

Syllabus	AM_IK_12, AM_IK_13
Topic	Jet ventilation & venturi devices

A 63-year-old male weighing 80kg presents for a rigid bronchoscopy and debulking of a proximal lung mass. You intend to use a jet ventilator.

**a)**

What does the acronym HFJV stand for? (1 mark)

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**b)**

List 3 anatomical approaches to jet ventilation (3 marks)

1. ....

2. ....

3. ....

**c)**

List 2 common indications for using jet ventilation (2 marks)

1. ....

2. ....

**d)**

List 4 advantages and 4 disadvantages of using HFJV (8 marks)

Advantages:

1. ....

2. ....

3. ....

4. ....

Disadvantages:

1. ....
2. ....
3. ....
4. ....

**e)**  
What would be an acceptable tidal volume for this patient using HFJV, and at what frequency and pressure? (3 marks)

Tidal volume .....

Frequency .....

Pressure .....

**f)**  
Aside from jet ventilation, list 3 other ventilation strategies that can be used for rigid bronchoscopy? (3 marks)

1. ....
2. ....
3. ....

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	Answer	Mark	Guidance
a)	High Frequency Jet Ventilation	1	All words must be correct
b)	Three approaches to jet ventilation: <ul style="list-style-type: none"> <li>• Supraglottic</li> <li>• Subglottic</li> <li>• Transtracheal</li> </ul>	1 mark for each (Max. 3 marks)	
c)	<ul style="list-style-type: none"> <li>• Elective use in airway/thoracic surgery</li> <li>• Elective use in vocal cord surgery</li> <li>• Elective use in anticipated difficult airway</li> <li>• Emergency use in CICO scenario via transtracheal cannula</li> <li>• Application to non-dependent lung in one lung ventilation</li> </ul>	1 mark for each (Max. 2 marks)	<p>Airway/thoracic surgery includes any major conducting airway surgery and surgery to proximal thoracic structures.</p> <p>Elective use in difficult airway via tracheal jet cannula.</p> <p>Application to non-dependent lung can aide CO<sub>2</sub> elimination and improve oxygenation.</p>
d)	<p><u>Advantages:</u></p> <ul style="list-style-type: none"> <li>• Reduced peak airway pressure</li> <li>• Reduced haemodynamic compromise compared with IPPV</li> <li>• Minimal vocal cord/surgical field movement</li> <li>• Improved visibility/surgical field access</li> <li>• Avoidance of ETT ignition during LASER surgery</li> <li>• Good in low resistance, large volume airway leak</li> <li>• Can be lifesaving manoeuvre in CICO via transtracheal jet cannula</li> </ul> <p><u>Disadvantages:</u></p> <ul style="list-style-type: none"> <li>• Barotrauma leading to: pneumothorax, pneumomediastinum, pneumopericardium, pneumoperitoneum, subcutaneous emphysema.</li> <li>• Malposition of catheters leading to: gastric distension, gastric rupture, dysrhythmias</li> </ul>	1 mark for each (Max. 4 marks for adv. & 4 marks for disadv.)	

	<ul style="list-style-type: none"> <li>• Necrotizing tracheo-bronchitis</li> <li>• Increased incidence necrotizing enterocolitis in neonates</li> <li>• Inadequate gas exchange (hypoxaemia, hypercapnia) in patients with severe lung pathology, predominantly restrictive disease</li> <li>• Potential for lower airway soiling</li> <li>• Contamination or obstruction of expired gases by surgical debris</li> <li>• Inhalational anaesthesia becomes impractical</li> <li>• Contamination of operating theatre air if anaesthetic gases used</li> <li>• Intermittent end-tidal CO<sub>2</sub> monitoring</li> <li>• Pressure measurements may be unrepresentative</li> <li>• High gas flow required</li> <li>• Need for humidification</li> </ul>		
e)	<ul style="list-style-type: none"> <li>• Tidal Volume: 1-3ml/kg @ 80kg = 80-240ml</li> <li>• Frequency: 1-10 Hz (60-600 impulses/min)</li> <li>• Pressures: 0.3-3 Bar</li> </ul>	1 mark for each (Max. 3 marks)	Pressures in Bar/Atm or appropriate conversion to cmH <sub>2</sub> O
f)	<p>Any of the following:</p> <ul style="list-style-type: none"> <li>• Apnoeic oxygenation: uncommon, good preoxygenation +/- HFNO, oropharynx packed to prevent leaks</li> <li>• Spontaneous assisted ventilation: Often in combination with TIVA</li> <li>• Controlled ventilation: small ETT passed alongside bronchoscope. Uncommon</li> <li>• Manual jet ventilation</li> <li>• High frequency jet ventilation.</li> </ul>	1 mark for each (Max. 3 marks)	

### References

1) E Evans, P Biro, N Bedforth. Jet Ventilation. CEACCP (2007) 7(1)2-7

<https://doi.org/10.1093/bjaceaccp/mkl061>

2) C Mitchell. High Frequency Jet Ventilation. (2015)

<http://www.nischoolofanaesthesia-finalfrca.org.uk/SAQs/science/physicssaqs/>