Patient Assessment, Packaging, Monitoring and Loading Considerations

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Course Outline

- Arrival at the bedside (determining the W,W,W,W and How)
- Patient assessment considerations in Aeromedical Operations:
  - Baseline
  - Current clinical condition / likely progression
  - Continuation of Care
- Patient Monitoring Considerations
  - Intubated **vs**. non-intubated
  - Ground-level **vs**. altitude
  - Basic **vs**. Advanced monitoring/investigations

Course Outline

- Patient Packaging Considerations
  - Intubated **vs**. Non-intubated
  - Spinal Injuries
  - Pregnancy / Early childhood/ Incubator
  - Temperature Management
  - Plan Well, Plan Ahead, Plan B (and have a potential Plan C)
  - Where and how to place/secure monitoring and other equipment pieces

- Loading Considerations
  - Loading ramps (types and safe use)
  - The loading/unloading process
  - Support (staff, weight, equipment)

Arrival at the bedside

Arrival at the bedside

- Who?
- What?
- Where?
- Why?
- How?

- E.g. 42 year old male with traumatic brain injury and haemo-/pneumothorax from George Hospital ICU to TBH ICU. C-Spine has not been cleared. On 2 infusions (sedation and adrenaline). Intubated/Ventilated with a high FiO2. Patient is post-surgery for a retroperitoneal bleed. Low MAP and poor perfusion. Weight: 108kg

Patient Assessment Considerations

- Baseline
  - Establish the patient's baseline, along with any medical/surgical history
  - Co-morbidities (important)
  - Is the current problem related to any of the above, or new?

- Current clinical condition / likely progression
  - Is the patient stable/unstable?
  - How long has the condition been remaining stable/deteriorating?
  - Are the current interventions managing all the problems, or are you having to transport with an issue unresolved/untreated?
  - Is the disease progression very time-sensitive?
  - Are the required interventions within your scope, or can only be initiated by the receiving facility

Patient Assessment Considerations

- Continuation of Care
  - Are there any infusions, treatments or interventions that are required to be continued for transfer?
    - E.g. Prostin, Blood transfusion, etc.
  - Can you achieve the level of care required for the transfer? If not, is there another option/ service who can?
  - Do you have adequate staff, expertise, equipment and consumables to manage the patient's condition, and likely progression of said condition.

Patient Monitoring Considerations

Patient Monitoring Considerations

- Intubated **vs.** Non-intubated
  - Have you got sufficient monitoring capability to detect an improvement/deterioration in the patient's clinical condition?
  - Minimum monitoring standards **vs**. ideal monitoring standards

- Ground Level **vs**. at altitude
  - Expected (not always) drop in SpO2 for patients not on closed-circuit ventilation. Atmospheric pressure (and hence, O2 pressure) is lower at altitude, compared to ground-level
  - Keep a close eye on patients with ICDs, if it has blocked inadvertently or is not functioning correctly, these patients can develop a tension pneumothorax at altitude.
  - You can request to fly at a lower altitude, although the aircraft would then be less fuel-efficient (increased cost of transportation). This mostly applies to the fixed-wing.

Patient Monitoring Considerations

- Basic vs. Advanced Monitoring/Investigations
  - An accepted industry standard is that the minimum parameters to monitor for a **stable** , ambulant, non-urgent patient is:
    - HR, RR, SpO2, BP, ECG (3 lead), LOC, HGT
  - Depending on the severity and nature of the patient's condition, the minimum industry standard for an **unstable**/non-ambulant, urgent or intubated patient is:
    - HR, RR, SpO2, BP, ECG (3 or 12 lead), GCS, HGT, Temp, EtCO2, Pupil Responses and size, sedation level (if applicable)
  - Extra parameters to monitor during transfer (if applicable)
    - Mean Arterial Pressures, Arterial Blood Gas values, Electrolyte levels, Arterial BP lines, Central lines

Patient Packaging Considerations


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Patient Packaging Considerations

Patient Packaging Considerations

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Patient Packaging Considerations

Patient Packaging Considerations

Incubator Transfers

Incubator Transfers

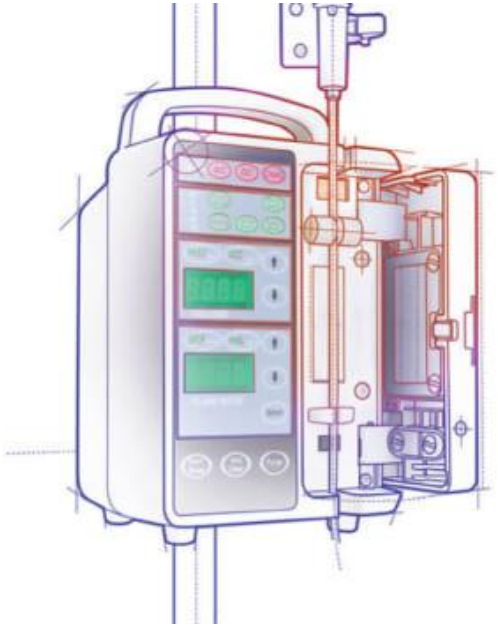
- Limited Battery life – even the best ones have shoddy batteries that are not very reliable.
- VERY heavy, in excess of 50kg (just the incubator). Add Monitor, infusion pumps/syringe drivers and ventilator as well. And of course, the patient. Total weight could be in excess of 80-90kg depending on equipment.
- Choose early when to “start up” your incubator. They can sometimes drain battery quickly, so having them on too long before the call (not connected to AC) would cause an unnecessary rundown on the battery life.
- But don’t start too late, it takes time to warm up. A cold incubator is pointless.

Syringe Drivers vs Infusion Pumps

- Preference is to use syringe drivers wherever possible. They have a closed system (to outside ambient pressure) with ideally, no air inside the system. This means changes in ambient air pressure have little to no affect on it's ability to retain accuracy with administration

So why not infusion pumps?

- Infusion pump have a much larger susceptibility to changes in ambient air pressure. As there is a fluid reservoir attached, and usually some air in the line or system, the change in volume from sea level to altitude usually increase the volume of air bubble 2-3 fold. This leads to line blockages or “air-in-line” alarms



How accurate are our infusion devices in general?

Cape Peninsula University of Technology

A comparison study: Manual flow rate regulators as compared to standard calculation based infusion devices and mechanical syringe drivers

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Study Results Summary

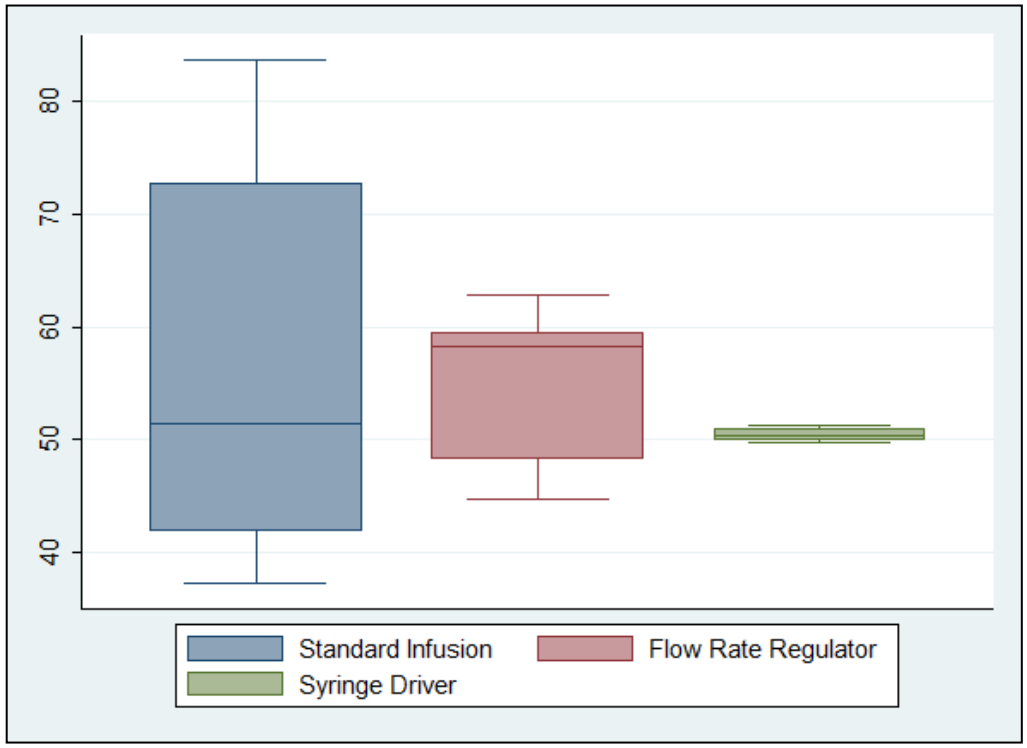
Standard Infusion Device	5ml/hour	50ml/hour	250ml/hour
Height: 1.0m	9.42 ± 4.66ml	55.5 ± 16.38ml	229.3 ± 35.26ml
Height: 1.5m	13.61 ± 7.86ml	44.37 ± 15.17ml	171.4 ± 41.98ml
Height: 2.0m	10.17 ± 5.10ml	57.83 ± 8.14ml	261.2 ± 30.64ml

Flow Rate Regulator	5ml/hour	50ml/hour	250ml/hour
Height: 1.0m	7.41 ± 3.78ml	55.6 ± 6.52ml	242 ± 20.78ml
Height: 1.5m	10.51 ± 5.52ml	80.46 ± 6.65ml	324.63 ± 23.22ml
Height: 2.0m	12 ± 3.05ml	106.09 ± 15.18ml	424.3 ± 30.84ml

Syringe Driver*	5ml/hour	50ml/hour	250ml/hour
	4.99 ± 0.03ml	50.44 ± 0.53ml	249.1 ± 2.22ml

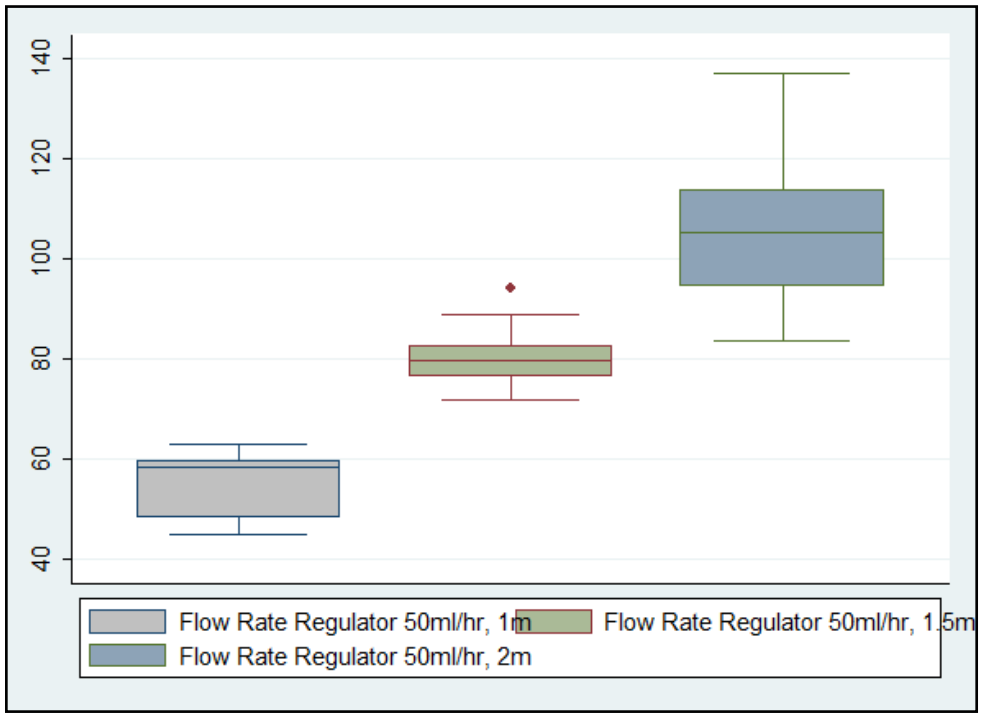
Study Results Summary

- Below is a graph taken from the study, which shows the general accuracy of the devices when set to 50ml/hour, fluid reservoir 1m above the administration point.



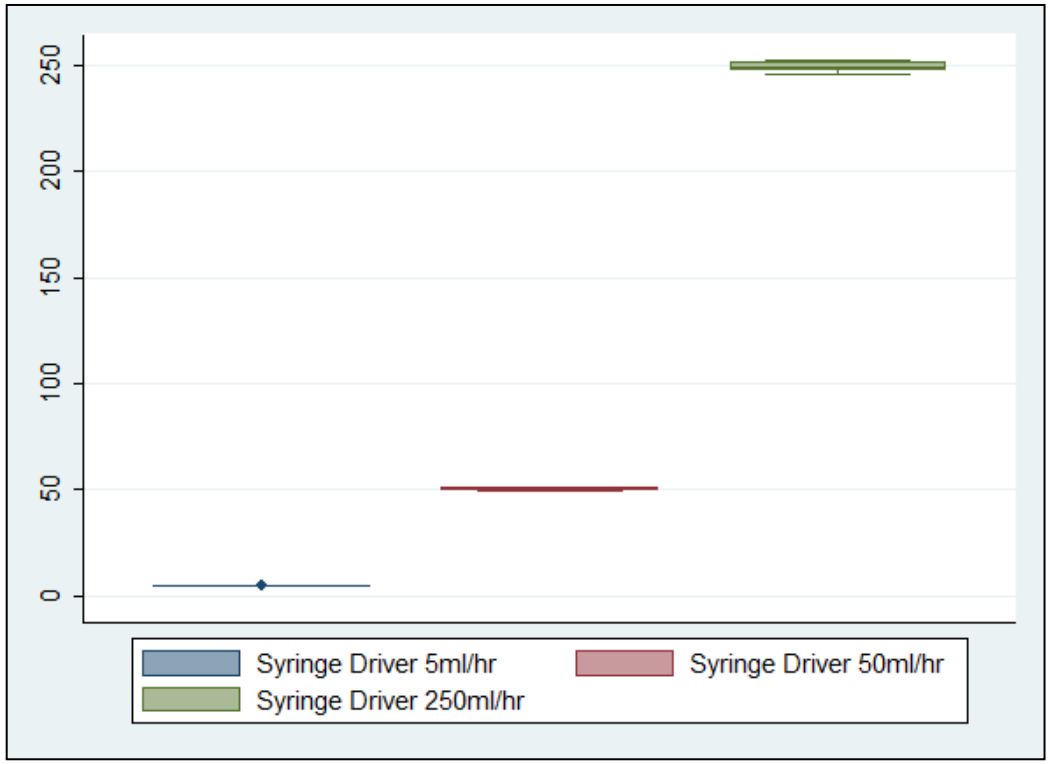
Study Results Summary

- Below is a graph demonstrating the accuracy of a Flow Rate Regulator (Dial-a-flow) at 50ml/hour, with the fluid reservoir at different heights above the administration point



Study Results Summary

- Syringe driver general accuracy at 5ml/hour, 50ml/hour, 250ml/hour.



Syringe driver

- *Drops Mic*

Infusion Summary

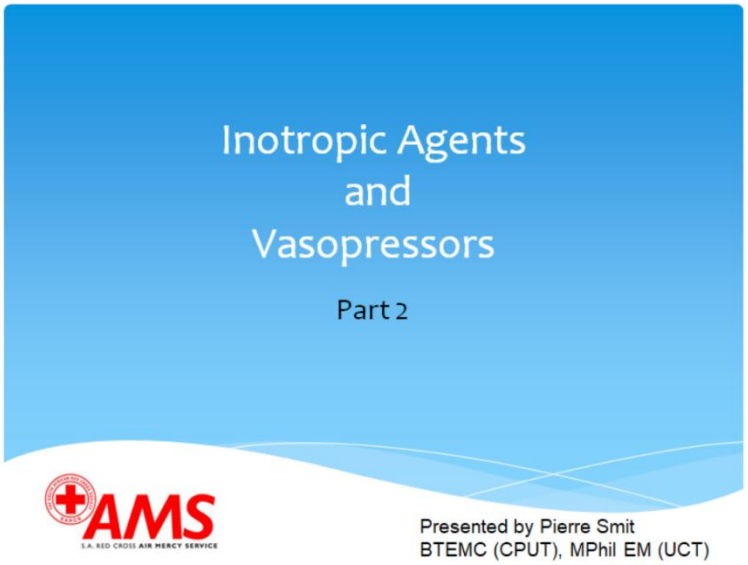
- Make sure you have enough
  - Delays at referring facility
  - Delays en-route to airfield
  - Delays in take-off
  - Head-wind
  - Delays in flight or unloading
  - Delays en-route to receiving facility
  - Delays at receiving facility

- Question: “So which of these delays do you usually experience in your day to day?”
- Answer: “Yes…”

Infusion Summary

- Don’t be scared of higher doses adrenaline or other inotropic/pressor agents. Paramedics are ritualistically taught to give as little adrenaline as possible.

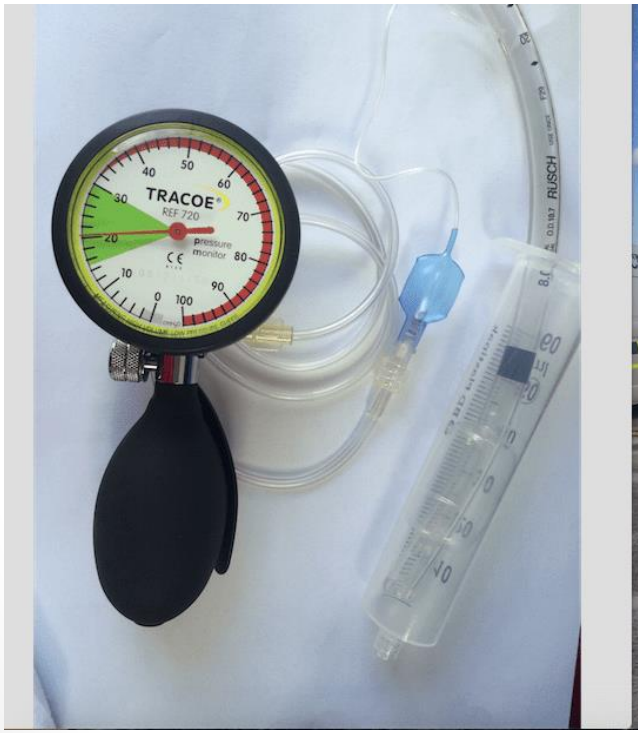
- Most of our patients only start showing improvement at our higher ranges, but are not yet getting adequate physiological benefit from it



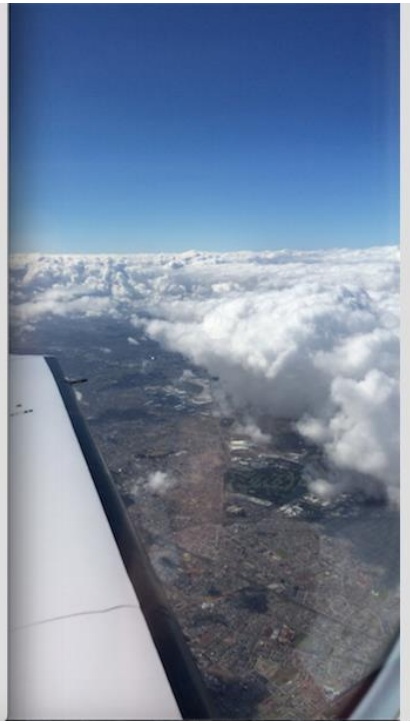
That should do it!

ETT Cuff Pressure

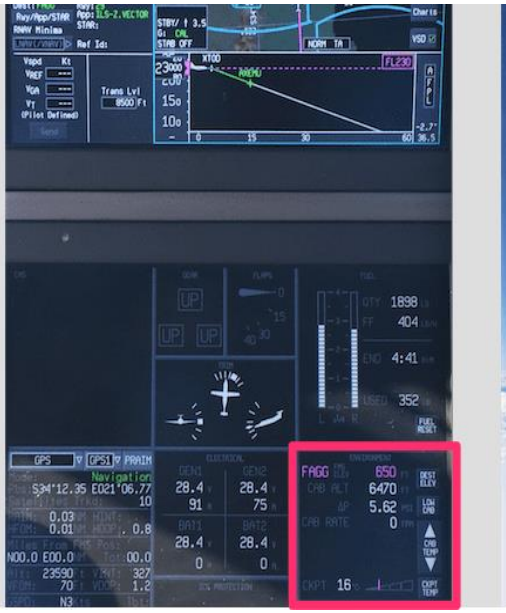
ETT Cuff Pressure – On Ground



Halfway Through Ascent (Cabin Altitude 3770ft)



Cruising Altitude (Cabin Altitude 6470ft)



Resetting at Altitude (Cabin Altitude 6470ft)

Halfway Through Descent (Cabin Altitude 3230ft)

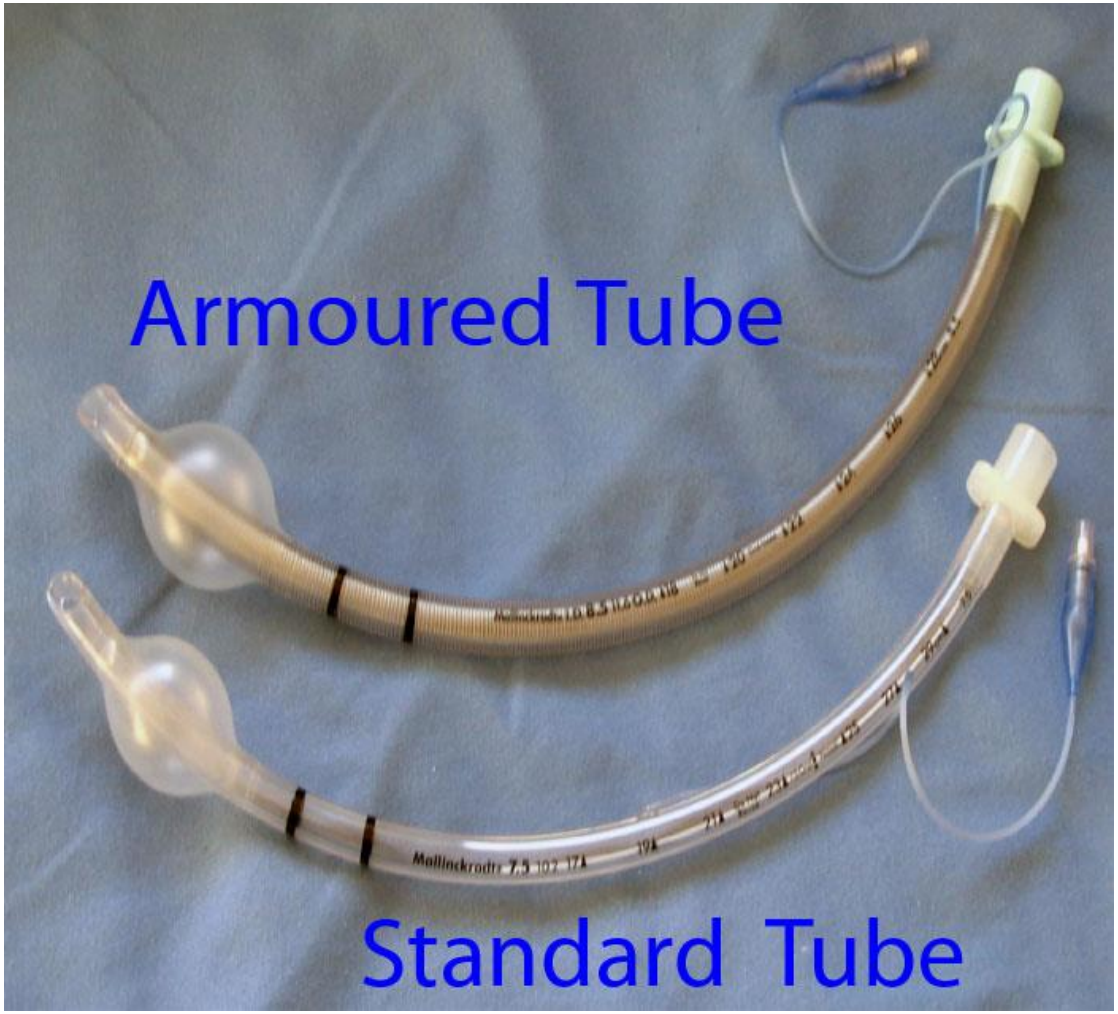
ETT Cuff Pressure – Do we still use Saline in cuff?

- It was an older teaching a practice standard before we introduced ETT cuff pressure measurements at AMS
- One would withdraw all the air from the ETT cuff, and replace it with normal saline
- As fluids are virtually incompressible, it means the cuff pressure would “theoretically” stay the same during the flight.

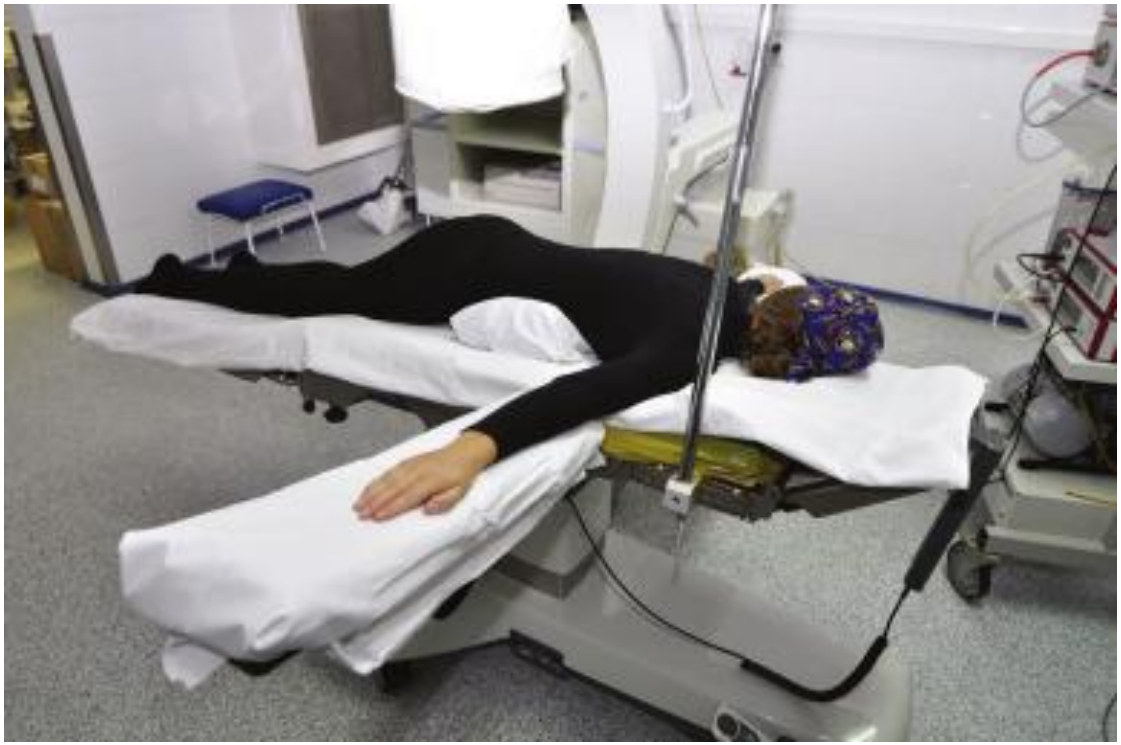
Saline in ETT Cuff - Issues

- Problems associated with using Saline, and which inevitably led to it's removal as routine practice:
  - Using Saline in the cuff requires you to deflate the ETT cuff, potentially causing micro-aspiration
  - It required the ETT to be replaced once the patient reaches the receiving facility, as they would not keep the ETT which has saline in the cuff
  - It is impossible to remove all the air from the cuff, some will always remain, which can then expand and increase cuff pressures
  - It is not what the cuff was designed to do, and manufacturer specifications do not include using saline in the cuff, increasing risk
  - It degrades the cuff over time, which was a finding in ICU at receiving facilities

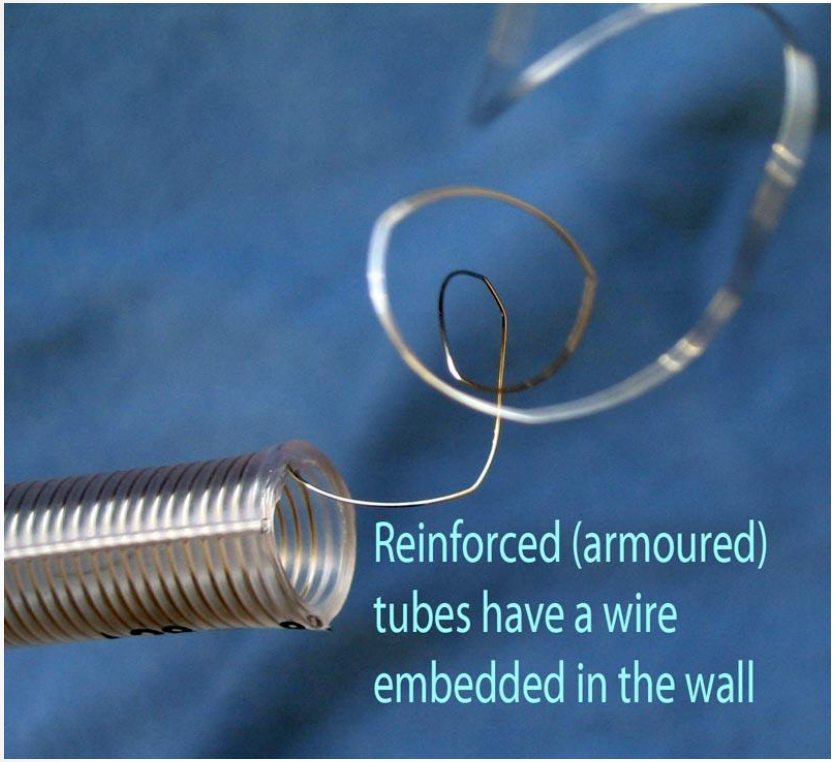
Armoured tubes?

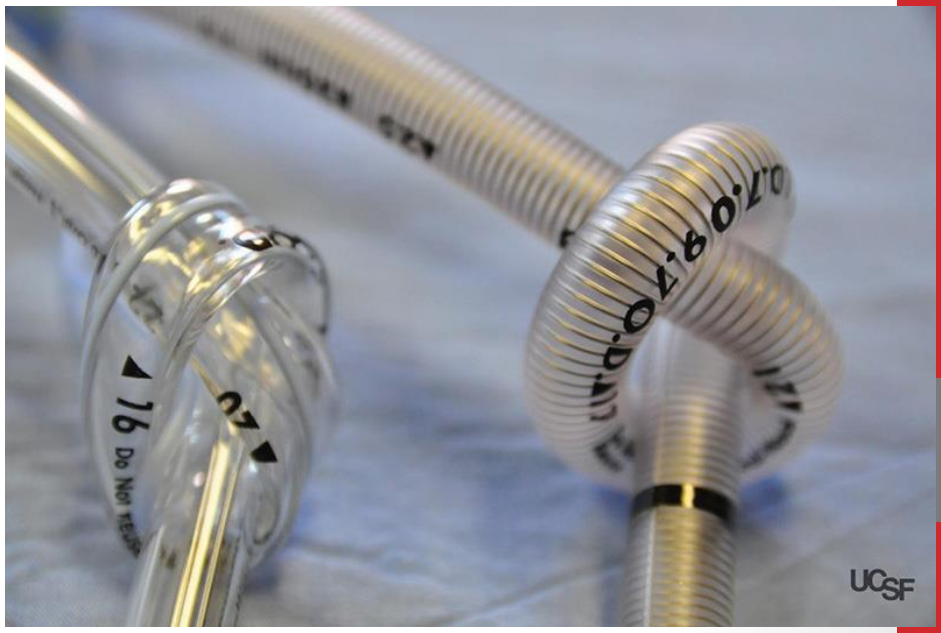


Armoured Tube

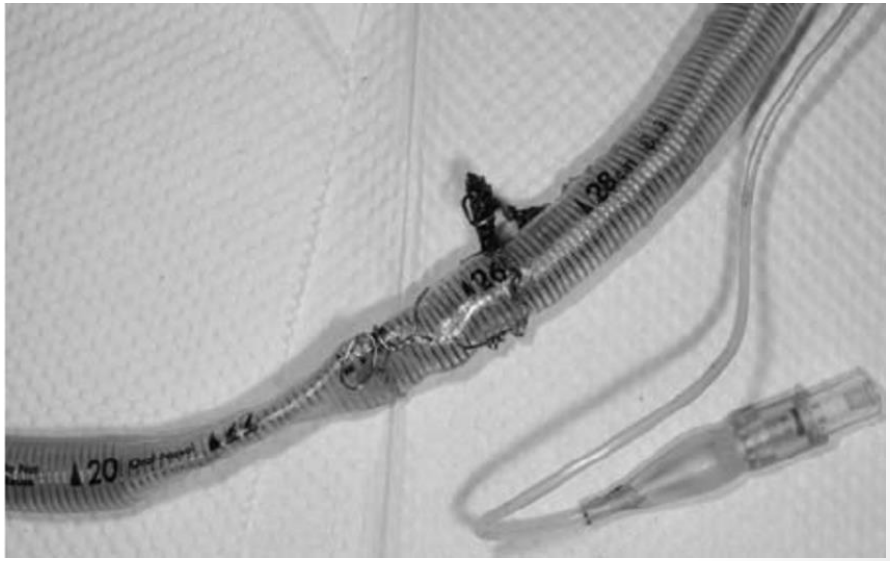


Armoured Tubes

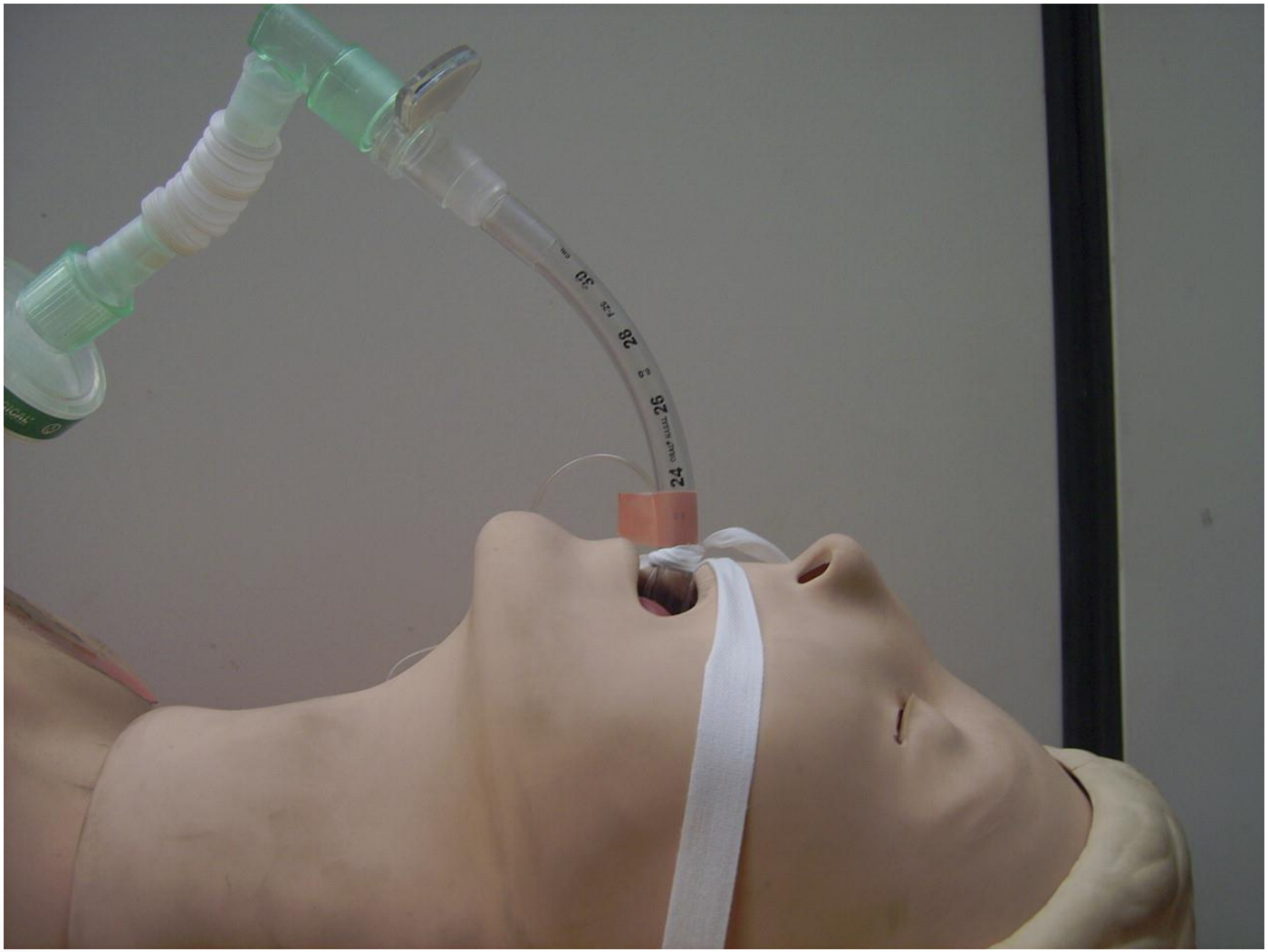




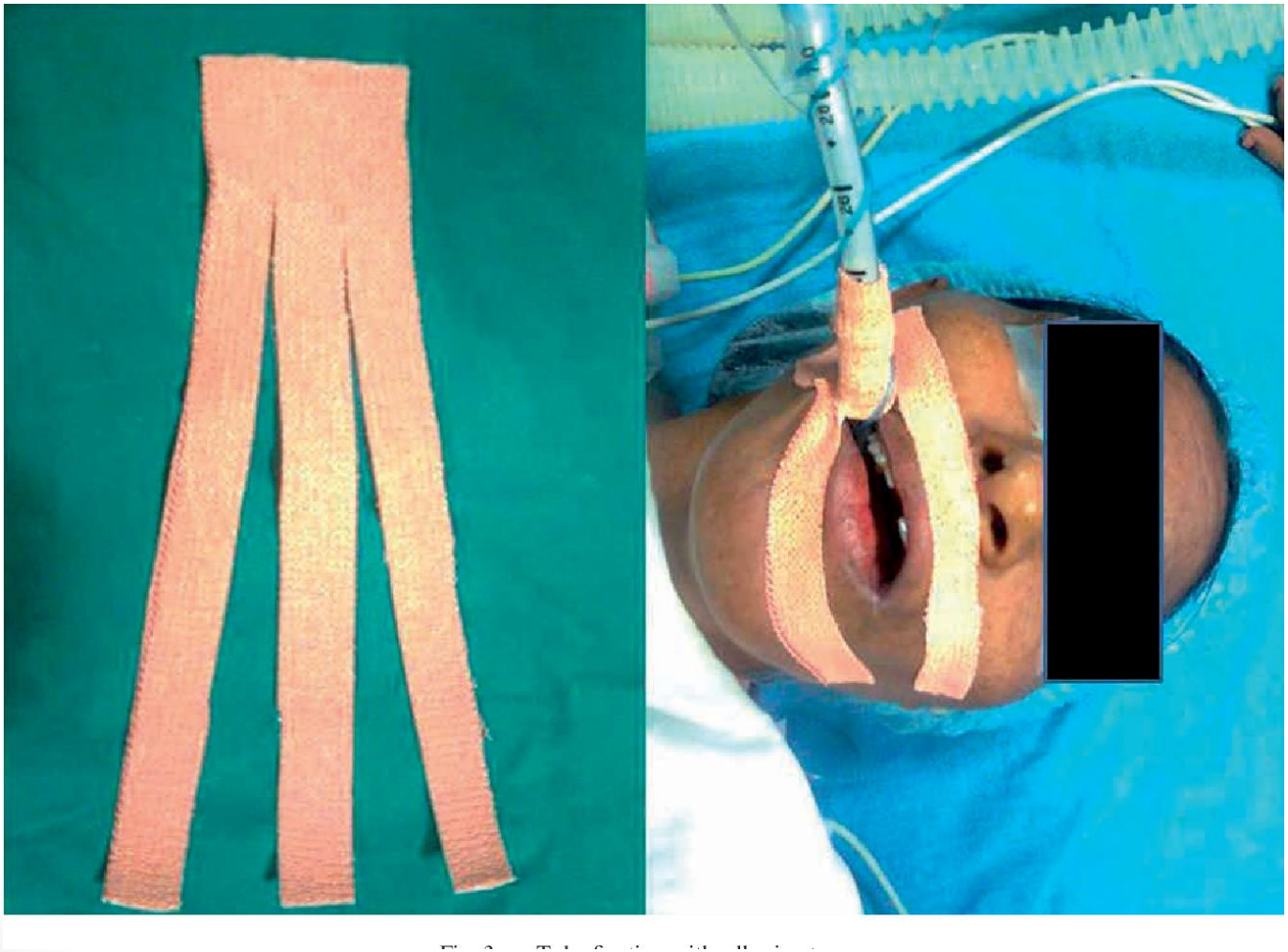
Armoured Tubes



ETT Ligature types

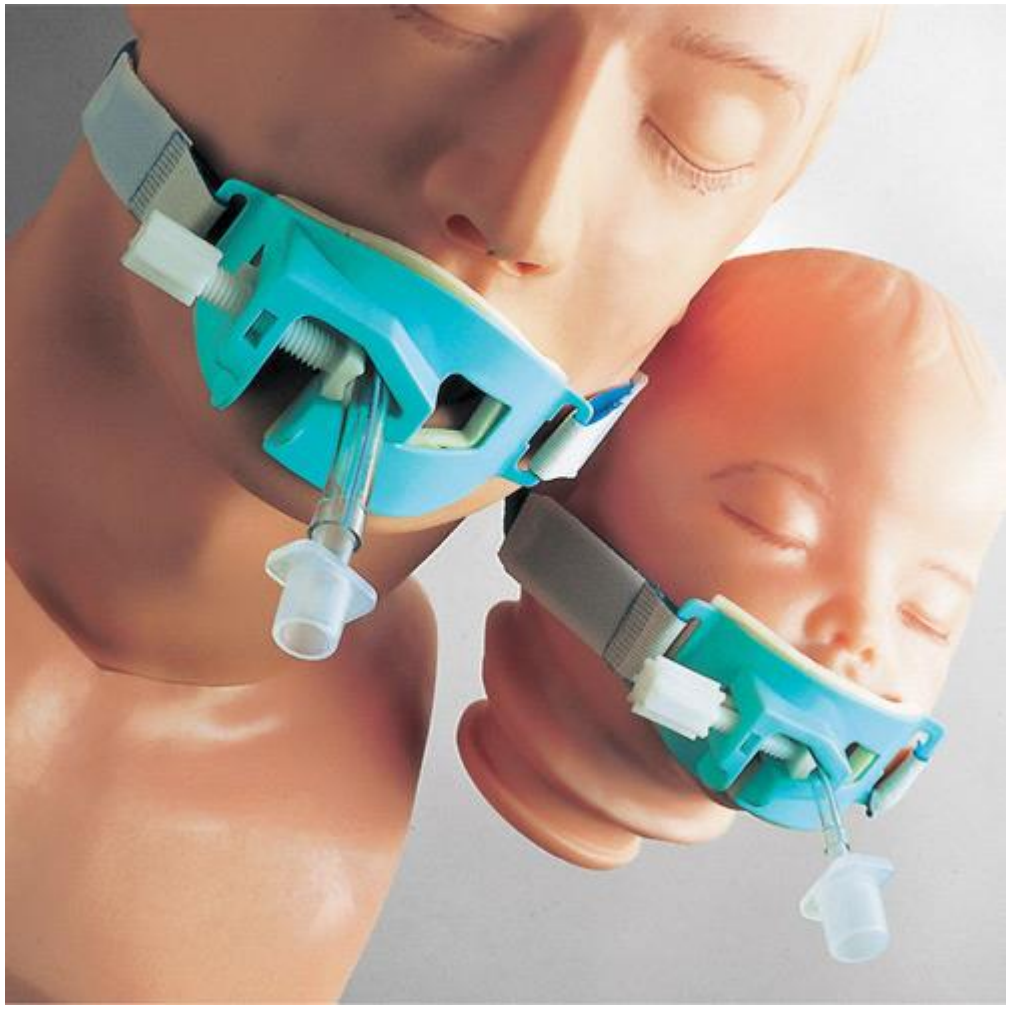


Elastoplast

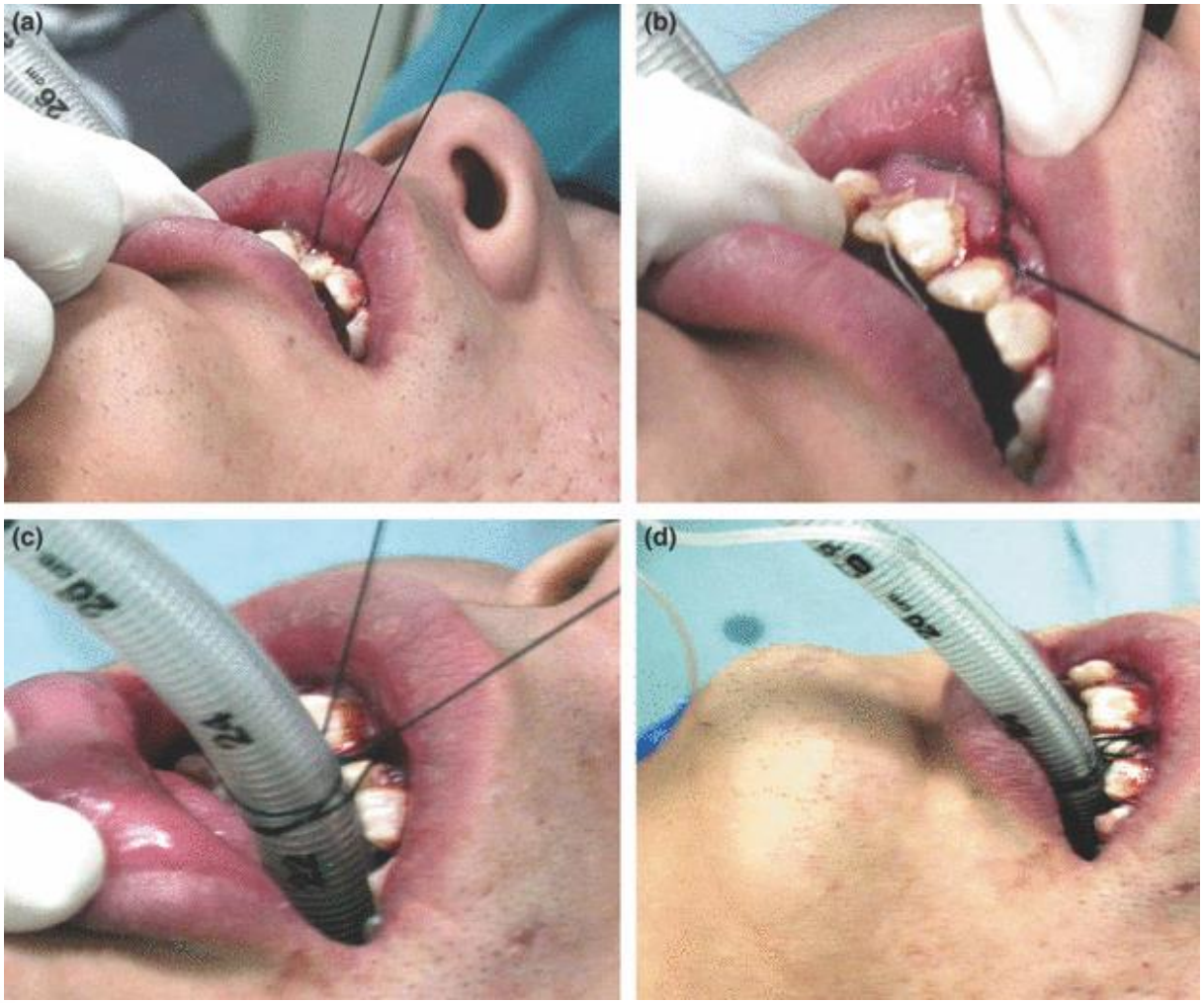


Straps with velcro

Thomas Tube holder



This…



Patient Packaging Considerations

- Important points to remember:
  - Everything during packaging and moving of a patient, or equipment, happens as “slow and controlled” as is humanly possible
  - Accidents and mistakes happen when we rush, so do not rush, please! Take your time, and if the patient’s clinical condition is such that rushing is required (which does happen), communicate with as many people along the way (especially your partner or colleague) that you stop often to check for hazards and safety concerns
  - Use the tools, equipment and techniques available to do things safely and correctly, even if it takes more time. Complacency is a terrible thing

Patient Loading/Unloading Considerations

- Loading Ramps (types and correct use)
  - Benefits
  - Common problems

- Make sure to have sufficient staff to assist with the loading and unloading of patients. Again, every step of the process is done “slow and controlled”. If you find yourself in a hurry, or rushing for whatever reason, remind yourself to slow down. Or ask your partner to set a slower pace if you find yourself feeling anxious or agitated.

Thank you!

Questions?