

Amino acid racemization in human dentine as an indicator of age

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Background: For establishing personal identification age is one of the most important parameter. Age estimation based in morphological methods or radiological examination of skeletal data is less accurate with margin of error greater than + 10 years. Racemization of amino acids from L- form to D-form is a natural process and correlates highly with protein age. In organs with low metabolic rates e.g. dentine, eye lens, white matter of brain, estimation of aspartic acid racemization gives a good evaluation of chronological age with accuracy of + 3 years. Therefore, aspartic acid is currently one of the methods of choice for precise age estimation.

Objectives: To determine the ratio of L-form and D-form of aspartic acid in human dentine and correlate it to chronological age and to find the margin of error associated with this method.

Method: A cross-sectional study done on 33 subjects between age group 15-60 years. All teeth except 3rd molars were included in the study. Filled and carious teeth were also excluded from the study. The teeth were demineralized, then hydrolyzed and then devaritized by established protocol. From the dentine peak areas of D and L ratio of aspartic acid was evaluated by using high performance liquid chromatography.

Results: Twenty-five samples of known age teeth were plotted on X-axis and $\ln [(1+D/L)/(1-D/L)]$ ratio of each sample of teeth was plotted on Y-axis; and coefficient of correlation KR was calculated. Linear regression equation was derived by using least square method formula, $\text{Age} = m (KR) + b$. Age of 8 samples of teeth were calculated from this formula and calibrated with actual age. The mean of actual age (36.6 + 4.10) was not different from the mean of calibrated age (32.63 + 4.65) (p-value = 0.007). The mean error was found to be 3.99 + 5.77.

Conclusion: The results strongly suggests that aspartic acid racemization of human dentine is a precise method for estimation of chronological age. The methodology should be standardized to make the results more accurate and prevent fallacies.

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