



# PATIENT POSITIONING DURING SURGERY

## Neuro-anesthesia Quiz # 78

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### Quiz Team

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Please click on any of the following links to proceed to that question/topic.

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# QUESTION 1

A 28y healthy male is **positioned supine** for excision of an incidental frontal glioma. Which of the following statements is **INCORRECT**?

Please click on any of the following links to proceed to that question/topic.

[A: There is an increase in cardiac output](#)

[B: There is a decrease in Functional Residual Capacity \(FRC\)](#)

[C: The Closing Capacity would be higher than the FRC](#)

[D: Induction of anesthesia would increase the V/Q mismatch](#)

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# Sorry! Incorrect.

## EXPLANATION

A: There is an increase in cardiac output

This statement is correct

Reclining from an erect to the supine position increases the venous return to the heart which augments the stroke volume and the cardiac output.

However, the high pressure activates the baroreceptors in the aorta (Vagus) and the carotid sinus (Glossopharyngeal) to decrease the sympathetic and increase the parasympathetic outflow and normalize the pressure, in an unanesthetized patient

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# Sorry! Incorrect.

## EXPLANATION

B: There is a decrease in Functional Residual Capacity (FRC)

This statement is correct

When a subject assumes a supine position, the functional residual capacity (FRC) decreases by 20%, due to the cephalad displacement of the diaphragm.

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# Great Job!! Correct.

## EXPLANATION

**C: The Closing Capacity would be higher than the FRC**

This statement is INCORRECT

In an elderly patient the closing capacity (CC) increases and when they assume a supine position, the FRC may decrease to a level lower than the CC

However, in a healthy young individual the FRC does not decrease to lower than the CC

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# Sorry! Incorrect.

## EXPLANATION

D: Induction of anesthesia would increase the V/Q mismatch

This statement is correct

The decrease in FRC due to supine position is further reduced by 10-15% by induction of anesthesia due to relaxation of the diaphragm.

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## QUESTION 2

A 40y M is anesthetized and positioned in the **left lateral decubitus** position for a right temporal craniotomy. Which of the following statements is **INCORRECT**?

Please click on any of the following links to proceed to that question/topic.

[A: The left lung is better perfused](#)

[B: The right lung is better ventilated](#)

[C: An axillary roll is used to push the humeral head away from the brachial plexus](#)

[D: An arterial pressure monitor of the dependent arm can detect vascular compromise](#)

# Sorry! Incorrect.

## EXPLANATION

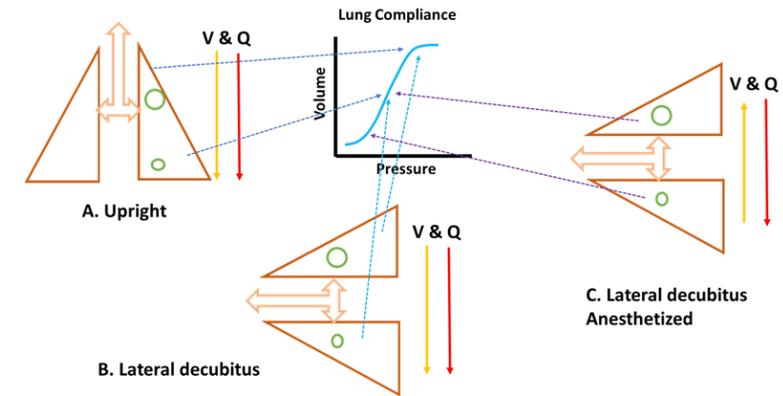
A: The left lung is better perfused

This statement is correct

In the lateral decubitus position, the ventilation (V) and perfusion (Q) are higher in the dependent lung in an awake, spontaneously breathing person.

However, with induction of anesthesia, the decrease in FRC and the weight of the abdominal contents against the dependent hemidiaphragm makes the upper lung more compliant and easier to ventilate, during both spontaneous and positive pressure ventilation.

The dependent (left) lung is better perfused



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# Sorry! Incorrect.

## EXPLANATION

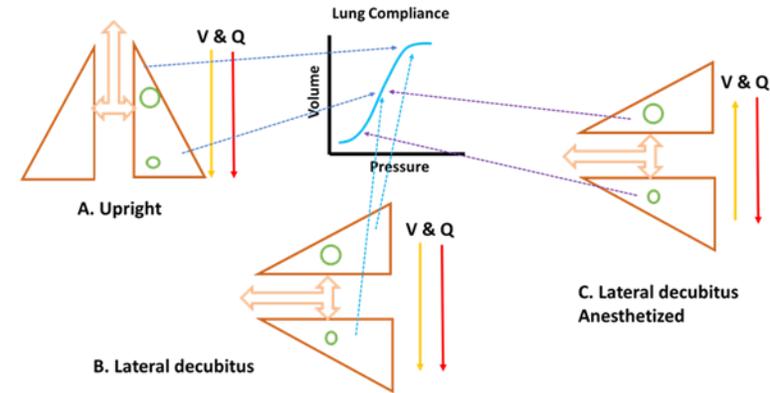
B: The right lung is better ventilated

This statement is correct

In the lateral decubitus position, the ventilation (V) and perfusion (Q) are higher in the dependent lung in an awake, spontaneously breathing person.

However, with induction of anesthesia, the decrease in FRC and the weight of the abdominal contents against the dependent hemidiaphragm makes the upper lung more compliant and easier to ventilate, during both spontaneous and positive pressure ventilation.

The non-dependent (right) lung is better ventilated



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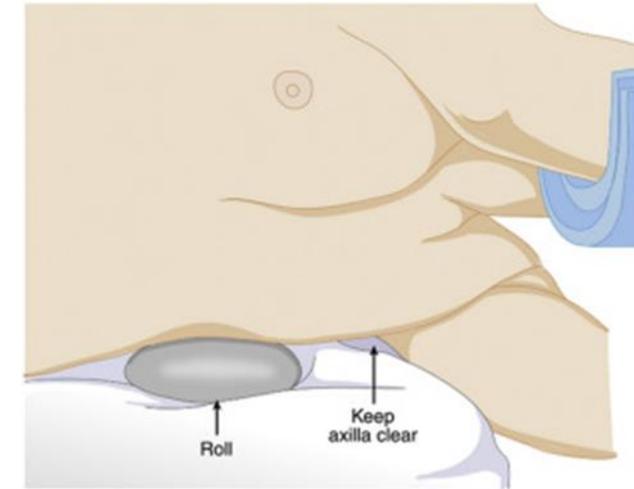
# Great Job!! Correct.

## EXPLANATION

**C:** An axillary roll is used to push the humeral head away from the brachial plexus

This statement is incorrect

To avoid compression to the dependent brachial plexus or the blood vessels by the head of the humerus, an 'axillary' roll is placed between the chest wall and the bed, just caudal to the axilla.



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# Sorry! Incorrect.

## EXPLANATION

D: An arterial pressure monitor of the dependent arm can detect vascular compromise

This statement is correct

A pulse oximeter probe or an arterial line on the dependent arm can detect early signs of vascular compression

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## QUESTION 3

A 30y F is in **sitting position** for excision of a III ventricular tumor. Which of the following statement is **INCORRECT**?

Please click on any of the following links to proceed to that question/topic.

[A: A Trans-esophageal echocardiography is the most sensitive monitor to detect Venous Air Embolism](#)

[B: The neck should be flexed to reduce the chance of cerebral ischemia](#)

[C: The arterial pressure transducer is leveled to the tragus to monitor cerebral perfusion](#)

[D: The lower extremities should be flexed such that the knees are at the level of the heart](#)

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# Sorry! Incorrect.

## EXPLANATION

A: A Trans-esophageal echocardiography is the most sensitive monitor to detect Venous Air Embolism

This statement is correct

A TEE, a precordial Doppler, and a precordial stethoscope are used to detect VAE. Of these a TEE is the most sensitive and can even detect insignificant turbulence due to micro-bubbles in the IV fluids

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# Great Job!! Correct.

## EXPLANATION

**B: The neck should be flexed to reduce the chance of cerebral ischemia**

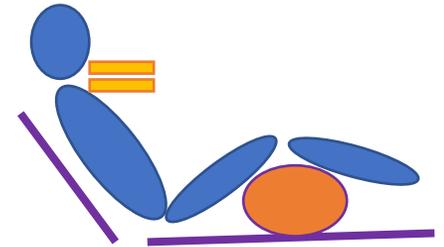
This statement is incorrect

One of the dreaded complications of sitting position is compromised cerebral circulation during hypotension episode due to significantly decreased perfusion pressure to the brain which is above the heart.

It is crucial to maintain the blood pressure

During positioning, the neck may be flexed to provide better surgical access. Acute flexion of neck has been described to cause cervical cord ischemia and quadriplegia

Ensure a 'two-finger' space between the chin and the sternum



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# Sorry! Incorrect.

## EXPLANATION

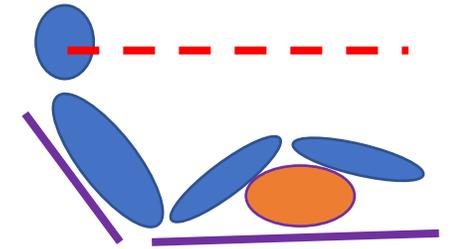
C: The arterial pressure transducer is leveled to the tragus to monitor cerebral perfusion

This statement is correct

One of the dreaded complications of sitting position is compromised cerebral circulation during hypotension due to the loss of pressure head above the heart.

It is crucial to maintain the blood pressure

The pressure transducer at the level of the tragus corresponds to the circle of Willis and indicative of cerebral circulation



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# Sorry! Incorrect.

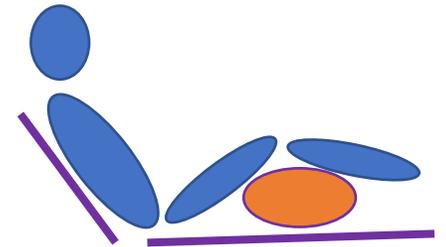
## EXPLANATION

D: The lower extremities should be flexed such that the knees are at the level of the heart

This statement is correct

The hemodynamic effect of changing a patient from supine to sitting position is significant and should be attempted in stages with close monitoring of blood pressure and administration of intravenous fluids and vasopressors as needed

Flexing and raising the knee improves venous return and aids in maintaining blood pressure



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## QUESTION 4

A 50y F, weighing 97kg is positioned **prone** on a Wilson frame for lumbar laminectomy and instrumentation. Which of the following statement is **INCORRECT**?

Please click on any of the following links to proceed to that question/topic.

[A: There is improved ventilation-perfusion matching in this position](#)

[B: A dreaded complication is visual loss due to retinal artery occlusion](#)

[C: Care should be taken to ensure that the chest support is not impinging upon the axilla](#)

[D: The upper extremities should be flexed and abducted, and the forearm supinated](#)

# Sorry! Incorrect.

## EXPLANATION

A: There is improved ventilation-perfusion matching in this position

This statement is correct

An unrestricted abdominal excursions during ventilation increases the FRC and improves ventilation–perfusion matching, and these can significantly improve oxygenation in the prone position.

This technique has been utilized for treatment of refractory hypoxemia and in early acute respiratory distress syndrome



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# Great Job!! Correct.

## EXPLANATION

**B: A dreaded complication is visual loss due to retinal artery occlusion**

This statement is incorrect

The most common cause for POVL is ischemic optic neuropathy (ION).

This can occur with external compression of the eye, raising the intra-ocular pressure and impairing flow in the retinal artery, as in patients positioned prone for spine surgery.

Prolonged surgery, excessive hemorrhage and associated hypotension during the spine surgery could be contributing factors.

Retinal artery occlusion can occur due to micro-embolus during an open-heart surgery.

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**Prone-view®** - a headrest to avoid pressure on the eye

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# Sorry! Incorrect.

## EXPLANATION

C: Care should be taken to ensure that the chest support is not impinging upon the axilla

This statement is correct

The elbow should be supported so as to keep the shoulder neutral, and the axilla should be free with no compression of the neuro-vascular bundle



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# Sorry! Incorrect.

## EXPLANATION

D: The upper extremities should be flexed and abducted, and the forearm supinated

This statement is correct

The forearm should be supinated or neutral with palm facing the torso, as shown in the picture



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## QUESTION 5

To avoid neurological injury during surgery, which of the following statements about patient position is **INCORRECT**?

Please click on any of the following links to proceed to that question/topic.

[A: The forearm and the hand should be placed supinated](#)

[B: When prone, the arm should be supported to keep the shoulder abducted and flexed](#)

[C: In lateral decubitus position, the 'axillary roll' can be avoided if the 'bean-bag' is elevating the chest wall](#)

[D: In supine position, the heel should be placed on a gel pad and knees kept straight](#)

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# Sorry! Incorrect.

## EXPLANATION

A: The forearm and the hand should be placed supinated

This statement is correct.

Ulnar neuropathy is the most common position-related nerve injury.

Pronation of the forearm exerts more pressure on the ulnar nerve, while supination decreases it.

ASA practice advisory recommends the use of padded armboards, limiting arm abduction to 90°, and keeping the forearm in neutral or supinated position



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# Sorry! Incorrect.

## EXPLANATION

B: When prone, the arm should be supported to keep the shoulder abducted and flexed

This statement is correct.

Adequate padding on the arm-board should be used to support the shoulder and keep them from 'hanging'

Patients in prone position tolerate arm abduction greater than 90°



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# Sorry! Incorrect.

## EXPLANATION

C: In lateral decubitus position, the 'axillary roll' can be avoided if the 'bean-bag' is elevating the chest wall

This statement is correct

In the lateral position, the axilla should be clear to prevent the compression of the neurovascular bundle in the axilla by the head of the humerus.

This is usually achieved by an 'axillary' roll placed under the chest and NOT at the axilla!



Beanbag lifts the chest and keeps the axilla free

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# Great Job!! Correct.

## EXPLANATION

D: In supine position, the heel should be placed on a gel pad and knees kept straight

This statement is incorrect

Although the heel should be placed on a gel or memory foam pad to avoid a pressure sore, a small pillow under the knee to flex the knee and the hip which would ease the stretch on the nerves under the knees



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[References](#)

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# References

- Cassorla L, Lee J-W. Patient positioning and associated risks. In: Miller's Anesthesia. 8<sup>th</sup> Edition, 2015: 1240
- Knight DJW, Mahajan RP. Patient positioning in anaesthesia. Continuing Education in Anaesthesia, Critical Care & Pain 2004; 4: 160-3
- Rozet I, Vavilala MS. Risks and Benefits of Patient Positioning During Neurosurgical Care. Anesthesiol Clin. 2007 September ; 25(3): 631
- American Society of Anesthesiologists Task Force on the Prevention of Perioperative Peripheral Neuropathies: Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies. Anesthesiology 2000; 92: 1168–1182

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THANK YOU