

Prolonged Apnoea after Suxamethonium, Diagnosis & Treatment: A Case Report

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Abstract:

Plasma Cholinesterase Deficiency is an autosomal recessive inherited blood plasma enzyme abnormality in which the Body's production of butyrylcholinesterase is impaired resulting in prolonged apnoea following depolarising muscle relaxants like Succinyl Choline (Suxamethonium) or Mivacurium. This is associated with paralysis & little or no neurological response. Individuals with plasma cholinesterase (Pseudocholinesterase) deficiency are often diagnosed only after experiencing prolonged apnoea after standard intubating dose of Succinyl Choline. Plasma Cholinesterase is not produced artificially & can be supplied through Blood & fresh frozen plasma. Hence treatment includes mechanical ventilation & supplementation of either whole blood or fresh frozen plasma.

Keywords: Plasma Cholinesterase, Succinyl Choline (Suxamethonium), Apnoea, Fresh Frozen Plasma

Introduction:

Neuromuscular blocking agents work at the neuromuscular junction. The depolarizing muscle relaxants acts as Ach receptor agonists resulting in an extended depolarization of the muscle end plate. As the muscle relaxant continues to bind the Ach receptors, the end plate cannot repolarize resulting in phase 1 block. This is self-limiting blockade & after a stipulated time, the blockade is released & repolarization occurs resulting in returning of spontaneous respiration, muscle reflexes & muscle power.[1]

This is a short acting muscle paralysis facilitating endotracheal intubation & hence depolarizing muscle relaxants are routinely used as induction agents followed by non-depolarizing muscle relaxants, which have longer duration of action, useful as maintenance agents.

Depolarizing muscle relaxants are associated with complications like prolonged apnoea & malignant hyperthermia. [8] Though somewhat rare, these complications pose problem for the usage of depolarizing muscle relaxants & now a days, use of non-depolarizing muscle relaxants as induction & maintenance agents has become common.

But COVID pandemic has again forced us to rethink use of depolarizing muscle relaxants as inducing agents as intubation without ventilation is the choice of technique.

Case report:

A 10 years old male child weighing 30 kg came for torticollis release surgery. Routine investigations, pre anaesthesia check-up & paediatrician reference was done. Everything was within normal limits, hence labelling ASA 1, posted for surgery.

Adequate fasting checked & proper consent of relatives was obtained & procedure was decided to be done under general anaesthesia.

As it was COVID times, intubation without ventilation was chosen. Patient received 100% O₂ for 5 minutes. Patient was given premedication Inj. Glycopyrrolate 0.1 mg, Inj. Midazolam 1.5 mg, Inj. Pentazocin 9mg slowly IV. Induction was done with Inj. Propofol 60mg & Inj. Succinyl choline 50 mg IV. Intubation without ventilation was performed with CoETT no. 6.0 & maintained on O₂ 2lit + N₂O 2lit + Sevoflurane 1%. SaO₂, Pulse, BP & ETCO₂ was monitored throughout. Surgery went for 45 minutes. Vitals were stable throughout the surgery, except no further dose of any muscle relaxant needed.

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ISSN No. : (p) 2348-523X, (o) 2454-1982

DOI: 10.46858/vimshj.8406

Date of Published : 31th December 2021

Even after 1 hour of mechanical ventilation from start, patient did not come out of intubating dose of Succinyl choline, plasma cholinesterase deficiency was suspected & blood sample was sent for serum cholinesterase levels. Mechanical ventilation continued. After around 1 more hour, serum cholinesterase level report received from laboratory. They were 340 IU/L. (Normal Range is 4600 – 14000 IU/L)

Treatment of Scoline apnoea contains fresh frozen plasma, hence blood sample is also sent to blood bank for FFP. 4 FFPs were received from blood bank simultaneously, and started immediately. After 4th FFP, the patient was wide awake, taking spontaneous, smooth, adequate & regular respiration & moving all four limbs. Patient self-extubated under the guidance of anaesthesiologist.

Patient was monitored in recovery for 4 hours, before shifting to wards.

Discussion:

The incidence of Plasma Cholinesterase deficiency is about 1: 4000 general population. [2] It is seen in all parts of the globe.[3] It is said to be prevalent in certain communities where consanguineous marriages are common. In Maharashtra, it is seen in Adivasis of Vidarbha & Districts adjacent to Andhra Pradesh like Solapur. But our case was from Ahmednagar city & had no relations in any of the above region.

Also, when enquired, none of the family member had such history while receiving Anaesthesia for any surgical case.

Plasma Cholinesterase deficiency can be acquired & is seen in chronic liver disease or alcoholic cirrhosis.[4] But our patient was not having any of the above as proved from pre operative investigations. Hence, our case may have some genetic consideration, as already mentioned, autosomal recessive & was not obvious, till he received succinyl choline. [5][6]

COVID Pandemic demands intubation without ventilation to decrease droplet formation & thereby contamination of operation theatre.

Non depolarizing muscle relaxants are safe in that, they do not depend on plasma cholinesterase, but they require more time (up to 3 minutes) for optimum relaxation for intubation. Hence, when used for induction, they demand ventilation prior to intubation.

Hence, amidst COVID situations, depolarizing muscle relaxants, which create favourable intubation conditions within 1 minutes, remain choice of muscle

relaxant for intubation without ventilation.

To add Serum Cholinesterase levels in pre-operative investigations is a useful tool to diagnose cholinesterase deficiency[7], before induction to avoid prolonged scoline apnoea.

Fresh whole Blood is rich in cholinesterase enzyme as the half-life of cholinesterase is short & hence stored blood may not have much cholinesterase to donate.

But, since now a days, blood bank seldom keeps whole blood, fresh frozen plasma is a good alternative. It is roughly estimated that one unit of FFP raises levels of plasma cholinesterase by 600-800 IU/L.[8] Hence adequate supply of FFP is needed.

Conclusion:

Though somewhat rare, scoline Apnoea can be seen. If General Anaesthesia followed by intubation without ventilation is planned, it is advisable to do Serum Cholinesterase levels in the pre operative investigations. Scoline apnoea is treated with success by giving adequate fresh frozen plasma.

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