Describe the potential adverse effects of administering neostigmine post operatively.

**Background**

Neostigmine is a quaternary amine carbamate anticholinesterase
Used for reversal of non-depolarising neuromuscular blockade

![Neostigmine molecule](image)

*(Figure from Peck and Hill 3rd ed)*

**Mechanism of action** = carbamylation of esteratic site of acetylcholinesterase → reversible (time-dependent) inactivation of AChE → increases [ACh] at all cholinergic synapses

Does not cross BBB → minimal CNS activity

**Dose** = 0.05 mg/kg IV in reversal of non-depolarising NMB

15 ~ 30 mg oral in treatment of myasthenia gravis

Finite number of AChE at NMJ → ceiling effect .:. cannot be used to reverse deep neuromuscular blocks

**Adverse effects** = any unwanted effects associated with drug administration

**Adverse Effects of Post-Operative Neostigmine**

At low doses of neostigmine → accumulation of ACh at muscarinic ACh synapses
At high doses of neostigmine → accumulation of ACh at nicotinic ACh synapses

**CVS**

↑ACh at mAChR → ↑vagal activity → bradycardia + hypotension ± ↓cardiac output .:. usually administer with glycopyrrolate or atropine

**RESP**

↑secretions (↑aspiration risk)
bronchoconstriction ± bronchospasm

**GIT**

↑secretions (salivation → ↑aspiration risk, diarrhoea)
↑GIT motility (enhanced peristalsis) → abdominal spasm and pain, possible disruption of bowel anastomosis
nausea + vomiting → ↑PONV
**MSK**

↑ duration of suxamethonium

high dose neostigmine → impacts neuromuscular transmission → depolarising blockade → muscle weakness

**EYE**

miosis

Examiner’s comments - 68% pass rate

This question examined the pharmacology of neostigmine, a drug that is being used in anaesthesia on a daily basis. An adequate description of adverse effects was therefore expected for candidates to obtain a pass mark.

The main points should include a discussion on the accumulation of acetylcholine at muscarinic (at low dose) and nicotinic (at higher dose) receptor sites after administration of neostigmine.

The muscarinic effects are severe and hence the co-administration of antimuscarinic agent is important. The most worrying adverse effects are bradyarrhythmia with hypotension. Bronchoconstriction, salivation, tracheobronchial hypersecretion, postoperative nausea and vomiting, and enhanced peristalsis (and potential damage on bowel anastomosis) should be mentioned.

Additional marks were awarded for including potential drug interaction with suxamethonium and mivacurium. Marks were also awarded for depolarizing block after excessive doses of neostigmine. No credit was given for description of neuromuscular monitoring.