides taken without patient glasses to show patients face easily.
- ☐ This is a FAQ i.e. problem of waring protective eye ware with RA the glasses can be pushed upwards.

Having a comfortable and less stressed patient in the chair allows for you to achieve optimum results.



ASDA RA Course 90

Men with facial hair can lift the nose piece.



ASDA RA Course

Nitrous Oxide Sedation and Analgesia







Break 20 mins

Or if ahead of schedule FAQ/or questions.





Dr Michael Walker Nitrous Oxide Sedation Singapore 2016



Frequently ask questions

Cost of RA?

What do I charge?

How long per cylinder?

How often and how long?

Nitrous oxide abuse and side effects?

Adv.+disadv. Of N2O?

How safe?

What about oral sedation?

What about Penthrox?

How do I scavenge, in my surgery if I don't have designated suction?

Cost of RA



In 2014/Australia

	Cost for refill+ GST		Volume(L)	\$/L		6L/min for 30min@ 50% N2O	
Gas N2O D size cylinder	\$	171.30	3400	\$	0.050	\$	4.53
Gas O2 D cylinder	\$	32.60	1600	\$	0.020	\$	1.84
	Cost of PK 24+ GST					Unit cost	
Dynomite	\$	239.10				\$	9.96
	Monthly cost + GST					Daily cost	
N2O cylinder	\$	12.49				\$	0.42
02 cylinder rental	\$	11.36				\$	0.38
Delivery once per month	\$	50.64				\$	1.69
				Sun	n	\$	18.82

			Previous sum	\$	18.82
	Cost &GST		Depreciation yr	Cost per use	
Circuit	\$	904.20	100/usages	\$	9.04
			Total sum	\$	27.86

	Cost &GST		Depreciation yr	Dailya	amount
Mobile MDM unit	\$	8,185.00	10	\$	2.24
Mobile Digital unit	\$	9,473.00	10	\$	2.60

Totals maria		Previous sum	\$	18.82
	Cost &GST	Depreciation yr	Daily amount	
Consumables	\$			
		Total sum	\$ 27.86	
		Previous sum	\$	18.82
	Cost &GST	Depreciation yr	Daily amount	
Consumables	\$	100/usages	\$	9.04
		Total sum	\$	27.86

	Cost &GST		Depreciation yr	Daily amount	
Mobile MDM unit	\$	8,185.00	10	\$	2.24
Mobile Digital unit	\$	9,473.00	10	\$	2.60

Cost of RA



\$30-\$40 per sedation

What do I charge

If it costs \$30-40 to use ,then commercial decision? What do Dentist charge in Singapore-Anybody???? In Australia charge \$60-\$80 per ½ hour. Or a flat fee.

How long do cylinders last?

```
D cylinder O<sub>2</sub> =1500 litres
```

D cylinder N₂O=3400 litres

So total =4900 litres

So at say use at 7 litres per minute total O_2+N_2O at 50%.

Then 1 set of cylinders lasts 700 minutes [oxygen runs out first]

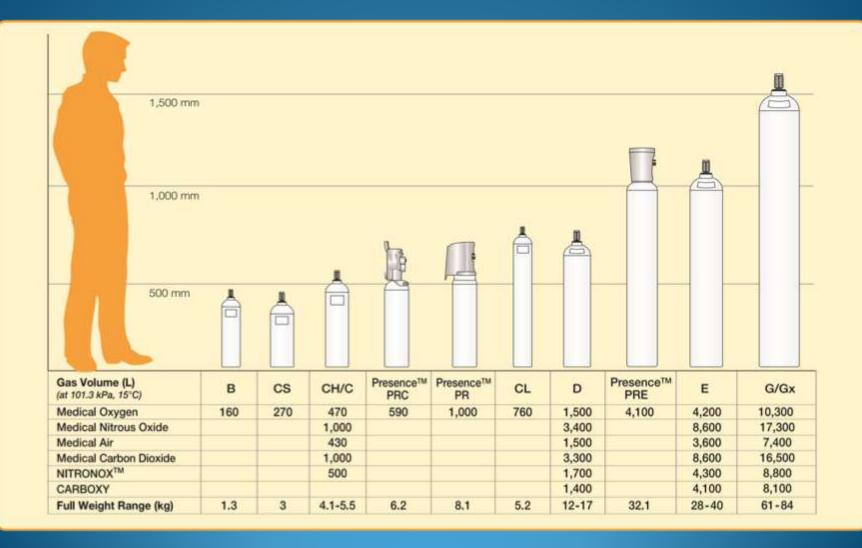
Concerned about of running out of gas! You can get an Uncle Steve as the cartoon shows, or

Answer:

keep spare cylinders



Cylinder sizes



Piped Gases – Wall Plate

Piped gases are neater, take less space and are more patient friendly, you can use "G" size cylinders [10,000litre tanks] and have designated scavenging.

Disadvantages: cost, positioning and distance to change cylinders



Length of appointment and how often.

- \square One and a half [1+1/2] hour appoints fine.
- How often ,can have appoints a few days apart , and then never have issues.

Nitrous Oxide Abuse





Proof that it works

Concern of abuse is peripheral neuropathy and or Vit. B synthesis depression

Advantages and Disadvantages

- It works on most people ,but not everyone.
- Must be presented in Dental practice as an option, i.e. in your health form is there a question saying are you apprehensive about dental treatment.
- Has to be used well, that is devils in the detail.
- Dentist need to be well trained.



How safe/Nitrous Oxide Analgesia so Pain hurts a lot Less





50% O2 / 50% N2O

But don't compare RA to this the experience of child birth

Safety





Safest sedative agent

Why use RA over Oral Sedation/Anxiolysis

- Regulation
- Ease of use
- Dentist isn't responsible afterwards
- No escort
- No after effects
- Safety





Penthrox, not so keen.



If you can smell the volatile not really scavanging

Matrx RA Circuit/Scavenging

- Scavenging regulator to be plugged into outside exhausting suction unit.
- Valve adjusted to remove excess nitrous without "sucking" it away before the patient can breath it.
- Pugs direct into low velocity suction.



Piped Gases – Wall Suction

- Piped gases are neater, take less space and are more patient friendly, you can use "G" size cylinders [10,000litre tanks] and have designated scavenging.
- Piped wall designated suction



Frequently ask questions/covered, so any others?

Cost of RA?

What do I charge?

How long per cylinder?

How often and how long?

Nitrous oxide abuse and side effects?

Adv.+disadv. Of N2O?

How safe?

What about oral sedation?

What about Penthrox?

How do I scavenge, in my surgery if I don't have designated suction?

So now break 20 mins or on to Equipment.

Or if ahead of schedule FAQ/or questions.





Equipment

- The equipment is relatively simple.
- Gas Cylinders
- Pressure regulators ,decreases pressure from the tanks.
- Pressure gauges
- Yokes
- Mixers, circuit and reservoir bag
- Nose hood[Autoclaveble and disposable].
- Safety features.
- Sterilizing.

Nitrous Oxide/Oxygen Cylinders

- OXYGEN: White body
- NITROUS OXIDE: white body with blue neck
- Cylinders must be restrained to prevent falling (damage to staff, equipment, yoke and cylinder)



Cylinders







Oxygen Regulator

- Diameter and thread system
- Gauge face white
- Connecting tube white
- Cylinders checked daily



Nitrous Oxide Regulator

- Diameter and thread system.
- Gauge face blue.
- Connecting hose blue.



Contents best checked by weight as gauge only works with approx last 1/6th gas [i.e. gas stored in a liquid state till cylinder 5/6th empty]

Yoke /Pin Index

- Yoke
- Pins
- Washer



- NO GREASE! Does not need lubrication, so no Vaseline, no silicon lubricant.
- □ Lubrication + gas under pressure =

MDM Mixer/Matrx Digital mixer





Manual[flow metres]

Digital[with audible alarm]

Reservoir bag

Reservoir bag: 3 litre bag is best. It balances the continuous flow against the intermittent demand by patient. Also allows monitoring of respiration.



Reservoir Bag

- ☐ Flow rate too high
- ☐ Bag over-inflated
- Reduced flow rate needed



Check for occlusion in fresh gas hose.

Reservoir Bag

☐ Flow rate too low.

Bag under-inflated

Increased flow rate needed



Check for leaks, perished bag or tubing.

Reservoir Bag

Flow rate correct.

Bag slightly inflated with signs of respiration.

May have to adjust flow rate as patient relaxes[i.e. higher flow rate at beginning].



Matrx RA Circuit / Nasal hood and tubing.

- Matrx scavenging hood
- Autoclavable
- One way system
- Odourless





Equipment - exhaust valve



Equipment - exhaust valve



Equipment - complete



Nose piece size



■ Nasal hood: are scavenging hoods that in combination with nasal cone permit the exhaled contaminated gases to be exhausted outside the surgery.

Nose piece size



■ Nasal hood: DynoMite single use nasal hoods, come in an assortment of scents, great for kids.

Equipment – Safety Features

- Pin index system
- Diameter and thread index system
- Minimum oxygen flow (or percentage)
- Oxygen fail safe
- Emergency air inlet
- Oxygen flush button
- Reservoir bag
- Colour coding

Sterilize Circuit

Private Practice bag and Autoclave



Nose piece size is critical to the technique



For the Practical Exercise since it's a one-way circuit we will only change the nasal hood ,but you have to pick your size.

Practical sessions

- 1) Add nitrous oxide in increments of 10% per minute initially.
- 2) When first effects are felt, increase in 5% increments until treatment dose is achieved.



Practical session: Part 1A

Introductory Administration

Aim:

To gain the patient's confidence in, and acceptance of the use of nitrous oxide to diminish the fear of the dental experience

To experience the first symptoms only of inhaling nitrous oxide ,start with 100% O₂ to establish flow rate.

Practical session: Part 1B

Aim:

The aim of the session is to produce a relaxed sedated who feels comfortable at the determined level of nitrous oxide inhalation.

RA Symptoms:

Warm relaxed feeling, light intoxication, tingling sensations in toes fingers and/or lips, numbness of lips, lethargy heavy limbs, pleasant dreams, humming droning or vibration sensation, throaty voice, words reach from far away, sounds are distant but clear, amnesia.

Practical session: Part 1C

Aim:

The aim is to test analgesia, some will be good some not, it's a Bell curve. Needle stick is not compulsory but a good education.

RA Symptoms: Analgesia?



Practical session: Part 1D

Aim:

The aim is to see how quickly nitrous oxide is reversed with 100% O2

□Use 100% oxygen for 3-5 minutes

Practical session: 2/ Overdose

Aim: Not too

The aim of the sessions is to not gradually increase the uptake of nitrous oxide until the patient feels uncomfortable symptoms.

Symptoms:

Perspiration, excessive talking, laughing or giggling, pressure in head, pressure in chest, heart pounding loudly and rapidly, dizzy, nausea, Eyes fixed and staring "Going to die".

Over-dose

□Use 100% oxygen for 3-5 minutes



Don't want to make a phobic patient more phobic

100% O2

Don't overdose

In 10% increments

Clinical dose +needle test In 5% increments

Now for equipment review and questions.

So any questions.

Then equipment review.

The practical demonstration and I need a volunteer, I haven't lost anybody yet.

Then lunch.

Then hands on.

100% O2

Don't overdose

In 10% increments

Clinical dose +needle test In 5% increments

Review of the day

- Variable levels of N20 to sedate people.
- ☐ Variable levels of analgesia with needle test
- Difficultly fitting nose piece on some people
- Body type bore no correlation to N20 levels
- Some people took longer to recover to 110%[more than 3-5] minutes, i.e. was OK but not entirely back to normal.
- Some people did not like it because ???
- Some people fear of new device and dislike of dis-associated effects

Dr Michael Walker

Nitrous Oxide Sedation
Singapore 2016/really hope this was a good course for you
Thanks for being a great audience

