A STUDY OF SERUM ENZYMAL CHANGES AFTER DEATH AND ITS CORRELATION WITH TIME SINCE DEATH.

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ABSTRACT

A prospective study was undertaken as a part of postgraduate thesis work on quantitative serum enzymal changes after death in the Deptt. of Forensic Medicine GMC Bhopal (M.P.) in 1999-2002. A total of one hundred study cases and ten control cases were randomly selected after screening. The sera was assayed biochemically by photoelectric colorimetry for an imotransferases (AST & ALT) and serum acid phosphatase. The enzymal levels were plotted against known postmortem interval. The graphical records were studied with a view to ascertain whether such assays could be of any help to calculate time since death routinely.

Key Words: Time since death, Serum enzymes, amino Transferase, acid phosphatase.

INTRODUCTION

The estimation of time since death after autopsy has been and remains to be one of the most difficult challenges to a medigolegal expert. This single vital information when calculated accurately has the potential to unravel many unfolded medicolegal mysteries. Thoughtall claims have been made regarding breakthroughs in this direction in recent times, but on analysing the whole scenario, it is very clear to see that medicolegal experts have to rely heavily and probably solely on age old subjective methods of observing the external as well as visceral somatic changes in the dead body that take place after death like cooling of the body, rigor mortis, changes in the eyes, hypostasis, signs of decomposition, mummification, adipocere formation, maggot infestation etc and circumstantial evidences. No objective and accurate method is available which is unequivocally accepted.

Hence there is need to re-explore other objective methods such as bio chemical, histological, serological assays etc. An effort was made to ascertain, whether it was practical and significent enough to estimate time since death by knowing quantitative serum enzymal changes.

Obviously one has to keep in mind that since he is dealing with biological material like human corpse, blood sera etc. there have to be inherent biological variations in antemortem levels as well as the postmortem changes.

MATERIAL & METHODS

A total of hundred study cases, which were the dead bodies brought to the departmen by investigative agencies for medicolegal autopsy, were studied. Ten living control cases have also been selected to study their serum enzymal profile obtained by the same method of enzymal assay as of study cases.

Enzymes studies were

1. Aminotransferases
   - AST aspartate aminotransferase
   - ALT Alanine aminotransferase

2. Serum acid phosphatase.

Ten ml. blood was taken out with a wide bore disposable plastic syringe through femoral puncture and was immediately centrifuged and the available serum aminotransferases were assayed by Reitman & Frankel's DNPH (Diphosphopyridine
nucleotide) colorimetric method using photoelectric colorimeter. Calibration curve was drawn, absorbance of light was measured from photoelectric & colorimeter and enzyme activity estimated by referring the absorbance value to calibration curve.

Serum acid phosphatase was estimated by KING’S method. Optical densities were measured from photoelectric colorimeter and enzyme activity was measured in King Armstrong units/ml by the following formula:

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\text{Serum acid phosphatase activity} = \frac{\text{Optical density (control)} \times 5}{\text{Optical density (blank)}} \text{ (in king armstrong units)}
\]

**OBSERVATIONS**

**RESULTS AND DISCUSSION**

1. The available literature on biochemical (enzymal) changes in postmortem blood (serum) and its relation with time since death is scanty. Whatever little work is available is almost exclusively by forensic scientists from the temperate countries, where environmental factors inclusive significantly of temperature, affecting such biochemical changes differs in a big way from countries like INDIA.

2. Increasing hemolysis of postmortem blood with greater postmortem interval seems to be the single most important confounding factor giving erroneously high values with photoelectric colorimetry. Hence further study involving other more sensitive & specific methods least effected by degree of hemolysis like radio immunoassay is recommended.

3. A definite and marked rise in serum enzymal levels after death was noted from 2 hours after death onwards.

4. In many cases with increasing time since death enzyme levels register increasing values but interspersed cases show such abnormality and non regular high or low values that deciphering the graphical pattern thus drawn involving two variables in terms of time since death seems unwisely.

5. The refrigerated bodies and samples give abnormally low values.

6. The cases dying of multiple injuries involving trauma to liver show markedly high levels.

7. In burn cases the graph is relatively more linear.
8. The conventional and routinely used subjective parameters like rigor mortis, hypostasis, cooling of the body, putrefactive changes etc. combined with the experience, acumen and "third eye" of the medicolegal expert and circumstantial evidence remains to be the best available tools for estimation of time since death.

9. This study is presented as a pilot study in this relatively less investigated subject and hopefully should pave the way for more elaborate, enthusiastic work in future in this subject.

References


