AN EARLY PREDICTOR IN LEPROSY - THE ATD ANGLE

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ABSTRACT

Leprosy is responsible for significant morbidity and deformity in India which is largely preventable if diagnosed and treated early. This early diagnosis forms the rationale for undertaking this dermatoglyphics study under which the atd angle (a-triradius under index finger, t-axial triradius between thenar and hypothenar area in the line of fourth metacarpal, d-triradius under little finger) has been measured. 100 leprosy cases have been selected from Leprosy ward and the OPD of Dermatology of Govt. Medical College, Surat with 50 age matched controls. It was observed that the atd angle was significantly low ($p<0.05$) in leprotic patients as compared to the control group (table I). In the case of MB (multibacillary) leprosy cases the atd angle was significantly low in the left hand ($p<0.05$) as compared to the control group (table II). No significant differences were observed in the right hand of MB leprosy cases. On the other hand in case of PB (paucibacillary) leprosy cases, the atd angle was significantly low ($p<0.05$) in both hands as compared to controls (table III). There was no statistically significant difference observed among MB and PB leprosy cases (table IV).

Thus the study reveals a shortening of atd angle in leprosy patients as compared to healthy controls. These findings need further exploration and validation for use as a tool for early prediction of leprosy cases.

KEY WORDS: Leprosy, atd angle, Dermatoglyphics.

INTRODUCTION

Leprosy, an infectious disease caused by Mycobacterium leprae is responsible for significant morbidity and deformity in India. This morbidity and deformity is largely preventable if the cases are diagnosed and treated at an early stage. Screening is an important tool for early detection and diagnosis of various diseases. This implies that logically screening for leprosy can ensure early diagnosis of the disease and reduction in the morbidity and deformity and thus constitute an integral component of a health care system for early diagnosis of leprosy cases. Studies have shown that leprosy is a HLA- linked genetic disease (De Vries et al 1976)[1] and genetic influence on leprosy has also been documented in various studies (De Vries et al 19761, Saha and Agarwal 1979)[2]. Ridley and Jopling (1966)3 had reported that the leprosy is determined by the host cell mediated immunity showing tuberculoid leprosy with high intact cellular immunity and lepromatous leprosy with absence or very low cell mediated immunity.

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The atd angle is also decided genetically and determined in foetal life itself (Sadler 2006)4. The epidermal ridges begin to appear in embryos at 10th week and are permanently established by 17th week (Moore 2008)5. Any growth disturbances (genetic or teratogenic) of the hand and feet, during this decisive period in fetal life may alter or distort the ridge alignment and disturb the dermatoglyphic patterns. The inheritance of most of dermatoglyphic features confirm to a poly[illegible]nic system with individual gene contributing a small additive effect (Schaumann and Alter, 1976)6.

The a, b, c and d are digital triradii located at the base of index, middle, ring and little fingers accordingly on palm as shown in fig.-1. Triradius is the centre of delta shaped junction of three radiant (line) making an angle of 120° with one another. The atd angle is constructed by joining of three triradii a, t, and d. The axial triradius't' is situated between thenar and hypothenar area in the line of fourth metacarpal. The atd angle once formed remains unchanged throughout the life.

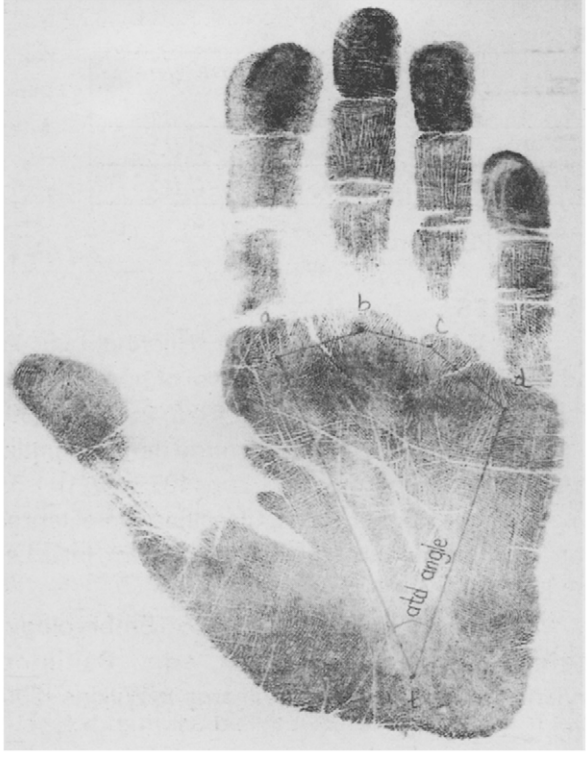
This study was undertaken to explore whether atd angle can be utilized as an indicator to assess if an individual is prone to leprosy. The number of such studies are very scant and therefore the necessity for further research to help us to

diagnose leprosy cases at an early stage when deformities are entirely preventable.

MATERIALS AND METHODS

100 cases of leprosy belonging to South Gujarat in the age group of 18 to 60 years have been studied. They were selected from Leprosy ward and OPD of Dermatology of Govt. Medical College. Out of 100 cases, 66 cases were of multibacillary leprosy and 34 cases were of paucibacillary leprosy. Patients with palmar deformity have been excluded as studying of the atd angle is not possible in these patients. 50 persons of same age group who had no previous or present evidence of leprosy or any other congenital or hereditary illness were selected as a control group.

Palmar prints were taken, using the Ink and Pad technique as described by Cummins and Midlo (1961)[7]. The person whose print was to be taken asked to wash the hands thoroughly with soap and water and then dry them completely with a clean towel. Subsequently the person was asked to place the hands on a tile smeared with printer's ink, and then place the hands on a white drawing sheet with uniform pressure for taking palmar prints. These prints were subsequently analysed for study of the atd angle. The leprotic patients well classified on Ridlay and Jopling scale (1966)[3].



OBSERVATION

The atd angle is constructed by joining of three triradii a, t, and d. The axial triradius't' is situated between thenar and hypothenar area in the line of fourth metacarpal. (fig. 1). It was observed that the atd angle was significantly low ($p<0.05$) in leprotic patients as compared to the control group (table I). In the case of MB leprosy cases the atd angle was significantly low in the left hand ($p<0.05$) as compared to the control group (table II). No significant difference was observed in the right hand of MB leprosy cases. On the other hand in case of PB leprosy cases, the atd angle was significantly low ($p<0.05$) in both hands as compared to controls (table III). There was no statistically significant difference observed among MB and PB leprosy cases (table IV).

DISCUSSION

De Vries et al (1976)[1], Saha and Agarwal (1979)[2] and Ridley and Jopling (1966)[3] have reported genetic predisposition in leprosy. The atd angle once formed remains unchanged throughout the life and is decided genetically and determined in fetal life itself (Sadler 20064, Moore 2008)[5]. Even any growth disturbances (genetic or teratogenic) during the decisive period in fetal life may disturb the dermatoglyphic patterns. This proves that the atd angle is formed and established in fetal period and never changes in life.

The degree of predisposing of a gene towards a disease manifestation and it's time of expression is very difficult to predict in certain disorders and the same is true for leprosy also.

The genetic influence on leprosy and atd angle has already been discussed. Furthermore the atd angle is determined in fetal life but leprosy manifests later in life. Therefore leprosy does not cause changes in the atd angle but the atd angle can be a predicator of predisposition to leprosy. Therefore it would be a prudent strategy to screen individuals for changes in the atd angle. This could be followed by measures such as health education on leprosy, early detection and cure of leprosy. All these measures will ensure complete cure and prevention of morbidity and physical deformities due to leprosy.

The observation of no significant differences of the atd angle in the right hand in MB leprosy cases as compared to the control group (table II). It is similar to the observations of Nagar SK et al (1981)[8], Ghei SK et al (1985)[9] and Bumb RA et al (1985)[10]. However the

CRITERIA	*HAND*	*TOTAL(PB+MB) (n=100) MEAN ± SD*	*CONTROL (n=50) MEAN ± SD*	*p Value*
atd angle	*RIGHT*	*40.23 ± 4.81*	*42.32 ± 4.8*	*<0.05*
	LEFT	*40.92 ± 5.23*	*43.5 ± 5.6*	*<0.05*

Table no.-I : Comparison of atd angle of Total case (PB+MB) & Control
MB multibacillary, PB - paucibacillary leprosy

CRITERIA	**HAND**	**MB (n=66) MEAN ± SD**	**CONTROL (n=50) MEAN ± SD**	**p Value**
atd angle	**RIGHT**	40.23 ± 4.81	42.32 ± 4.8	>0.05
	LEFT	40.92 ± 5.22	43.5 ± 5.6	<0.05

Table no.-II Comparison of atd angle of MB Leprosy & Control

CRITERIA	**HAND**	**PB (n=34) MEAN ± SD**	**CONTROL (n=50) MEAN ± SD**	**p Value**
atd angle	**RIGHT**	40.23 ± 4.48	42.32 ± 4.8	<0.05
	LEFT	40.92 ± 5.22	43.5 ± 5.6	<0.05

Table no.-III Comparison of atd angle of PB Leprosy & Control

CRITERIA	*HAND*	*MB (n=66) MEAN ± SD*	*PB (n=34) MEAN ± SD*	*p Value*
atd angle	*RIGHT*	*40.23 ± 4.81*	*40.23 ± 4.48*	*>0.05*
	LEFT	*40.92 ± 5.22*	*40.92 ± 5.22*	*>0.05*

Table no.-IV Comparison atd angle of MB & PB Leprosy

finding of significant difference in the atd angle of left hand among MB leprosy cases and controls is contrary to the Ghei SK et al (1985)[9]. Our finding of significant differences in both of the hands in the case of PB leprosy cases and in left hand of MB leprosy cases as seen in table II & III is a new finding hitherto unreported.

CONCLUSION

The present study reveals a shortening of the atd angle in the left hand of MB leprosy patients and in both hands in PB leprosy cases as compared to healthy controls. This is a novel finding and if duplicated and validated by studies elsewhere can form an important plank for application as an early predictor of leprosy.

REFERENCES

1. De Vries RRP, Fat RFMLA, Nijenhuis LE, Van Rood JJ, HLA-Linked genetic control of host response to mycobacterium leprae. Lancet 1976; 2:1328-1330.
2. Saha K, Agarwal SK, Immune deficit in patient with lepromatous leprosy. Int J. Lepr 1979; 47(1):1-5.
3. Ridley D, Jopling WH, Classification of leprosy according to immunity- a five group system. Int J. Lepr 1966; 34: 255.
4. Sadler TW; Langman's Medical Embryology in Integumentary System. 10th edn. Baltimore, Maryland, USA: Lippincott Williams & Wilkins. 2006, p336.
5. Moore Keith L, Persaud TVN;The Developing Human in The Integumentary System. 8th edn. Philadelphia, Pennsylvania: Saunder & Co. 2004, p440.

6. Schaumann B, Alter M, Dermatoglyphics in Medical Disorders. 1976; New York: Springer-Verlag, pp187 - 189.
7. Harold Cummins and Charles Midlo, Palmar and Plantar Epidermal Configurations (Dermatoglyphics) in Eurpoean Americans, Am J Phys Anthropol, 1926; 9:471-502.
8. Nagar KS, Laha NN, Sethi NC, Mehta RS, Palmar dermatoglyphic in leprosy. J. of Association of Physician of India 1981; 29: 841-847.
9. Ghei SK, Girdhar BK, Ramu G, Katoch K, Ramanathan U, Sengupta U, Desikan KV. Dermatoglyphics in leprosy (Metric analysis of palms). Indian J Lepr. 1985; 57(4):826-833.
10. Bumb RA, Busar RP, Kothari A, Singhi MK, Jain S. Dermatoglyphics in leprosy. Indian J Lepr. 1985; 57(4):834-40.