



Estimation of Sodium(Na^+) and Potassium(K^+) in Vitreous Humour of Eye After Death

KEYWORDS

Sodium(Na^+), Potassium(K^+), Post-Mortem Interval (PMI), Time Since Death (TSD).

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ABSTRACT

The interval between death and time of examination of body is called post mortem interval (PMI). The most important medico legal issues in any post mortem examination are to determine time since death (TSD). In present study sodium and potassium of vitreous humour of post mortem cases evaluated within 5 To 48 hours of time since death and serum of antimortem subjects. Vitreous humour sodium concentration decreased and raised of potassium concentration time since death. Results were statistically correlated between post-mortem cases and antimortem sodium and potassium value. There was a linear relationship between vitreous humour potassium concentration and post mortem interval (12 hours and > 13 hours) and showed significant correlation of potassium and ($p < 0.001$) and sodium ($p < 0.05$).

INTRODUCTION

Autolysis starts with the cessation of energy metabolism in the cell and causes of dissolution the chemical, physical and morphological integrity of the body loss of selective permeability cessation of active membrane transport are direct consequences of energy breakdown¹. Different tissues of different topographical location within the body have varying energy depots and rate of glycolysis as result of velocity of autolytic processes between different occasion of the body and inter-individually between different purpose differ widely thereafter autolytic processes depend on the time since death^{2,3}. The interval between time since death and time of examination of the body is called post mortem interval (PMI). For the investigation of crime, it is very important to determine time since death and time of post mortem examination⁴. Different method to estimate post-mortem interval are cooling of body, change in eye, post-mortem staining, rigor mortis, decomposition changes, content of stomach and bowel, content of urinary bladder and circumstantial evidence from the above mentioned abbreviation only the approximate time of death can be given vitreous humour of eye relatively stable, less susceptible than other body fluid to rapid chemical change and the contamination easily accessible and its composition is similar to that of aqueous fluid, cerebrospinal fluid and serum thus it is suitable to estimate post-mortem interval⁵. Thus vitreous humour is suitable for biochemical analysis to estimate post-mortem interval^{6,7}.

Our aim and objectives of study was on attempt to know the changes in the concentration in vitreous humour of eye (sodium and potassium) with increasing time since death (PMI).

MATERIAL AND METHOD

We have studied 60 cases (30 cases study group of post-mortem and 30 cases were antimortem, control group), in department of biochemistry and forensic medicine, Jhalawar Medical College Jhalawar (Raj.). The vitreous humour (cadaver) sample was collected by method of Coe et al 1989, by using 10ml syringe and needle. Approximately

amount of 2.5 ml was collected from the eye of cadaver. Only crystal clear liquid free from tissue contamination and fragments was used in present study. Most of the biochemical analysis were carried out immediately post-extraction sample and analysed from sodium and potassium. Before analysing vitreous humour were centrifuged at 2000 rpm for 05 minutes. Analysis of their constituents was carried out on electrolyte analyser (make carelyte) is based on the advanced ion selective electrode (ISE) technology. Serum sodium and potassium were estimated in healthy antimortem subjects coming to O.P.D, of Jhalawar Medical College, Jhalawar.

Ethical permission has been taken from ethical committee of Jhalawar Medical College, Jhalawar (Raj.)

RESULTS

We have studied sodium and potassium in vitreous humour of eye and in antimortem serum of 30 cadavers and 30 healthy groups respectively between ages of 10 years to 60 years.

Table 1 given below, shows that the sodium (mmol/l) mean \pm SD decreasing according to time since death (\leq 12 hours and >13 hours of time since death) with post-mortem vitreous humour sodium concentration and antimortem serum concentration were statistically correlated and found statistically significantly ($P < 0.05$). Potassium concentration in vitreous humour of eye and antimortem serum level were compared and found to significant correlation ($P < 0.001$) in Table no.1. During the study post-mortem period vitreous potassium demonstrated linear rise in every \leq 12 hours of PMI and significantly increasing in later post-mortem hours (>13 hours) (table no.2).

There was a significant reduction in the vitreous sodium concentration in proportion to the time since death.

Vitreous potassium was raised in early \leq 12 time since death and it was significantly increasing after 13 hours of

post-mortem hours and shows strong correlation with the post-mortem interval.

Table 1: Mean \pm SD of Na⁺ and K⁺(mmol/l) of antimortem serum and post- mortem vitreous humour.

PARAM-ETERS	ANTIMOR-TEM	POSTMOR-TEM	p-VALUE	SIGNIFI-CANCE
SODIUM	140.56 \pm 5.09	135.16 \pm 3.41	< 0.05	SIGNIFI-CANT
POTAS-SIUM	4.41 \pm 0.51	8.78 \pm 2.31	< 0.001	SIGNIFI-CANT

Table 2: Mean \pm SD of Na⁺ (mmol/l) and K⁺ (mmol/l) according to time since death.

TSD (InHrs.)	Na ⁺ (sodium)	K ⁺ (potassium)
\leq 12 Hrs.	138.71 \pm 2.55	7.24 \pm 2.14
>13 Hrs.	140.92 \pm 2.90	9.38 \pm 2.09
p- Value	< 0.05	<0.001
p value= \leq 12 hrs. Vs.>13 hrs.		

DISCUSSION

In the present study we have estimated electrolytes sodium and potassium in the vitreous humour of eye with increasing time since death in cadaver vitreous humour of eye.

The mean value of sodium (mmol/l) in vitreous humour of eye in post-mortem cases and in antimortem serum healthy subjects both were correlated found to be significantly ($p < 0.05$) we have correlated TSD \leq 12 hours and >13 hours TSD and were found to be significant ($P < 0.02$). Balasooriya et al⁹.1984, reported vitreous sodium level in post-mortem cases found to be decrease sodium level during the first 85 hours after death. Our results is similar to reported other workers.^{10,11}

Vitreous potassium level in post-mortem cases significantly correlated (< 0.001) with their corresponding antimortem serum level. During the study of potassium level in vitreous humour potassium showed linear rise of potassium level was constituent in early \leq 12 hours and significantly increasing after 13 hours (< 0.05) later post-mortem these results were similar with previous study reported in literature.^{6,7,9,11,12}

However Coe et al 1985 the differences in vitreous potassium value obtained with different instrumentation for a number of substances and demonstrated that potassium concentration obtained by flame photometry were lower values obtained by direct potentiometry with potassium ion selective electrode.¹³ The use of cellular debris contaminated sample may tend to produce on artefactual increase actual potassium concentration of vitreous humor.Nilesh kumar et al 2014 studied potassium level in vitreous with known time since death and described linear rise in potassium concentration with increasing death interval.^{12,14,15,16}

Rise in potassium time since death. Vascular choroid and the retinal lining cells might be the Sources of potassium ions influx and influx of potassium ions into vitreous from the autolysis of cell membrane.^{17,18} reported no statistically significant difference in potassium concentration are present between the two eyes of a body at time of post-mortem interval .¹⁹

CONCLUSION:

Vitreous humour is the useful fluid from which to estimate post-mortem vitreous humour sodium and potassium to know time since death in post-mortem cases. The objective of the present study was to investigate the utility of vitreous humour biochemistry in post-mortem cases and comparison with antimortem serum sample. There was decrease in sodium concentration and increased in potassium level in PMI cases TSD. Estimation of vitreous electrolytes (Na⁺ and K⁺) in post-mortem cases found to be high utility to know time since death

Limitation: The main shortcoming of our study was of having a small group of subjects.

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