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Three Physiological change : Age Estimation

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ABSTRACT

Our research is based on the confrontation of modifications of Gustafson's aging method with the aims of producing of up to date. Identification tables for practical forensic dentistry. The identification tables were produced using the mutual relationship of sum of point values such as the secondary dentine, the secondary cementum , transparency and age.

Keywords: Teeth, estimation of age, identification tables, regression equation.

INTRODUCTION

Identification of the living person and the dead is of paramount importance in forensic practice routinely. Age estimation is one of the prime factors employed to establish identity. Estimating age from teeth is generally reliable as they are naturally preserved long after all the tissues and even bones have disintegrated. Gustafson (1950)[1] devised a multivariate method of age estimation using six of these measures of histological change. His method combined scores from measurements of attrition periodontitis, secondary dentine, cementum apposition, and root dentine translucency. Johanson (1970)[2] tested Gustafson's method on a larger, independent sample and he added two major refinements : intermediate grades for scoring each variable and multiple regression. Johanson's formulas predicted age at death within five years 78.3% of the time, within ten years 95.7% of the time, and within fifteen years 97.8% of the time. The age of 26.1% of the individuals in his sample (12/46) were predicted with an accuracy of plus or minus year.

The present study is based on the subjective evaluation of three makers : secondary dentine, secondary cementum and the transparency.

MATERIAL AND METHODS

Our sample consists of 60 freshly extracted permanent teeth from patients aged 14-71 years collected from Department of Oral and Maxillofacial Surgery, Government Dental College associated with Pt. Bhagwat Dayal Sharma Postgraduate Institute of Medical Science, Rohtak (India). Acquired through extractions, the teeth were consecutively disinfected by formaldehyde solution for 17 days. The following information was collected : exact date of birth of the patient, date of extraction of tooth, sex, profession, type and place of tooth in dentition. The teeth were first cleaned with pumice slurry and polishing brush in a slowly rotating hand piece. The teeth were then thoroughly washed under running water. Each tooth was cut into four sections using a high diamond tipped disc. The sections were again rinsed under running water to clear them of

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debris and particles. Following grinding and dehydration, tooth sections were embedded in penta between a slide and cover glass for microscopic observation. The ground sections were evaluated by two modifications of Gustafson's method using the light microscope with the possibility of image analysis. The present study is based on evaluation of three of six Gustafson makers. The individual changes were classified using a 13 point scale (0, 0.25, 0.5, 0.75, 1, ...3) in this method. The ground sections were examined four times at low magnification.

All the statistical analysis were performed using SPSS Software Package (Version 7.0) and Microsoft Excel 95 (Version 7.0). The relationships between measured histological changes and age were analyzed by computing the Pearson and Spearman rank co-efficient. Equations for age prediction were derived using least squares regression analysis. Absolute mean error of estimation was counted from absolute values of residuals. The formula for age prediction were calculated from multiple regression analysis in methods.

RESULTS

The correlation between individual histological changes and actual age.

Sum of point	Age (in years)
1.75	14.34
2.0	16.67
2.25	17.02
2.5	19.62
2.75	21.02
3.0	25.08
3.25	26.82
3.75	29.35
4.0	31.32
4.25	33.48
4.5	35.42
4.75	37.52
5	38.58
5.25	39.52
5.5	41.94
5.75	44.92
6.0	49.02
6.25	51.68
6.5	52.27
6.75	53.35
7.0	55.32
7.25	59.02
7.5	60.43
7.75	61.67
8.0	62.72
8.25	65.79
8.5	75.82
8.75	75.83
9	76.92
9.25	77.02
9.5	78.12

The resulting formula of age calculation for relationship between sum of point values and age using the regression analysis was established as follows:

$$\text{Age} = \frac{(\text{SPV}) + 1.78}{0.5}$$

DISCUSSION AND CONCLUSION

Age estimation of an unknown person based on the examination of bodily remains can be performed either by osteological or stomatogical methods. Because the teeth are frequently better preserved than other material, their use for identification of an individual's at death is very important. Dental aging received considerable attention within the field of anthropology as well as forensic science. Although many variations upon the basic Gustafson method for dental age at death estimation have been designed, examples beings Miles[3] (1963), Reu et al. (1991)[4], Stott et al (1982)[5], rarely have any of these techniques been tested independently against samples of known age. An exception is work by Burns and Maples (1976)[6], who repeated Gustafson's work with an independent sample composed of African Americans and European Americans. Their results indicated that variables such as race, sex and class played a significant part in the ability to accurately age an individual and that Gustafson's cited error was unreproducible. Analysis of the data revealed that Kilian's method[7] (absolute maximum error of estimation is 7.72 years at 95% confidence interval) enables us to give more accurate estimation of age than Kashyap and Koteswara Rao's methods (absolute maximum error of estimation is 9.94 years at 95% confidence interval). Kashyap and Koteswara Rao's[8] method is based on the quantitative evaluation of four markers : the abrasion, the secondary dentine, the secondary cementum and the transparency while in this methods is based on quantitative evaluation of three markers : the secondary dentine, secondary cementum and transparency. In conclusion these methods of physiological changes. Direct relationship with age in years.

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Failure of clinical forensic dentistry

Clinical forensic dentistry (CFD) is facing a crisis of identity and ultimately of existence. Unlike its partners, forensic pathology and forensic psychiatry, clinical forensic medicine has failed so far to establish itself as an independent medical and academic discipline, and in some jurisdictions, has allowed and encouraged a fragmentation and loss of services to other medical and paramedical disciplines.

CFD has existed for very many years and the dentists have provided their services under a variety of titles including police surgeon, government medical officer, forensic medical examiner and, more recently, forensic physician. The discipline includes custodial medicine, traffic medicine, assessment of assault victims of all ages (both physical and sexual) and alleged offenders, aspects of forensic psychiatry, crime scene examination, and the provision of expert evidence in courts and tribunals. In some cases, practitioners in this field also conduct autopsies to determine causes of death. In the past, much of this work was conducted by general practitioners with a special interest in forensic dentistry. In some countries, pathologists also conduct clinical forensic examinations. Sadly, in a few regions where the clinical forensic doctor once conducted a full range of forensic duties, these duties have been or are being fragmented and directed to practitioners in other disciplines with the subsequent deskilling of the forensic practitioner, a reduction in the scope of the forensic dentist's field of practice and thus a decreased ability to recruit and retain new practitioners, a reduced level of clinical forensic practical experience and knowledge for both the forensic and other practitioners, and the resultant potential for an increased disservice to both the courts and the parties brought before the courts.

For the forensic dentists , this creates a problem as there is neither a peer-group regulating body nor an accredited, current CDE programme. Specialist forensic societies and associations exist which provide varying degrees of educational support but these lack the standing of a learned College. Added to this are other additional problems that compound the educational dilemma for CFD. One is the absence of academic acceptance of the discipline and the other is the research base on which it is founded. Academic acceptance is essential for the development and progress of any medical discipline. This requires research and teaching staff with suitable clinical and research backgrounds that are able to attract research funding and gain and maintain good standing within the academic community. The absence of research has led to a not-often-publicized problem. Many of the 'facts' in forensic odontology , be it forensic pathology or CFD, are not based on scientifically proven data. Practitioners have developed theories that have mutated to 'facts' in text books without the appropriate rigour of scientific investigation and experimentation. Some of these 'facts' have proven to be fiction when subjected to appropriate investigation. A classic example is that of the colour evolution of bruises where a few recent research papers have disproven the accepted published dogma.

If CFD is to survive and function as a specialty or sub-specialty and to provide an ongoing professional service, the issues of direction, education and training require urgent attention. This will require:

1. the establishment of academic centres of excellence, staffed by experienced and appropriately qualified forensic practitioners to develop an educational and research base and who can gain and maintain standing within the academic community;

2. the availability of funds from both government and private sources for the conduct of forensic dental research;

3. the establishment of learned societies or colleges to implement and monitor standards for and quality of forensic practitioners, and to conduct CDE; and

4. cessation of fragmentation of CFD.

Achievement of these aims will not be easy and will also require a campaign to convince medical colleagues, the legal profession, academics and politicians of the need for CFD as a speciality in itself.

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