

AGE ESTIMATION IN OLD INDIVIDUALS BY CT SCAN OF SKULL

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ABSTRACT

Determination of age goes on becoming difficult as the age advances particularly after the age of 40 years with conventional methods. To overcome this problem the present study was carried out. In the present study 100 cases with age range of 40 to 70 years were taken. The study was carried out to estimate timings of suture closure with the help of axial sections at different levels of sutures of skull on CT scan. The closures of lambdoid, parieto-mastoid, coronal and squamous sutures were studied and grading was done depending upon closure of sutures. Each suture was found to close at particular age group. Each individual was exposed to CT scan and 3 axial sections (cuts) were taken for each individual. Each suture was found to close at particular age group.

KEY WORDS:

INTRODUCTION

Scientific estimation of age of an individual whether living, dead or human remains is a vexing problem for Medical Jurist in both civil and criminal matters. Age estimation cases are being referred to Forensic expert. Age estimation of living is most important issue to the court and to common citizen as well. Community relies on medico-legal expert for justice. If proper age is not given, it is injustice to the patient and profession.

Following types of age groups for age estimation are considered: -

1. Gestational age,
2. Infancy to puberty,
3. Puberty to adulthood and
4. Adulthood to old age.

As many studies had been done in past to estimate gestational and infancy to puberty with great accuracy. Estimating age is not an easy task because as age advances estimated, ages given by Forensic experts have wide age range. So to decrease this wide age range combined study including general physical examination and closure of sutures of skull will be done in present study. Other factors that are likely to affect age are: racial, nutritional, endocrinal and hereditary determinants.

The study done by Krogman in 1962 is very old and may not be applicable today because due to evolution, the results may vary a lot and also results vary from country to country and also from region to region. The factors to be considered in present study for age estimation in old age from 40-70 years in both male and female individuals are Computed Tomography of Head for lambdoid suture closure, ecto-cranially.

Epiphysis of bones unite and sutures of skull close at a particular age for a given population it is of great medico-legal importance as most reliable evidence of age of a person. Age estimation help in both civil and criminal cases such as consent, juvenile offenders, kidnapping, rape, marriage, attainment of majority, employment, impotence, sterility, competency as a witness, identification, senior citizen concession, retirement benefits, in old pension cases and in question of age fitness or unfitness.

MATERIAL AND METHODS

In this study hundred cases (Male & Female both) between age group of 40 - 70 years with age interval of five years and twenty cases from each age group were studied who were CT scanned for closure of suture of skull ecto-cranially. Status of suture closure was divided into following five stages:

| Stage | Closure of Suture | Grade |
|-------|------------------------|-------|
| I | No closure | A |
| II | Less than half closure | + |
| III | Half closure | ++ |
| IV | More than half closure | +++ |
| V | Complete closure | ++++ |

Age of each individual studied was confirmed from birth certificate, service record, driving license, passport, ration card or voter's card.

Method for CT Scan: Patient was made to lie supine on CT Scan machine called Somatom Hi Q. Four axial sections were taken on CT Scan at different levels on bone window of suture of skull.

OBSERVATIONS & DISCUSSION

Table 1 - Ages For Suture Closure

| S. No. | Name of Suture | Age of earliest union (Years) | Age of Fusion in Majority of cases (Age Group) |
|--------|-----------------|-------------------------------|--|
| 1. | Lambdoid | 40 | 45 - 50 years |
| 2. | Parieto mastoid | 45 | 55 - 60 years |
| 3. | Squamous | 45 | 60 - 65 years |
| 4. | Coronal | 40 | 45 - 50 years |

Table 2 - Comparison of time of closure of lambdoid suture (in years)

| Author | Year | Race | Sex | | | Method | Age of earliest union |
|---------|--------|--------|------|--------|----------|----------------|-----------------------|
| | | | Male | Female | Mixed | | |
| Krogman | 1962 | U.S.A. | - | - | 31 | Gross skeletal | - |
| Parikh | 1990 | Indian | - | - | 45-50 | X-ray | - |
| Vij | 2001 | Indian | - | - | About 55 | X-ray | - |
| Present | 2001-4 | Punjab | - | - | 45-50 | CT Scan | 45 |

Table 3 - Comparison of time of closure of Parieto-mastoid suture (in years)

| Author | Year | Race | Sex | | | Method | Age of earliest union |
|---------|--------|--------|------|--------|-------|----------------|-----------------------|
| | | | Male | Female | Mixed | | |
| Krogman | 1962 | U.S.A. | - | - | 50 | Gross skeletal | - |
| Parikh | 1990 | Indian | - | - | 55 | X-ray | - |
| Present | 2001-4 | Punjab | - | - | 55-60 | CT Scan | 45 |

Table 4 - Comparison of time of closure of squamous suture (in years)

| Author | Year | Race | Sex | | | Method | Age of earliest union |
|---------|--------|--------|------|--------|-------|----------------|-----------------------|
| | | | Male | Female | Mixed | | |
| Krogman | 1962 | U.S.A. | - | - | 50 | Gross skeletal | - |
| Parikh | 1990 | Indian | - | - | 60 | X-ray | - |
| Present | 2001-4 | Punjab | - | - | 60-65 | CT Scan | 45 |

Table 5 - Comparison of time of closure of Coronal suture (in years)

| Author | Year | Race | Closure of suture in majority of cases | Earliest Union (in years) |
|---------------|-----------|--------|--|---------------------------|
| Krogman | 1962 | USA | Type 1 & 2 - 24 to 38 Type 3 & 4 - 26 to 41 | - |
| Parikh | 1990 | Indian | 35-40 years | - |
| Reddy | 1992 | Indian | Anterior 1/3rd 20-30 yrs, Middle 1/3rd 40-50 yrs. and posterior 1/3rd 30-40 yrs. | - |
| Nandi | 2000 | Indian | Start at 24-25 Yrs. and complete at 45-50 yrs. | - |
| Vij | 2001 | Indian | Lower Half 40-50 yrs. and Upper Half 50-60 yrs. | - |
| Ramachandran | 2003 | Indian | Upper Half 50-60 Yrs. and Lower Half 40-60 Yrs. | - |
| Present Study | 2001-2004 | Indian | 45-50yrs. | 40 Yrs. |

Table 6 - No. of cases showing closure of different sutures at different age groups

| Age Group (Years) | Lambdoid Suture | | | Parieto-Mastoid | | | Squamous Suture | | | Coronal Suture | | |
|-------------------|-----------------|-------------|----|-----------------|-------------|----|-----------------|-------------|----|----------------|-------------|----|
| | No. of cases | Compl union | % | No. of cases | Compl union | % | No. of cases | Compl union | % | No. of cases | Compl union | % |
| 45-50 | 20 | 16 | 80 | 20 | 7 | 35 | 20 | 5 | 25 | 20 | 17 | 85 |
| 50-55 | 20 | 15 | 75 | 20 | 9 | 45 | 20 | 14 | 70 | 20 | 16 | 80 |
| 55-60 | 20 | 14 | 70 | 20 | 14 | 70 | 20 | 13 | 65 | 20 | 18 | 90 |
| 60-65 | 20 | 15 | 75 | 20 | 17 | 85 | 20 | 16 | 80 | 20 | 18 | 90 |
| 65-70 | 20 | 15 | 75 | 20 | 18 | 90 | 20 | 17 | 85 | 20 | 19 | 95 |

SUGGESTIONS FOR FUTURE STUDY

1. In present study, persons between the ages of 25-40 years for closure of suture are not taken, so to find good results, sutures like basilar suture and sagittal suture etc. should be included as these sutures close between this periods.
2. In present study, persons above age of 70 years are not studied so suture like palate should be studied which close at that particular age.
3. As in present study difference between each age group is 5 years and so it will be reduced to get better results.
4. To know suture closure further and more accurately more views e.g. coronal section on CT scan should be included for suture closure.
5. To know closure of suture more coronal or axial cuts for each suture should be taken.

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