

# **ANAESTHESIA ANALGESIA FOR FOB & THORACOSCOPY**

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# Why Anaesthesia analgesia ?

- To relieve patients' fears of
  - Pain
  - Difficulty of breathing
  - Nasopharyngeal irritation

- It is operator requirements
  - Patient's comfort
    - No/minimal coughing
    - No bad experience (willing for repeat procedure if needed)
    - No patient agitation
  - Easy of execution
    - No premature termination of procedure
  - Minimal iatrogenic complications
    - Trauma to upper and lower airways → bleeding
    - VC injury → speech change (temporary)
    - Induce/exacerbate of hemoptysis

# To achieve these goals

- Anticholinergic
- Anaesthetic
- Anxiolytics
- Sedative
- Analgesic

- Anticholinergic
  - Atropine and Glycopyrrolate
  - 0.01 mg/kg and 0.005 mg/kg
  - Anti muscarinic
  - Theoretical benefits
    - Bronchodilation
    - Inhibit secretions
    - Protect against vasovagal reaction

- IV or IM route

- Improve PFT but not sustained through post FOB period.

Hewer RD et al, Aust NZ J Med . 2000 ; 30 ( 4 ): 466 - 469

Williams T et al, Chest . 1998 ; 113 ( 5 ): 1394 - 1398 .

- Nebulization

- Had continued PFT improvement after FOB.

Zavala DC et al, Chest . 1981 ; 79 ( 5 ): 512 - 515 .

- But most of studies show no clinical significant reduction in bronchial secretions.

Neuhaus A et al, Ann Thorac Surg . 1978 ; 25 ( 5 ): 393 - 398 .

Belen J et al, Chest . 1981 ; 79 ( 5 ): 516 - 519 .

Hewer RD et al, Aust N Z J Med . 2000 ; 30 ( 4 ): 466 - 469 .

Roffe C et al, Monaldi Arch Chest Dis . 1994 ; 49 ( 2 ): 101 - 106

Williams T et al, Chest . 1998 ; 113 ( 5 ): 1394 - 1398 .

Cowl CT et al, Chest . 2000 ; 118 ( 1 ): 188 - 192 .

# Study from our institute



CHEST

Original Research

INTERVENTIONAL PULMONOLOGY

## **Anticholinergic Premedication for Flexible Bronchoscopy**

**A Randomized, Double-Blind, Placebo-Controlled Study of Atropine and Glycopyrrolate**

*Javid Ahmad Malik, MD; Dheeraj Gupta, MD, FCCP;  
Ashutosh N. Agarwal, MD; and Surinder K. Jindal, MD, FCCP*



# Study from our institute

*Background:* Anticholinergic premedication is commonly used during flexible bronchoscopy, although the benefits are unproven and potential risks exist.

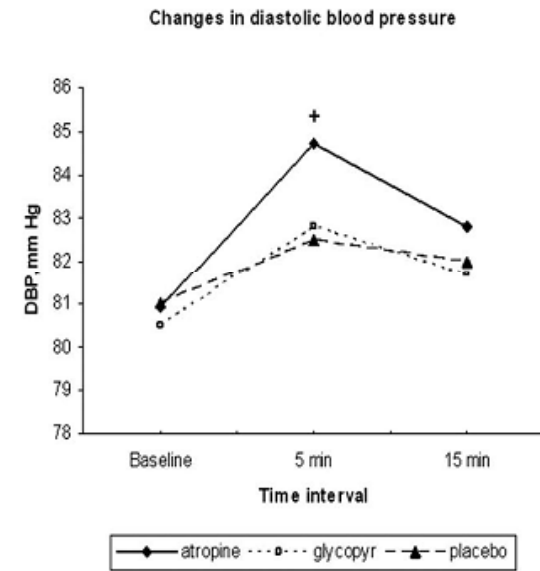
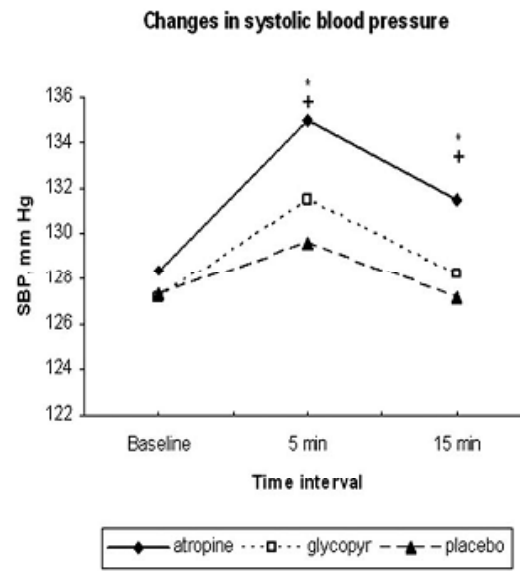
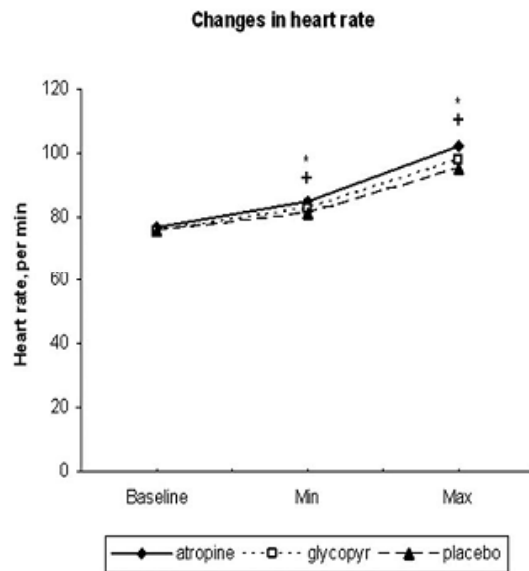
*Methods:* We studied 1,000 patients undergoing diagnostic flexible bronchoscopy to investigate the efficacy and safety of atropine and glycopyrrolate. Patients received atropine (0.01 mg/kg; n = 339), glycopyrrolate (0.005 mg/kg; n = 336), or placebo (2 mL of normal saline solution; n = 325) IM before bronchoscopy in a randomized, double-blind fashion. Bronchoscopist- and patient-reported secretions, cough and patient discomfort, oxygen desaturation, procedure time, and procedure-related adverse events were compared among the groups.

*Results:* After adjusting for covariates, glycopyrrolate ( $p = 0.02$ ), but not atropine ( $p = 0.064$ ), was associated with reduced bronchoscopist-reported airway secretions. Neither drug was independently associated with patient-reported airway secretions or with bronchoscopist- or patient-reported cough or discomfort. Neither drug was independently associated with oxygen desaturation. Atropine was associated with a longer procedure time ( $p = 0.042$ ). Rise in heart rate and BP was significantly greater with anticholinergics, particularly atropine, compared with placebo.

*Conclusions:* Anticholinergic premedication may reduce airway secretions during flexible bronchoscopy but is not associated with any significant reduction in cough, patient discomfort, oxygen desaturation, or procedure time and is associated with greater hemodynamic fluctuations. Routine anticholinergic premedication may be unnecessary or even harmful during flexible bronchoscopy.

(*CHEST* 2009; 136:347–354)

# Study from our institute



\*  $p < 0.05$  (atropine vs glycopyrrolate); +  $p < 0.05$  (atropine vs placebo)

- Atropine and glycopyrrolate, when administered prebronchoscopy, do not produce a clinically meaningful improvement in lung function or decrease in bronchial secretions, and their use is discouraged.

ACCP, Consensus Statement .CHEST 2011; 140( 5 ): 1342 – 1350

# Anaesthetic

- The airway is divided into:
  1. Nasal cavities
  2. Oral cavities
  3. Pharynx ( consisting of the naso-, oro-, and hypopharynx)
  4. Larynx
  5. Trachea

- ***Superior laryngeal nerve***

- a. Internal br.

- *visceral sensory and secretomotor innervation to the larynx above the true cords.*

- b. External br.

- *supplies with motor fibers to the cricothyroid muscle*

- ***Recurrent laryngeal nerve***
  - It supplies all muscle of the larynx except cricothyroid
  - It conveys visceral sensation to the vocal cords and infraglottic regions.

# Types of Anaesthesia

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graph TD; A[Types of Anaesthesia] --> B[General]; A --> C[Local]; B --> B1[1. Inhalational]; B --> B2[2. Non-inhalational (intravenous)]; C --> C1[1. Local infiltration]; C --> C2[2. Field block]; C --> C3[3. Nerve block]; C --> C4[4. Topical];
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## General

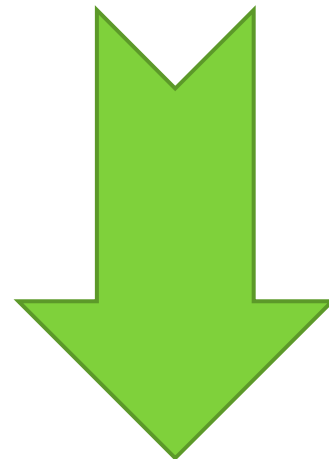
1. Inhalational
2. Non-inhalational  
(intravenous)

## Local

1. Local infiltration
2. Field block
3. Nerve block
4. Topical

# Local Anaesthesia

- It binds reversibly to a specific receptor site within the pore of the Na<sup>+</sup> channels in nerves and block ion movement.
- It can act on any part of the nerve system and on every type of nerve fiber.
  - Pain
  - Temp
  - Touch
  - Deep pressure
  - Motor function





- Local Anaesthesia is used before and during FOB
  - To decrease cough
  - To reduce the dose of sedation

# Type of LA

- **Esters** :- (*Plasma esterase*)
  - Cocaine : 4% - 10% (max 1 mg/kg)  
Habit formation & S/E
  - Benzocaine : 20%  
Methemoglobinemia
  - Tetracaine : 1%  
Methemoglobinemia
- **Amides** :- (*Hepatic CYP 450*)
  - Bupivacaine : max 2 mg/kg  
More cardiotoxic & long acting
  - **Lidocaine**: 1% -15% (max 4.5 mg/kg)

# Lidocaine

- Most commonly used
- Short half-life :
  - On set : 2-5 min
  - Duration : 15-60 min
- Minimum tissue toxicity
- Wide safety margin
  - Max dose
    - 4.5 mg/kg (max 300 mg)
  - Metabolite : liver (CYP 450, CYP 1A2)
  - Excretion : renal

- Toxicity
  - CNS & CVS : Dose related > 7mg/kg (serum >5 mg/L)
  - MHb : rare, idiosyncratic
- Use with caution in pt with
  - Advance age
  - Impaired liver function
  - CHF
- Keep watch on total dose of lidocaine
  - Used before and during the procedure

# formulations

- Jelly 2% (30 gm tube)
  - 20 mg/gm
- Spray
  - 10% pump spray (50 ml, 500 spray)
  - 10 mg/ spray
- Injection
  - 0.5 %+/- adrenaline (5mg/ml)
  - 1.0% +/- adrenaline (10mg/ml)
  - 2.0 % +/- adrenaline (20mg/ml)
- Topical solution (clear 30 ml bottle)
  - 4.0% (40 mg/ml)
- Viscous (2% ,red 200 ml bottle)
  - For gargle
  - 20 mg/ml

# Composition of L.A.

COMPONENTS	FUNCTION
Local anaesthetic drug (e.g. lidocaine HCL)	Blockade of nerve conduction
Sodium chloride	Isotonicity of the solution
Sterile water	Volume
Vasopressor (e.g. epinephrine)	↑ Depth & duration of anesthesia; ↓ Absorption of local anesthetic & vasopressor
Sodium (meta) bisulfite	Antioxidant
Methylparaben *	Bacteriostatic agent

\*In ALL multidose vials of injectable drugs.

# LA- Methods

- Local infiltration

- Small terminal nerve endings in the area of the surgery are flooded with local anesthetic solution.
- Incision is made into the same area in which the LA has been deposited

## ■ Field block

- Method of securing regional anesthesia consisting of depositing a suitable LA solution in proximity to the large terminal nerve branches.
- Incision is made into an area away from the site of injection



## ■ Nerve block

- Method of securing regional anesthesia by depositing LA solution within close proximity to a main nerve trunk
- Usually at a distance from the site of operative intervention

There are three blocks used for upper airway anesthesia:

1. **Glossopharyngeal block** – for oropharynx.
2. **Superior laryngeal block** – larynx above the vocal cords.
3. **Translaryngeal block** – larynx and trachea below the vocal cords.

# Superior laryngeal block

- Requires some degree of neck extension.
- Requires to identify the greater cornu of the hyoid bone and superior cornu of the thyroid cartilage

- DeMeester TR et al evaluated efficacy of local nerve block using lidocaine in a large trial in which 313 awake patients underwent glossopharyngeal and laryngeal nerve blocks prior to bronchoscopy.
- They achieving excellent anesthesia with minimal morbidity and good patient acceptance.

DeMeester TR et al, Ann Thorac Surg . 1977 ; 24 ( 3 ): 278 - 283

- But

- Knowledge of anatomy and training are required to master this technique.
- Often more difficult to perform, and carry a higher risk of complications.
- The common complications of nerve blocks are:
  - Bleeding,
  - Nerve damage
  - Intra-vascular injection

# 3. Translaryngeal block

- This is more correctly described as a method of **topically** applying local anesthetic to the trachea and larynx
- Requires some degree of neck extension so that the cricothyroid membrane can be identified

- Transcricoid or transtracheal injection method, when compared with nebulization or spray-as-you-go techniques
  - Produced less cough
  - Tolerated well by patients
  - No increased risk of complications.

Isaac PA et al, Anaesthesia .1990 ;45(1): 46 - 48

Graham DR et al, Chest .1992; 102 (3): 704-707

# Local anaesthesia for fiberoptic bronchoscopy: transcricoid injection or the “spray as you go” technique?

A R Webb, S S D Fernando, H R Dalton, J E Arrowsmith, M A Woodhead,  
A R C Cummin

Thorax 1990;45:474-477

## Abstract

Single injection transcricoid local anaesthesia was compared with the "spray as you go" technique in patients having day case FOB. Patients were randomised to receive either 100 mg lignocaine by a single crico-thyroid puncture or 240 mg lignocaine instilled through the bronchoscope under direct vision. Further doses were given by the operator to both groups as required. The 30 patients receiving transcricoid lignocaine coughed less (3.56 (SD 3.1) coughs/min) than the 32 patients receiving lignocaine through the bronchoscope (5.89 (4.8) l/min) despite receiving a lower total dose of lignocaine (322 (25.9) v 451 (20.9) mg).

Cricothyroid puncture was not associated with any complications and was not unpleasant for the patients.



- Study from India also concluded that transcricoid puncture without sedation was associated with
  - No complication
  - No patient discomfort
  - Required lesser dose of LA
  - More stable vitals
  - Good conditions for bronchoscopist

Alka Chandra et al, Indian J Anaesthesia 2011; 55:483-7

- Nerve block
- Transcricoid or transtracheal injection
  - Despite having high level of topical anesthesia and good pt acceptance , they are discouraged as first line techniques due to
    - Invasive nature
    - Require special training

- Topical Anaesthesia
  - Soaked cotton pledgets
  - Gel
  - Dropper instillation
  - Gargling
  - Spray
  - Nebulization
  - “Spray-as-you-go technique”

- Nebulized lidocaine ?

- Studies demonstrated patients' preference for nebulized lidocaine over spray

Isaac PA et al, Anesthesia 1990; 45:46–48

Keane D et al, Eur Respir J . 1992 ; 5 ( 9 ): 1123 - 1125

Foster WM et al, Am Rev Respir Dis . 1992 ; 146 ( 2 ): 520 - 522

The benefits of nebulized lidocaine during the FOB are equivocal as

Auther	Journal	Study	result	comments
Foster WM	Am Rev Respir Dis 1992; 146:520–522	Nebulized vs sprayed	Favors	Less dosage of LA
Gjonaj ST	Chest 1997; 112:1665–1669	Nebulized vs sprayed	Favors	Less dosage of LA
Asmooni Younus	Pak J of Chest Medicine 2010; 16(2): 3-6	Nebulized vs Sprayed & Midazolam	Favors	Less dosage of LA & Midazolam

- But

- McAlpine LG et al found that inhaled topical lidocaine induces bronchoconstriction in a significant proportion of patients with asthma (25%).
- This response was not related to airway histamine responsiveness or to the preservative in the lidocaine preparation.

Chest. 1989 Nov;96(5):1012-5

- Charalampidou S et al did not support the hypothesis that additional nebulized lignocaine confers any additional benefit to the ease of procedure or cough severity in patients undergoing FOB.

Ir Med J.2006 Jan;99(1):8-10

# Nebulized Lidocaine for Flexible Bronchoscopy\*

## A Randomized, Double-Blind, Placebo-Controlled Trial

*Daiana Stolz, MD; Prashant N. Chhajed, MD; Jörg Leuppi, MD; Eric Pflimlin, MD; and Michael Tamm, MD*

**Objective:** Topical anesthesia for flexible bronchoscopy can be administered via transcricoid injection, nebulizer, or directly through the bronchoscope in a “spray as you go” fashion. We performed a prospective, randomized, double-blind, placebo-controlled trial to evaluate whether nebulized lidocaine provides additional benefit and reduces the total anesthetic dose required during bronchoscopy.

**Setting:** Tertiary care university hospital.

**Methods:** One hundred fifty patients (93 men; age, 20 to 89 years) undergoing diagnostic flexible bronchoscopy were randomized to receive either 4 mL of 4% lidocaine (160 mg) or 4 mL of saline solution as placebo via nebulization. Combined sedation was achieved using 5 mg of IV hydrocodone and midazolam boluses. Supplemental lidocaine doses and total midazolam required as judged by the bronchoscopist were recorded for each patient. After the procedure, both bronchoscopists and patients charted their perception of cough on a 10-cm visual analog scale (VAS). Similarly, patients recorded their discomfort related to the procedure on a 10-cm VAS.

**Results:** The most common procedures were BAL in 77 cases (51%), transbronchial biopsy in 40 cases (27%), and transbronchial needle aspiration in 34 cases (23%). Outcome parameters, including hemodynamic findings, duration of the procedure, cough scores for physicians and patients, discomfort score for patients, midazolam doses, and supplemental lidocaine doses, were similar in both groups. Mean total lidocaine dose required in the lidocaine group was  $318 \pm 41$  mg and was significantly higher than the total dose required in the placebo group ( $157 \pm 44$  mg [ $\pm$  SD]) [ $p < 0.001$ ].

**Conclusion:** Additional nebulized lidocaine cannot be recommended for flexible bronchoscopy performed under combined sedation. (CHEST 2005; 128:1756–1760)

□ “Spray-as-you-go technique”

- A randomized study demonstrated that the use of topical lidocaine through the bronchoscope significantly reduced the frequency of cough and the total dose of sedation needed during the procedure.

Antoniades N et al, *Respirology* . 2009 ; 14 ( 6 ): 873 - 876

- And study comparing 1% vs 2% solutions of topical lidocaine found similar efficacy and therefore suggested the use of the lower concentration to enhance safety.

Mainland PA et al, *J Clin Anesth* . 2001 ; 13 ( 6 ): 440 - 446



- We use both
  - Nebulization lignocaine
  - “Spray-as-you-go technique” during FOB
    - SOS at VC
    - Routine after VC
- Nebulization of lignocaine need further large study ?

- Anxiolytics
- Sedative
- Analgesic
  - This is a continuum of states of consciousness ranging from minimal sedation (anxiolysis) to general anesthesia

ASA Standards, Guidelines and Statements, October 2007

Levels of Sedation/ Parameters	Minimal Sedation (Anxiolysis)	Moderate Sedation/Analgesia ( <i>Conscious Sedation</i> )	Deep Sedation/Analgesia	General Anesthesia
Responsiveness	Normal Response to Verbal Stimulation	Purposeful* response to verbal or tactile stimulation	Purposeful response after repeated or painful stimulation	Unarousable, even w/painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

\* Reflex withdrawal from a painful stimulus is NOT considered a purposeful response  
 ASA Standards, Guidelines and Statements, October 2007

- Is sedation needed during FOB?
  - FOB can be performed without sedation.
    - It is safe ( No difference in complications)
    - It is acceptable
      - ( But Pt's preferences not considered)

Aslam M et al, J Pak Med Assoc.1993;43(6):120- 122

Colt HG et al, Chest. 1990;98(6):1327 - 1330

- But sedation led to
  - Patients – better tolerance of the procedure
  - Operator – higher satisfaction
  - But with the cost of longer recovery time

Maguire GP et al, *Respirology*.1998 ;3(2) 81-85 .

Putinati S et al, *Chest* . 1999;115(5)1437 -1440 .

Gonzalez R et al, *Acta Anaesthesiol Scand* . 2003;47(4):411-415 .

- There is increasing use of sedation during FOB in the western world
  - North America 50.7% (1991)
  - UK 73% (2003)

Prakash UB et al, Chest.1991;100(6):1668-1675 .

Pickles J et al, Eur Respir J . 2003 ; 22 ( 2 ): 203 - 206 .

# Use of sedation depends on

- Site of bronchoscopy:
  - Office/day care
  - ICU
  - OT

- Procedure :
  - Prolonged procedure time (EBUS-TBNA)
  - Multiple tests in a single patient
    - TBNA, EBBx & TBLBx in sarcoidosis
    - Bronchial washings, TBNA & EBBx in lung cancer
  - Foreign body removal
  - Interventional pulmonology (with FOB)



- Patient:
  - Pediatric age group
  - Apprehensive (young females)
  - Uncooperative patients
  - Repeat procedure with unpleasant past experience ['horrifying', 'will rather die but not undergo it again']
  - ? H/o CAD/arrhythmias /poorly controlled HTN

- Benzodiazepine and opioids combination are preferred
- Reversal agents are available for both.
- Synergistic effects on patient tolerance during the procedure
  - Benzodiazepine- sedation, anterograde amnesia, decreased patient discomfort
  - Opioids – analgesia, antitussive properties

ACCP,Consensus Statement .CHEST 2011; 140( 5 ): 1342 – 1350

- But combination may produce greater degree of O<sub>2</sub> desaturation than benzodiazepine alone

Greig JH et al, Respir Med. 1995;89(1):53-56

- **Midazolam**-the most common agent used in bronchoscopy
  - quick onset of action,
  - rapid peak effect,
  - short duration of effect.
- Adult dose: 0.06-0.07 mg/kg (0.5-2.5 mg IV )
- Pediatric Dose: 0.05-0.2 mg/kg IV (max 0.6 mg/kg)
- Higher doses of 0.13 to 0.24 mg/kg have no clear advantage over smaller doses, and a significant number of patients required reversal agents.

Williams TJ et al, Respir Med.1999;93(5):361-365 .

# Opioids: “God’s medicine”\*

Agent	Fentanyl	Alfentanil	Meperidine	Morphine
Onset of action	5-10 min	Immediate	5-10 min	5-10 min
Peak effect	5 min	Immediate	15 min	15-30 min
Duration of action	1-2 h	1-2 h	3-4 h	1-6 h
Metabolism	Hepatic	Hepatic	Hepatic	Hepatic
Renal excretion	<5%	<1%	<5%	90%
Elimination half-life	3-4 h	1 h	3-4 h	2 h
Major adverse events	Respiratory depression	Respiratory depression	Respiratory depression, bronchospasm, hypotension, nausea, reduction of seizure threshold	Respiratory depression, histamine release (itching and hypotension), bronchospasm

\*Sir William Osler , Urology . 2009 ; 74(3):517-521

- Opioids as a single agent

- Inferior to benzodiazepine in terms of procedure recall and patient comfort
- But has better cough suppression

Houghton CM et al, Respir Med . 2004;98(11): 1102-1107

Stolz D et al, Thorax.2004;59(9):773-776

- **Fentanyl**: most commonly used
  - quick onset of action,
  - rapid peak effect,
  - short duration of effect
- Adult dose: 25-50 mcg over 1-2 minutes
- Pediatric dose: 1-2 mcg/kg

# Other drugs

- **Remifentanil:**
  - ultra short acting synthetic opioid analgesic drug
  - Dose: 1 mcg/kg bolus f/b 0.05-0.2 mcg/kg/min
  - It has ester linkage (metabolism by plasma esterases ) unlike other synthetic opioids.
  - It causes dose depended decrease in
    - Heart rate
    - Arterial pressure
    - Respiratory rate
    - Tidal volume

- Propofol:
  - it is an IV anesthetic that produces sedation, anxiolysis, and amnesia but has no direct analgesic properties.
- Dose:
  - Induction: 0.1-0.15 mg/kg/min
  - Maintenance: 0.025-0.075 mg/kg/min
- Onset: 30-45 sec
- Duration: 20-75 min
- C/I
  - Lack of MV support
  - Sever cardiac dysfunction
- Propofol infusion syndrome (>5mg/kg/h for >48 hrs)
  - Metabolic acidosis, rhabdomyolysis, hyperkalemia, lipemia, hepatomegaly, cardiac and renal failure.



- **Dexmedetomidine:**
  - alfa 2 agonist
  - Sedative, analgesic, sympatholytic and anxiolytic
- **Dose:**
  - 1 mcg/kg loading over 10 minutes f/b 0.2-1 mcg/kg/hour
- Dexmedetomidine is associated with fewer O<sub>2</sub> desaturation than remifentanil but have longer recovery time, more LA requirement and poorer operator satisfaction.

- Safe sedation guidelines:
  - Appropriately trained person for administering sedation & for its monitoring
  - Verbal contact should be maintained at all times (i.e. "conscious sedation")
  - I/V access should be present at all times
  - Oxygen & its delivery devices as well as resuscitation equipment available within FOB suite

- Anticholinergic X
- Anaesthesia
  - Blocks & Transtracheal !!
  - Nebulization ??
  - Spray-as-you-go ✓
- Anxiolytics
- Anterograde amnesia
- Sedation
  - Midazolam ✓
- Analgesia
  - Fentanyl ✓

# Thoracoscopy

- Pre-operative Fasting
- Pre-medication
- Prophylactic antibiotics
- Anticoagulants and heparin prophylaxis
- Skin preparation
- Sedation
- Local anaesthesia

- Pre-operative Fasting

- 6 hours: pre-procedure fast for solids

- 3 hours: pre-procedure fast for clear fluids

Ljungqvist et al, Br.J.Surg 2003; 90:400-406

Strunin L et al, Br.J.Anaesth 1993; 70:1-3

Lewis P et al, Can.J.Anaesth. 1990; 37:S132.

- Pre-medication:

- NSAID: ibuprofen 800mg po one hour prior
- Opioids: alternative analgesic option
  - But there are some histopathological evidence to support the concern that NSAIDs may reduce effectiveness of pleurodesis.
  - NSAIDs following pleurodesis should be used with caution.

## ■ Atropine

- It has not been subjected to randomised study
- Some authors routinely administer 0.4–0.8 mg of atropine s.c/i.m. prior to the procedure, to prevent vasovagal reactions

Mathur P et al, Clin Chest Med 1995; 16: 479–486  
M. Hansen et al, Respir. Med. 1998; 92, 228-232

- Case reports of vasovagal reactions and a death due to vagal stimulation following tube insertion may support its use as premedication

Reinhold C et al, AJR 1989;152:1189–91.  
Ward EW et al, J Trauma 1994;36:258–9.

- But BTS pleural disease guideline 2010, regarding Local anaesthetic thoracoscopy has not mentioned about this

Najib M Rahman et al, Thorax 2010;65(Suppl 2):ii54eii60.

- Prophylactic antibiotics

- Routine administration

- It has not been subject to formal study
    - If used a single dose of an anti-staphylococcal antibiotic (co-amoxiclav 1.2g iv, or vancomycin 600mg iv in penicillin sensitive) should be considered

- Antibiotic prophylaxis strongly recommended

- Risk factors for infection: asplenia, prosthetic heart valves, previous endocarditis.



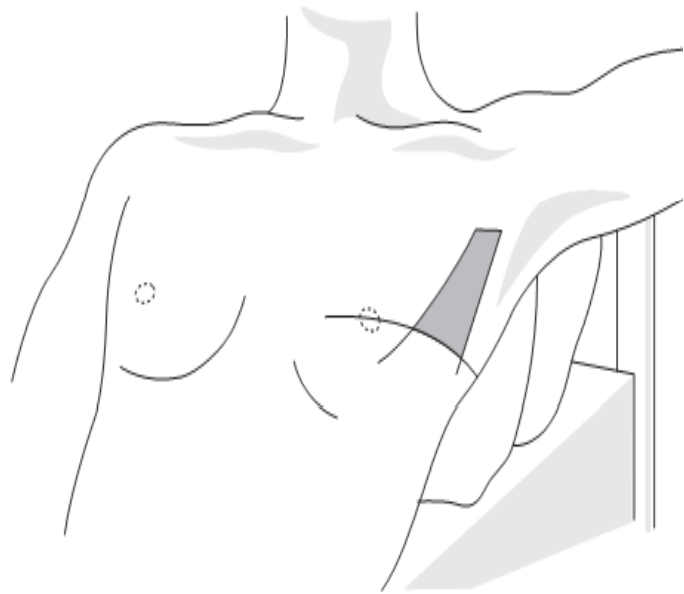
- Anticoagulants and heparin prophylaxis
  - Oral anticoagulants should be stopped 5 days before & normalisation of the coagulation profile confirmed prior to the procedure
  - Aspirin and, in particular, clopidogrel, should be discontinued at least 7 days prior to the procedure
  - UFH stopped 4-6 hr before surgery.
  - LMWH stopped 24 hr before surgery.
  - The risk of thromboembolism may be further elevated following talc pleurodesis, and this effect can be avoided by prophylactic heparin
  - Prophylactic LMWH, should be started 12 – 24 hours after procedure, should be continued until the patient is fully mobile

- Positioning and monitoring:
  - The patient's head is rested on a pillow, with the hands positioned in front of the face
  - A pillow placed under the patient's chest helps to spread the contra-lateral ribs, making it easier to insert the trocar and cannula and minimizing discomfort during manipulation of the thoracoscope.
  - BP, Pulse, SpO<sub>2</sub>, ECG monitoring

- **Skin preparation:**
  - The skin over the whole hemi-thorax including the axilla of the side should be prepared with an alcohol-based skin sterilizing solution.
- **Sedation:**
  - Thoracoscopy level **I** -similar to that used for FOB
  - Thoracoscopy level **II**- according to the procedure performed and operator preference.
  - Thoracoscopy Level **III** -necessitate GA

- The optimal choice of sedative for local anaesthetic thoracoscopy has not been subject to study.
  - **Midazolam**: 1 to 5 mg in small doses before / during the procedure and titrated according to the patient's response.
  - **Fentanyl**: 50-100 micrograms for analgesia.
- Physician should be aware for the possible risk of respiratory depression and reversal agents should be available.

# Site for Local anaesthesia



The recommended site of local anaesthesia and chest entry is the fourth or fifth intercostal space in the mid-axillary line :  
Safe triangle  
Lower space for malignancy  
Upper space for Pneumothorax

Thoracic USG may be used immediately prior to the procedure to identify the safest and most appropriate site for trocar insertion, avoiding areas of lung adhesion to the chest wall

Safe triangle :bordered by the anterior border of the latissimus dorsi, the lateral border of the pectoralis major muscle, a line superior to the horizontal level of the nipple, and an apex below the axilla

- Local anaesthesia

- Lidocaine 0.5-1% is used.
- 30 mL is often used with light sedation & 15 mL is used with heavy sedation
- It is injected perpendicular to the skin, at the level of skin, subcutis, intercostal muscles and the parietal pleura
- Aspiration of pleural fluid should be confirmed before proceeding further