

Sexing of Human Mandibles From 'Rameal-Breadth' and 'Mandibulo-Foraminal' Index

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ABSTRACT Fifty intact, dry and healthy human 'Mandibles' were examined with special reference to the 'Rameal-Breadth' Index (RBI) and 'Mandibulo-Foraminal' Index (MFI). Attempt was made to assess the utility and dependability of these two indices chiefly for the identification of sex, besides trying to establish their co-relationship with different age groups. Both the RBI and MFI were significantly higher in females ($P < 0.01$ and < 0.001 for RBI and MFI, respectively) in comparison to males in all the age groups. The MFI was found to be a better discriminating function as compared to RBI for sexing. The RBI and MFI were in a way, associated with the age group. In the higher age group, the RBI, in males, showed a declining value while in the same age group and sex, the MFI revealed a gradual ascent. In the female MFI values, the trend, however, was reverse.

INTRODUCTION

Expertise of an experienced Forensic Medicine expert is essential for ascertaining the identity of an individual especially from fragmentary pieces of bones.

In view of paucity of available anthropometric data, conclusive sexing of 'Mandible', specially when mutilated, is obviously complex and hence always necessitates a guarded comment.

Keeping the above constraints in mind, an attempt was made through the present preliminary work, to review all the available and established anatomical parameters pertaining to 'Mandible' besides devising a few other valuable measurements/indices in order to pinpoint the sex.

Effort were also put to know about the co-relation of such indices, if any, with the age group of the subjects.

MATERIALS AND METHODS

For the purpose of the study, fifty healthy and intact 'Mandibles' were collected from unclaimed dead bodies and cadavers of known age (20-60 years) and sex brought for medico-

legal autopsy and dissection by the students of Anatomy. They were later processed and completely dried up, for the study.

Emphasis was laid on 'Rameal-Breadth Index' (RBI) and 'Mandibulo-Foraminal Index' (MFI) among all the anatomical and bio-metric parameters.

Formulation of RBI And MFI

$$RBI = 100 \frac{'rb'}{'rl'}$$

Where 'rb' is the minimum antero-posterior breadth of ramus

'rl' is the progressive length of ramus

$$MFI = \frac{100 'mdf' - 'i'}{'mdf' - 'lb'}$$

Where 'mdf' is the antero-inferior margin of Mandibular Foramen.

'i' is the deepest point of the mandibular notch.

'lb' is the lower boarder of ramus.

The required measurements were recorded by means of sliding caliper and Mandibulo-meter (Fig.1).

OBSERVATIONS

The mean RBI ranged from 54.26 to 57.47 in males as against 58.14 to 63.14 in females,

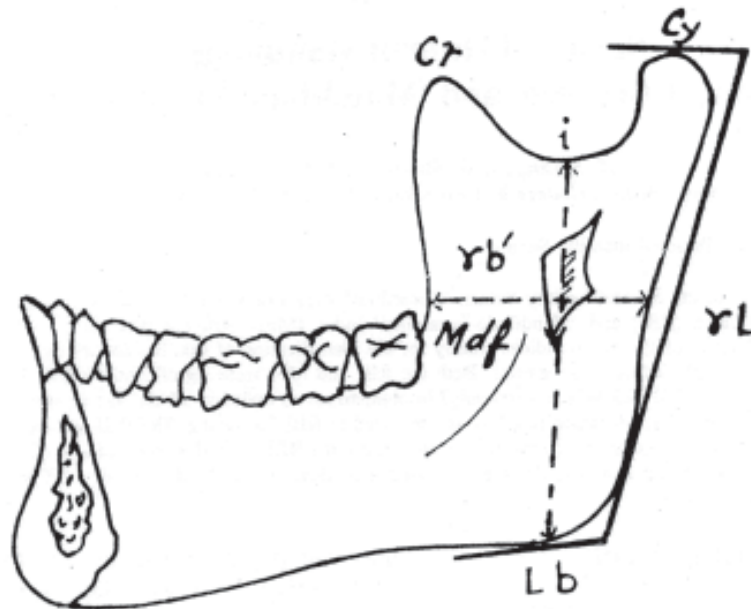


Fig. 1. Diagrammatic representation of mandibular measurements

while the over all mean sex differentials for the said index were 56.82 ± 0.70 and 60.06 ± 0.95 for males and females, respectively (Table 1).

Table 1 : Mean R - B Index by age and sex

Age in years	Male (n=50)	Female (n=50)
21-30	56.80 ± 1.08	59.13 ± 1.40
31-40	57.15 ± 1.21	58.14 ± 1.77
41-50	57.47 ± 1.57	60.70 ± 2.31
51-60	54.26 ± 1.93	63.14 ± 2.09
All age groups	56.82 ± 0.70	60.06 ± 0.95

The RBI was, in a way, associated with age, for both the sexes. While for the males, the same index declined to the lowest value in the higher age group (51-60 yrs), the trend was just opposite in the females who in the same higher age group depicted the highest

RBI value as compared to the rest of the age span (Figs. 2 and 4).

The distribution of RBI (Table 3) showed a clustering of cases in the 55-65 range both in males and females.

In the case of MFI, it ranged from 85.62 to 91.95 in males and from 98.68 to 109.81 in females, with the over all mean sex differentials being 88.54 ± 2.19 and 102.51 ± 2.31 , respectively (Table 2).

Table 2 : Mean M.F. Index by age and sex

Age in years	Male (n=50)	Female (n=50)
21-30	85.62 ± 5.63	109.81 ± 4.91
31-40	91.09 ± 2.52	98.95 ± 4.82
41-50	89.99 ± 4.23	100.57 ± 3.77
51-60	91.95 ± 2.69	98.68 ± 3.43
All age groups	88.54 ± 2.19	102.51 ± 2.31

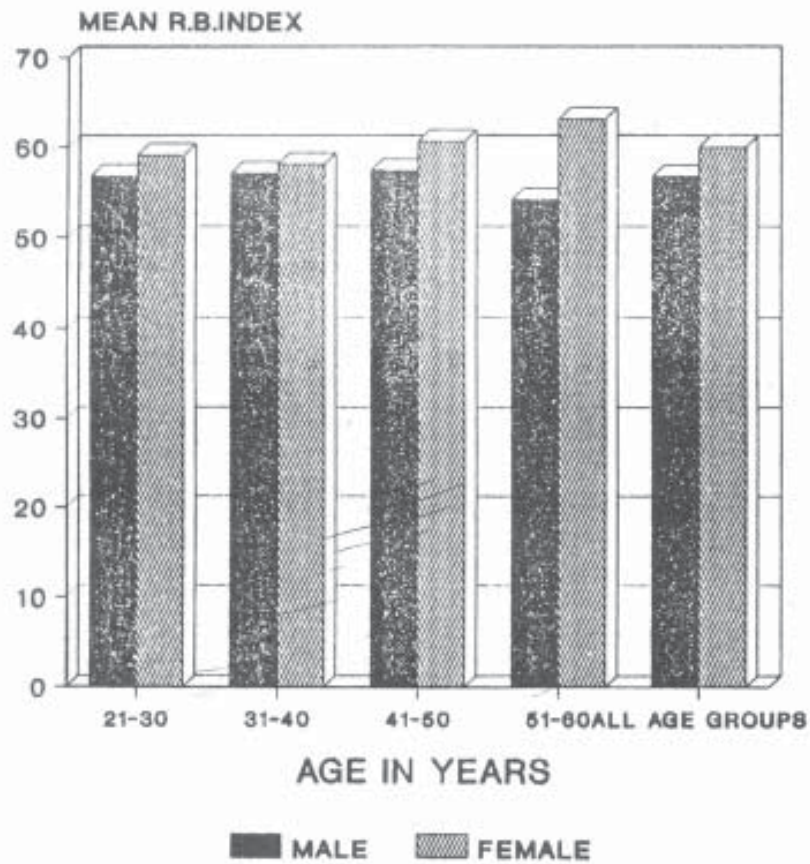


Fig. 2. R.B. Index by age and sex

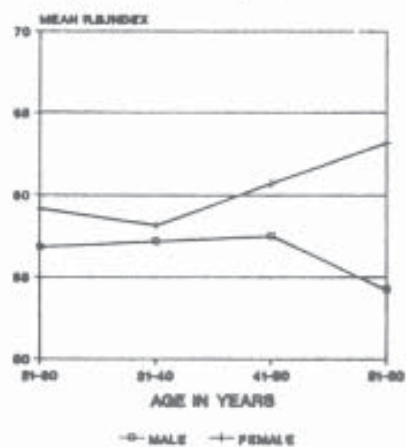


Fig. 4. R.B. Index by age and sex

Table 3 : Distribution of the RBI range by sex

RBI Range	% of Samples		Total Number (n=50)	
	Male	Female	Male	Female
45-55	38	30	19	15
55-65	60	46	30	23
65+	02	24	01	12

Table 4 : Distribution of the MFI range by sex

MFI Range	% of Samples		Total Number (n=50)	
	Male	Female	Male	Female
<90	90	36	18	10
90-110	58	52	29	26
>110	06	28	03	14

The MFI was also related, in a way, with the age in both the sexes. In the higher age group (51-60 yrs), the MFI showed the highest value in males and the lowest in females which was a sharp contrast to the RBI in which the trend was just the reverse (Figs. 3 and 5).

Clustering of cases from distribution of MFI (Table 4) values, was seen in the 90-110 range for both the sexes.

The RBI was also observed to be higher in female sex ($P<0.01$) as compared to males. Similar observations were made for the MFI as well ($P<0.001$).

DISCUSSION

In the present study, both the RBI and MFI are higher in females in all the age groups. This finding is in agreement with Morant's (1936). The reason for such higher value among females in case of RBI, could be most probably the comparatively less wide and shorter Mandibular ramus, while for the MFI, this could be attributed to the fact that the Mandibular Foramen is situated nearer to the base or inferior boarder of ramus in females as compared to males, which has been confirmed by the measurements in the present series of bones (mdf-lb).

The probability of the RBI range of 55-65 is higher in males as compared to females.

The chance of MFI range of 90-110 is similarly greater among males than females.

Age-wise, diminution of the RBI value to the lowest in the higher age group (51-60 yrs) in the males could possibly be owing to the commencement of osteo-porosis and other secondary degenerative changes in comparison to just the opposite female value which might be the influence of hormones secreted during the menopausal period, though exact cause/s for this could not be found out. Age related MFI values similarly could be due to further thinning and shortening of both the Mandibular body and ramus following absorption of alveolar sockets besides degenerative phenomena in course of ageing in either sex, though the hormonal added influence from menopause could not be simply ruled out in females. However, definite etiology for such trend is yet to be explored.

On comparison between the RBI and MFI in respect of their efficiency as regards the detection of sex, the latter is found to be more efficient and preferable, for the better contrast between the male and female values and compared to the former (RBI) where the difference in the values is not marked though cannot be absolutely ignored.

Lastly, as mentioned above, for the conclusive sexing, a guarded comment should always be made because of the inadvertent errors committed while sexing a single intact or broken bone, to begin with, from the different established anatomical parameters, to be subsequently and finally sexed basing on the RBI and MFI values. The complexity of the problem is also due to the skill and expertise involved, for working out the indices from the various measurements plus the availability of the essential tools like Mandibulometer etc. at ease, addedly, at all the Medico-legal centres.

CONCLUSION

The MFI is more efficient for sexing in comparison to the RBI. Both these indices,

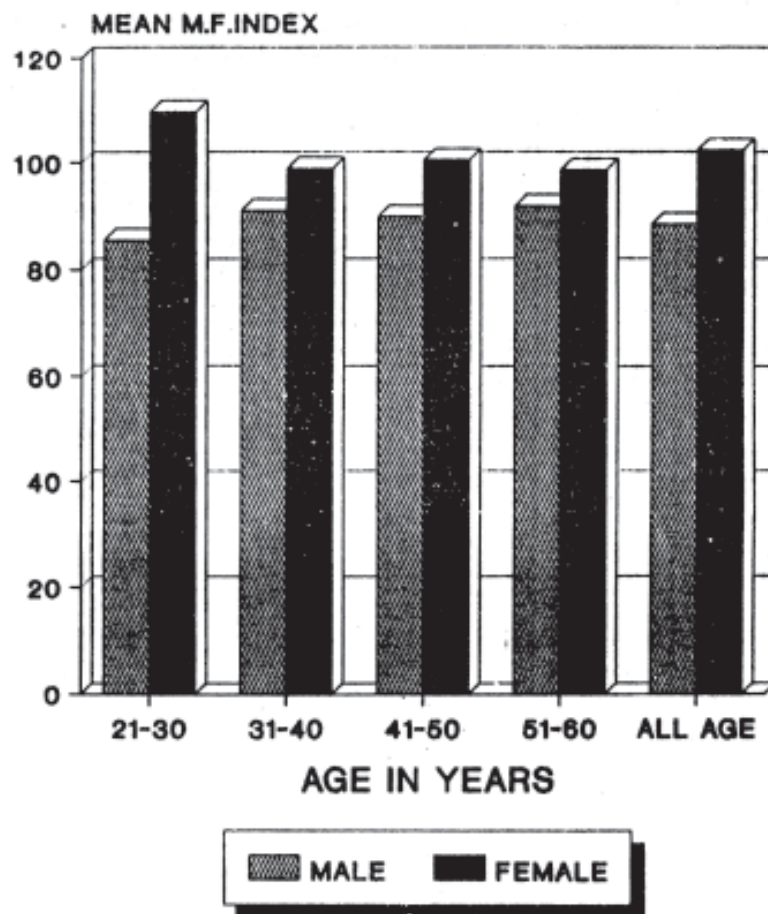


Fig. 3, M.F. Index by age and sex

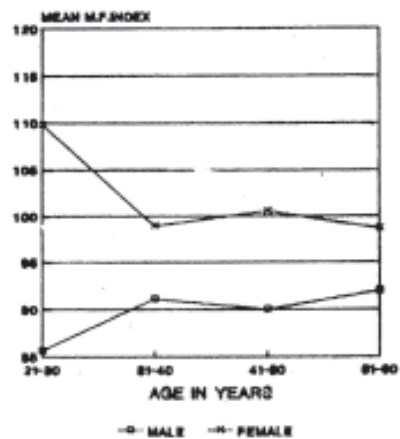


Fig. 5, M.F. Index by age and sex

as has been observed, may not only discern sex, but also reflect the probable age range of the deceased, which is an added informative and scientific clue to establish the personal identity.

The RBI and MFI may also be used to detect the sex with known probability of classification, both in the intact and mutilated 'Mandibles', still retaining the required anatomical parameters.

However, this being a preliminary work with a limited number of samples, a large-sample

study may be done for further confirmation and modification of the estimates.

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