

PROLONGED APNOEA AFTER SUXAMETHONIUM IN A MALAYSIAN PATIENT DUE TO SILENT PLASMA CHOLINESTERASE – FIRST CASE REPORT

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SUMMARY

Abnormal variants of plasma cholinesterase (ChE, EC. 3.1.1.8) are a rarity in this region and to date there is no reported case of suxamethonium sensitivity in the Malaysian population. We now report a case of a Malaysian Indian patient who received suxamethonium, developed prolonged apnoea and on investigation was found to be a homozygote for the silent gene. His family was screened for abnormal variants of plasma cholinesterase. The results are discussed.

INTRODUCTION

Prolonged apnoea following the administration of short acting muscle relaxant suxamethonium (scoline) due to the presence of abnormal variants of plasma cholinesterase is a well documented entity. A survey on a multiracial Malaysian population¹ showed an absence of the gene for the Dibucaine resistant variant of cholinesterase (E.C.3.1.1.8.) and the heterozygote $E_1^a E_1^u$ in volunteers tested both by the rapid screening method and the spectroscopic (D.N.) method.

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Similar surveys in Oriental populations have shown low incidence of the same gene.² These investigations might account for the non-existence of any known, proven case of suxamethonium sensitivity (prolonged apnoea) in Malaysian anaesthetic practice.³

CASE REPORT

A 53 year old Indian patient was admitted for treatment of a chronic discharging perianal sinus. Pre-anaesthetic examination revealed a normal patient and all the investigations were within normal limits. The patient was given Pethidine 50 mg and Atropine 0.6 mg intramuscular one hour before the surgery. Patient requested for general anaesthesia and a relaxant technique was planned. Anaesthesia was induced with Thiopentone 250 mg and paralysis obtained with suxamethonium 100 mg. Patient was intubated and controlled ventilation was instituted. Patient developed prolonged apnoea which lasted for three hours and thirty minutes. Patient regained full muscle power at the end of four hours. During the period of apnoea patient was ventilated with Nitrous oxide-Oxygen mixture. The surgical procedure lasted for thirty minutes. Blood taken for estimation of plasma cholinesterase showed a low level of the enzyme. Patient's family was screened subsequently and the results are given below.

MATERIALS AND METHODS

Two brothers of the patient and their children

TABLE I
PLASMA CHOLINESTERASE VALUES, DIBUCAINE NUMBERS, AND THE PHENOTYPES OF THE
PROPOSITUS AND HIS FAMILY MEMBERS

Individual	Serum cholinesterase values (ChE. No.)* (Normal 49-124)	Dibucaine Numbers	Phenotype
II ₁	51	83	Normal homozygote/ heterozygote
II ₃	31	75	Heterozygote
II ₄	51	80	Normal homozygote
**II ₅	19	-0-	Abnormal homozygote
II ₆	104	79	Normal homozygote
III ₁	35	77	Heterozygote
III ₂	39	72	Heterozygote
III ₃	53	83	Normal homozygote
III ₄	41	90	Heterozygote
III ₅	46	79	Heterozygote
III ₆	46	62	Heterozygote
III ₇	46	76	Heterozygote
III ₈	59	58	Heterozygote

** Propositus

* ChE. No. Cholinesterase Number (Δ pH units/Hours x 100)

along with patient's children were studied. Plasma cholinesterase estimation was done according to the electro metric method ⁴ and dibucaine numbers were determined according to the spectrometric method. ⁵

RESULTS

The results are shown in Table I. The serum cholinesterase values are reported in Δ pH units/HourX100 (cholinesterase Number). The table also shows the probable phenotypes. The propositus and his family are shown in Fig. 1.

DISCUSSION

The plasma cholinesterase enzyme system consists of ten genotypes which are detected by using inhibitors like dibucaine and fluoride. The rarest of them the 'silent gene' was first reported by Liddel & Lehmann. ⁶ Since then many cases have been reported by various authors from different countries. The silent gene is not really silent since it does not imply non-production of a protein molecule but that it would synthesise cholinesterase lacking in the structure required to hydrolyse the choline ester bond and have no enzymic activity which could therefore not contribute to any of the parameters such as dibucaine numbers which are

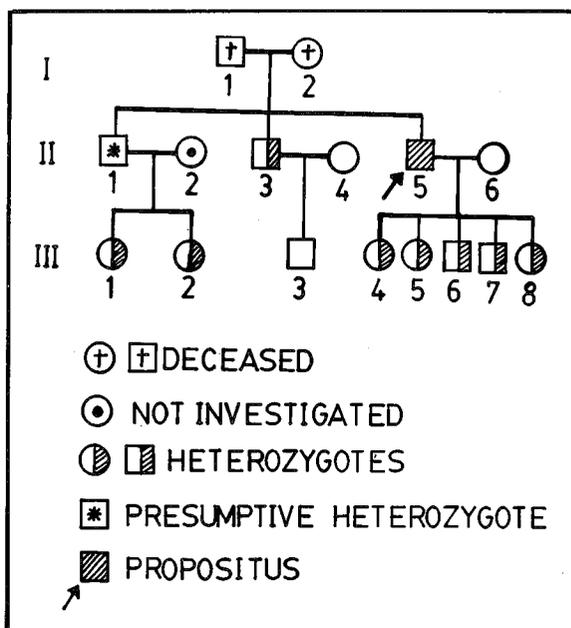


Fig. 1 Family pedigree data.

being measured. ⁷ There are variations in the properties of plasma cholinesterase enzyme in the apparent homozygotes for the silent gene and two types of enzyme deficiencies have been

recognized.^{8,9} One class of enzyme deficiency (type I) with no cholinesterase activity and a second class (type II) which had 2-8% of the normal activity. In both the types of deficiencies a residual enzyme(s) is implicated; the source of which is not known. The available evidence suggest that there are a number of silent genes which vary in their degree of expression, from apparently complete absence to detectable degrees of activity¹⁰ and they are allelic.

Combination of a normal and a silent gene does not always result in abnormally low enzyme levels. Normal individuals with the genotype $E_1^uE_1^u$ have large range of enzymic activities and heterozygotes $E_1^uE_1^s$ average almost 70 percent of the average $E_1^uE_1^u$ activity.^{11,12} In the proven pedigrees all heterozygotes with a silent gene have an average activity which is greater than the expected 50 percent of the mean activity for the corresponding homozygote, but there is a large range of activities for all genotypes.⁷ Because of these known overlapping of enzyme activities a clear distinction between the various genotypes and the identification of genetically low or low normal cholinesterases values can be only made on family studies.

The results of our study show that the propositus is a homozygote for the silent gene, with a very low level of enzyme activity and a dibucaine number O. All his children have below or low normal values of activity and variable dibucaine numbers. All of them are heterozygotes. The brother (II₁) had a low normal level of enzyme activity and a normal looking dibucaine number. But his two daughters (III₁ & III₂) were found to be heterozygotes and he should probably be considered a heterozygote. The other brother (II₃) was also found to be a heterozygote. The exact genotyping could not be done due to the nonavailability of fluoride numbers. All the individuals in our study were otherwise in good health. The propositus and all the heterozygotes were given warning cards to be shown to the anaesthetist should an operation be necessary.

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