

RELIABILITY OF MCKERN AND STEWART METHOD FOR ESTIMATING AGE IN MALES: AN AUTOPSY STUDY IN A TEACHING HOSPITAL IN TIRUPATHI

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ABSTRACT: INTRODUCTION: Determination of age after 25 years becomes very difficult as all teeth will be erupted and ossification Centre's fused. Studies have shown that the changes in the morphological surface of pubic symphysis are the most reliable to estimate age between 20 to 40 years. We estimated the age based on the morphology of pubic symphysis and assessed the reliability of Mckern-Stewart criteria by comparing with actual age. **METHODS:** A total number of 80 male pubic bones from the dead bodies in the age group of 18-65 years were studied. Only bodies with known age, without a history of any disease or deformity of affecting the bones during their life time were included. Age of the deceased was estimated by using pubic symphysis and compared with actual age. **RESULTS:** The results show that the age can be estimated up to the accuracy of ± 2 years up to the age of 30 years, ± 6 years above 30 years and is not reliable beyond fourth decade. **CONCLUSION:** In our study, we observed Mckern-Stewart criteria for estimation of age using pubic symphysis is not reliable beyond 30 years of age. However, caution has to be executed in interpreting our study results as sample size is less.

KEYWORDS: Determination of age, Pubic symphysis, Mckern & Stewart method.

INTRODUCTION: Determination of age after death from the skeleton is one of the most important aspects of identification. Identification remains incomplete, unless the age of a person is determined. Identification becomes difficult in situations such as advanced decomposition, damage by animals, mass disasters, where bodies have been mutilated or fragmented. Under these conditions, the regressive changes in pubic symphysis are one of the best methods to determine age, as they are well preserved by virtue of their anatomical position. Determination of age by the use ossification Centre's and dentition is possible up to the age of 25 years. Changes in the morphological surface of pubic symphysis are the most reliable to estimate age between 20 to 40 years of age.¹ The symphyseal surface of pubic bone has been described as a modified diaphyseo-epiphyseal plane and as such may be expected to show metamorphosis, if not actual growth. Its age range extends from the second to fifth decade and during this period it is accurately correlated with age changes in the long bones and skull.²

METHODS: A total number of 80 male pubic bones from the dead bodies in the age group of 18-65 years were studied. These bodies were brought for autopsy to the department of Forensic Medicine, S. V. Medical College, Tirupati, Andhra Pradesh, Only bodies of known age without a history of any disease or deformity affecting the bones during their life time was included.

ORIGINAL ARTICLE

The pubic symphysis from dead bodies was removed by cutting the pubic rami 1 cm lateral to the pubic tubercle and then through the inferior ramus of the pubic bone above downwards and macerated in water for 30-40 days to separate the soft tissue from bone. After that the bones were washed with soap, air dried and studied by using the criteria of Mckern and Stewart.³⁻⁴ They divided the pubic symphysis in to 3 components having 6 metamorphic changes in each and the symphyseal surface in to dorsal and ventral halves by longitudinal ridge. These halves are termed dorsal demiface (component I) and ventral demiface (component II). Component III is the symphyseal rim, which encircles the two components and appears after the other components have run their course. The total score for an individual is calculated as the sum of the score of all three components.

STATISTICAL ANALYSIS: The data was entered into excel spreadsheet and statistical analysis was performed using SPSS-16. Data was presented as mean \pm SD. T test was used to compare means of our study with Mckern and Stewart. A two tailed p value less than 0.05 was considered statistically significant.

RESULTS:

Component I: Dorsal margin was observed to begin (Score 1) at the mean age of 19.3 years and complete (Score 2) at the mean age of 21.25 years. Dorsal plateau was observed to begin (Stage 3) at the mean age of 25.5 years and complete (Score 5) at the mean age of 42.9 years.

Component II: Ventral bevelling observed to begin (Score 1) at the mean age of 21 years and complete (Score 2) at the mean age of 25.5 years. Ventral rampart was observed to start (Stage 3) at the mean age of 26.07 years and complete (Stage 5) at the mean age of 46.16 years.

Component III: Symphyseal rim observed to start (score 1) at the mean age of 21 years and complete (score 3) at the mean age of 31.11 years. Rarefaction of symphyseal rim was observed to start (stage 4) at the mean age of 43.81 years.

The standard deviation up to the total score of 10 was ± 2 , whereas above the score of 10, standard deviation was ± 5 suggesting high variability in age estimation. (Table-1) A comparison of mean age for the total score between American male and Indian male pubic bones showed that metamorphic changes appear early in Americans as compared with Indians. (Table-2)

Total Score	Our Study		McKern and Stewart Study		Age Difference (+)- Overage (-)- underage	P-value
	Sample Size	Age (yrs)	Sample size	Age (yrs)		
1-2	2	19.0 \pm 1.41	76	19.0 \pm 0.79	0	1
3	2	20.0 \pm 0.00	43	19.8 \pm 0.85	+0.02	0.74
4-5	3	21.6 \pm 0.57	51	20.8 \pm 1.13	+0.8	0.19
6-7	2	25.5 \pm 0.70	26	22.4 \pm 0.99	+3.1	0.001

ORIGINAL ARTICLE

8-9	10	25.0±1.89	36	24.1±1.93	+0.9	0.19
10	10	26.6±1.71	19	26.1±1.87	+0.5	0.48
11-13	16	31.7±4.05	56	29.2±3.33	+2.5	0.01
14	16	43.8±3.39	31	35.8±3.89	+8	0.001
15	18	54.3±6.67	4	41.0±6.22	+13.3	0.001

Table 1: Comparison of the present study with the standard Mckern and Stewart study (1957)

Total Score	Present Study	Mckern & Stewart	Pal & Tamanker	Sinha	Arvind Kumar	Gaurav Sharma
1-2	19.0	19.04	14.60	17.00	21.0	20.50
3	20.0	19.79	19.66	-	22.0	25.25
4-5	21.64	20.84	20.87	20.33	25.5	22.05
6-7	25.54	22.42	25.60	23.8	-	27.72
8-9	25.07	24.14	29.14	27.5	31.87	28.44
10	26.60	26.05	35.66	26.33	34.75	30.23
11-13	31.75	29.18	38.12	38.15	36.9	36.87
14	43.80	35.84	45.00	48.88	47.83	42.71
15	54.34	41.0	55.00	59.4	49.0	52.07

Table 2: The component scores and total score for the bone using Mckern& Stewart criteria were cross tabulated in relation to the known age of the bodies and compared with other studies

DISCUSSION: When the present study was compared with Mckern & Stewart study which was done on American males, it was observed that up to the age of 30 years, the morphological changes appeared more or less at the same age in both studies, but after the age of 30 years, the maturation of pubic symphysis appeared early in American males compared to Andhra Pradesh males. When the present study was compared with Pal and Tamanker study⁵ which was done on Gujarati population, morphological changes appeared more or less at the same age in both studies, except for the total scores of 8–13 which appeared around 7 years late in Gujarati population. When the present study was compared with Sinha study⁶ which was done on male population of Delhi, it was observed that the changes in pubic symphysis appear more or less at the same age up to the age of 30 years, but after the age of 30 years, the morphological changes appeared 5 years earlier in the present study. When the present study is compared with Sharma et al⁷ changes in pubic symphysis appeared 3 years late in Punjabi population. Kumar et al⁸ studied 112 pubic bones in East Delhi population; changes appeared 4 years late in Delhi population. On comparison of all these studies, it is evident that morphological changes in pubic symphysis appear late in Indians compared to Americans. From studying the scoring of all three components separately, it was clear that there is a developmental sequence from components 1 to 3. This means that the developmental stage in component 1 can be greater or equal to the developmental stage in component 2. The same holds true for components 2 and 3. This is in accordance with the study of Iscan⁹ and Sharma et al. The present study reveals that the lacunae

ORIGINAL ARTICLE

of Mckern & Stewart method lies within the range given for scores 14 and 15, that is 29+ and 36+ years respectively, and does not account for variability of age after 30 years. So the age assessment from pubic bones in the fourth decade and beyond is not reliable. Similar observations have been made by Katz and Suchey¹⁰ which correlates with the present study.

CONCLUSION: Age can be estimated by the study of metamorphosis of symphysis pubis based on Mckern & Stewart criteria up to the accuracy of ± 2 years in the age group of 19–30 years and ± 5 years above 30 years. Age estimation from symphysis pubis in the fourth decade and beyond is not reliable. However, caution has to be executed in interpreting our study results as sample size is less.

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ORIGINAL ARTICLE

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