

Applicability of RBI and MFI For Sexing Human Mandibles

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ABSTRACT Fifty intact, dry and healthy human 'Mandibles' were examined with special reference to the various cut-off points in respect of RBI (Rameal-Breadth Index) and MFI (Mandibulo-foraminal Index) for classification of the specimens as male and female.

The RBI value of 57 was reflected as the most optimum cut-off point while for the MFI, the 'maxima' was at the cut point MFI value of 95, irrespective of the age.

The 'test cut-off points' of RBI and MFI were also determined in order to check their degree of sensitivity and specificity for such classification of sex which was 58% and 62%, respectively for the RBI as against 62%, and 64% in the case of MFI, for all age group samples.

INTRODUCTION

Conclusive sexing of human 'Mandible', especially from fragmentary pieces, necessitates an extremely guarded comment from even experienced Forensic-Anatomists, for want of a good number of anthropometric data and presence of bizarre characteristics, as observed in a few samples.

The utility and dependability of RBI and MFI for sexing of 'Mandibles' in human beings were screened in our earlier study. The strong association of sex with both these indices urged for further analysis in depth to study the various cut-off points and their applicability in the classification of the specimens under reference, as male and female.

MATERIAL 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 Yrs) and sex, brought for medico-legal autopsy and dissection by the students of Anatomy. The bones thus collected were

later processed and completely dried up, for the study.

Formulation of RBI and MFI

The RBI and MFI were formulated as follows:

$$RBI = \frac{100 \text{ rb}'}{r1}, \quad MFI = \frac{100 \text{ mdf-i}}{\text{mdf-lb}}$$

Where rb'...minimum antero-posterior breadth of ramus; r1...progressive length of ramus; mdf...antero-inferior margin of Mandibular foramen; i...deepest point of Mandibular notch; lb...lower border of ramus.

The required measurements were recorded by means of sliding calipers and Mandibulometer (Fig. 1).

Later, each and every specimen was classified as male or female depending on whether it was less or more than 'X' (RBI as Variable) in the first instance and MFI as 'X' Variable in the second instance.

The corresponding predictive value was estimated as a probability of being classified correctly (male or female). The probability so calculated was plotted against the variable 'X' in the range of 54 to 63 for RBI and from 85 to 109 with respect to MFI. The 'test cut-off points' of RBI and MFI were calculated to assess their sensitivity and specificity for sex classification.

OBSERVATIONS

RBI: In case of RBI, the points of maximum predictability were found to exist in all the three types of graphs pertaining to different age groups (Fig. 2). The RBI value of 57 offered the predictability of 55%, 60% and 75% for the 20-50 yrs of age range, all ages and in the

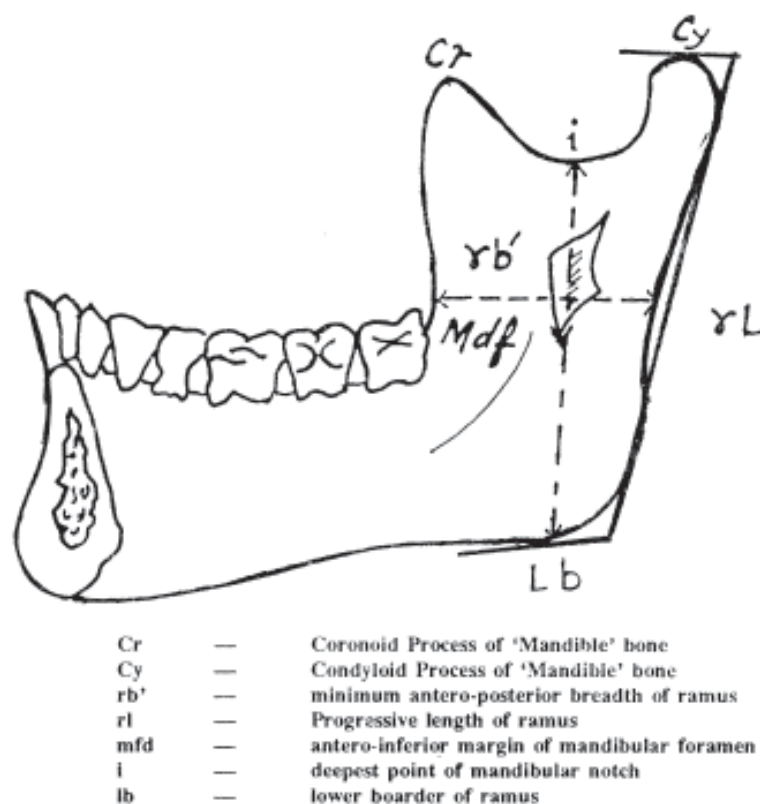


Fig. 1. Diagramatic representation of mandibular measurements

higher age group of 51-60 yrs respectively, reflecting that this (57) was the most optimum cut-off point for classification of sex within the limitations of the present study.

MFI: The cut-off point for MFI (95) showed comparatively higher predictive value as compared to RBI, in the younger age group, in a sense that as high as about 65% of the samples could be correctly classified as against 55% in RBI in this age span. The MFI cut-off point, irrespective of age, also had a 'maxima,' at the cut point MFI value of 95. The predictive value of all age groups was observed to be 63%. However, for the higher age group, the clear cut trend was not noticed.

Sensitivity and Specificity of RBI and MFI

The sensitivity and specificity values for RBI were determined as 58 and 62 per cent as against 62 and 64 per cent in case of MFI for all age group samples.

DISCUSSION

Morant, G.M. (1936), while conducting a biometric study of human mandibles, opined broadly about the usefulness of RBI and MFI in the sex determination but had not gone in depth to assess the relative efficiency including the sensitivity and specificity of these indices. As such, there is hardly any literature available on this to minutely discuss and compare with the present results.

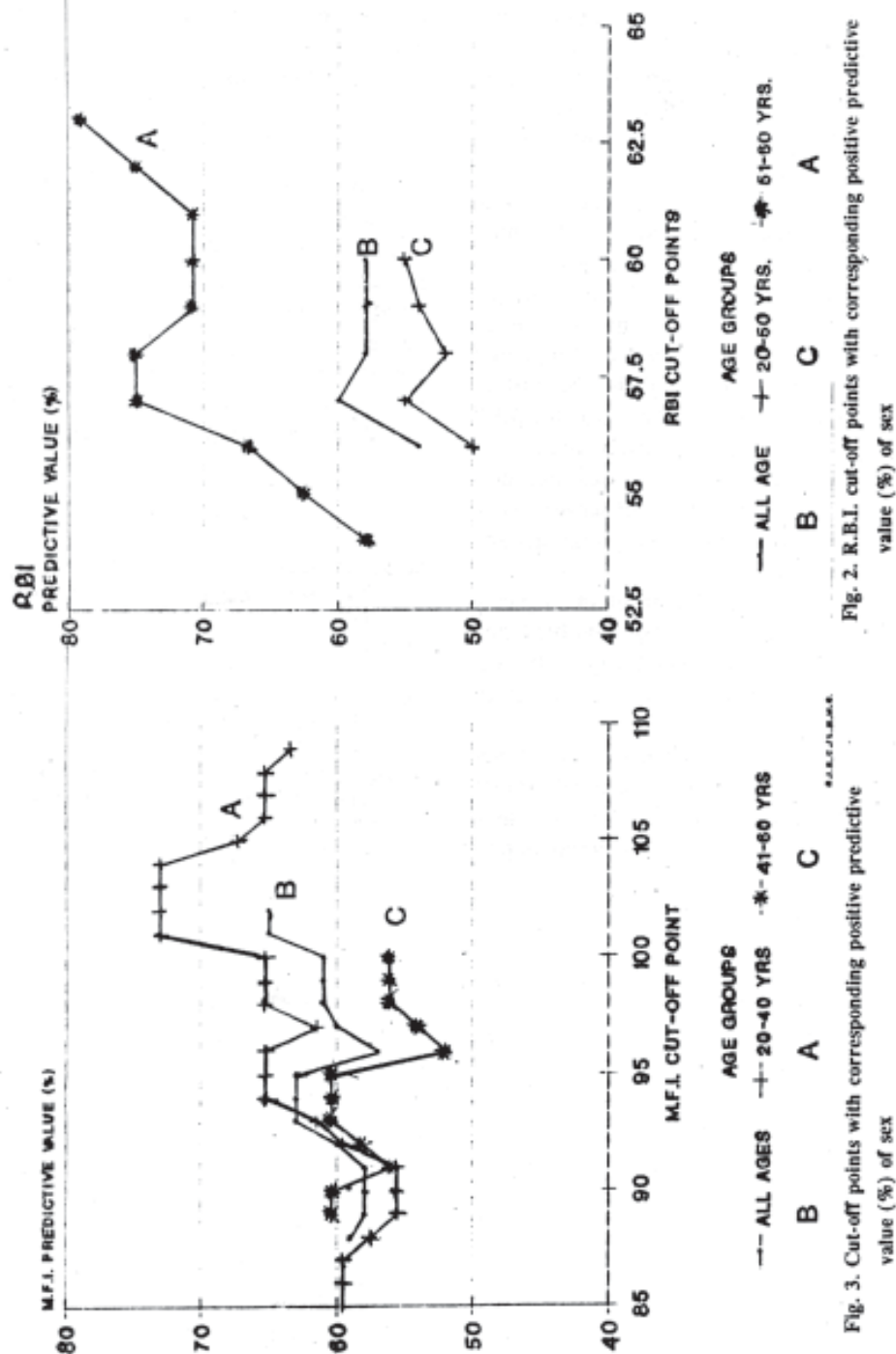


Fig. 2. R.B.I. cut-off points with corresponding positive predictive value (%) of sex

Fig. 3. Cut-off points with corresponding positive predictive value (%) of sex

Although the predictive value of RBI at the cut-off point (57) was observed to increase in the higher age range of 51-60 years, the sample size was too small to arrive at a definite conclusion. Such observations were not marked to a significant extent with MFI in the same age span.

Of the two indices, RBI was noticed to be age dependent as opposed to MFI. RBI seemed to be more effective in the age range of 20-50 years while MFI might be utilised in all the ages between 20-60 years with equal efficiency that is to say that the efficiency of RBI appeared to be influenced by the age of the 'Mandible' bone while the same did not hold true for MFI.

Barring unavoidable and inadvertent technical errors in regard to the various measurements, the readings were observed very carefully to prevent erratic interpretations and inferences.

The complexity of the problem is partly due to the skill and expertise involved and partly also for the non-availability of the essential tools like Mandibulometer etc. at all the Medico-legal centres.

However, this is a preliminary and innovative work, in the field of advanced Forensic Medicine which can obviously be taken as a precious guideline for the establishment of per-

sonal identity from even broken pieces of Mandible bones in human beings. Added invaluable informations on this can of course be had from more and more studies on this aspect.

CONCLUSION

Relative efficiency of MFI and RBI was proved from the study of various cut-off points, test cut-off points including the sensitivity and specificity. The 'Maximas' were observed to be at RBI cut value of 57 and MFI cut point value of 95 where a sizeable chunk of specimens could be classified correctly, as males and females, in other words, the maximum predictive values were obtained at the above cut-off points.

REFERENCES

- Modi, N.J.: *Modi's Text Book of Medical Jurisprudence and Toxicology*, N.M. Tripathy Pvt. Ltd., Bombay, 19th Edition (1979).
- Morant, G.M.: A Biometric study of human mandible. *Biometrika*, 28: 34-122 (1936).
- Martin, E.X.: A study of Egyptian series of mandibles with special reference to mathematical methods of sexing. *Biometrika*, 28: 149-178 (1936).
- Sarangi, M.P., Sharma, G.K. and Verma, R.K.: Sexing of human mandibles from ramal-breadth and mandibulo-foraminal index. *J.Hum. Ecol.*, 5 : 211-216 (1994).