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Dermatoglyphics in Primary Glaucoma Patients

KEYWORDS: Primary glaucoma, Dermatoglyphics, Kolkata

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ABSTRACT *The paper reports the findings of a study conducted to identify dermatoglyphics characteristics that can be used as screening tools for persons susceptible to primary glaucoma. Data was collected on 103 primary glaucoma patients(30 males,73 females) from glaucoma OPD of NRS Medical College and Hospital, Kolkata and on 87 controls(40 males,47 females). The study revealed that the occurrence of whorl pattern was significantly less in female primary glaucoma patients as compared to the female control group, but the arch pattern showed significantly higher chance of occurring in female patients in comparison to the control group.*

INTRODUCTION

Primary glaucoma is characterized by an increase in intraocular pressure without an external cause or other disease. Glaucoma is the second leading cause of blindness globally after cataract (WHO, 2004), and perhaps presents an even greater public health challenge as the blindness it causes is irreversible. The etiopathogenesis of glaucoma is still unknown. However, persons with family history of glaucoma have been noted to be at more risk of developing glaucoma (WHO, 2004). The association of primary glaucoma with twenty genetic loci and three genes-MYOC, OPTN and WDR36 confirms the family occurrence of glaucoma (Koolwijk et al, 2007).

Dermatoglyphics are the dermal ridge configuration on the digits, palm and soles. These features are found to be permanent variables and are inherited. Once formed, they remain permanent and never change throughout life except in dimension in commensurate to the growth of the individual. Abnormalities in the dermal ridge pattern may result from genetic defects in the individual. Several studies have been conducted on affections with a strong hereditary background like schizophrenia, diabetes mellitus, debilitating dementia, psoriasis, autistic disorder, thalassemia (cf. Milicić, 2003, Dogramaci, 2009, Schaumann B and Alter M, 2007). Significant differences have been demonstrated between the dermatoglyphic pattern in the patients and phenotypically normal individuals. Katia et al. (2005, 2006) conducted finger and palmar dermatoglyphic studies on primary open angle glaucoma patients. The results show that the dermatoglyphic traits of the digito-palmar complex in patients affected by primary glaucoma differ from that of phenotypically healthy population. The results mostly affirm the existence of genetic predisposition for the development of primary glaucoma, thus emphasising the relevance of hereditary factors in the etiopathogenesis of this disease.

The present study was conducted with the prime concern of investigating the reliability of dermatoglyphics as a predictive diagnostic tool for primary glaucoma. For this, the dermatoglyphic patterns in primary glaucoma patients were analysed and the results were compared with normal healthy controls. No chromosomal investigations were carried out.

MATERIALS AND METHODS

Data was collected on 103 patients (30 males, 73females) with primary glaucoma from glaucoma OPD of NRS Medical College and Hospital, Kolkata, and on a control group consisting of 87 normal healthy people (40 males, 47 females) who did not have any family history of primary glaucoma.

A history of visual symptoms and detailed family history of glaucoma was taken. Clinical examination including refraction, tonometry, gonioscopy, opthalmoscopy and visual field testing was done. For qualitative study, digito-palmar prints were taken by traditional ink method proposed by Cummins and Middlo (1976). To carry out a quantitative study, the following were determined and compared with the control group:

(i) Finger ridge count (FRC), which is the number of ridges the line from the center of a loop to a marking known as the triradus crosses (see Figure 1). The triradus is formed by the forking of a ridge so that a Y-shape state can be recognized.
(ii) Total finger ridge count (TFRC), which is the total of the TRCs of all fingers
(iii) Asymmetry of finger ridge count (AFRC), which is calculated by the following formula (cf. Pour-Jafari et al., 2003) –

$$\sqrt{A^2} = \sqrt{\sum_{i=1}^{5}(R_i - L_i)^2},$$

where $\sqrt{A^2}$ = asymmetry of finger ridge count, R_i =ridge count of the i^{th} finger on the right hand and L_i = ridge count of the i^{th} finger on the left hand.

Finally, the results of case and control groups were statistically compared.

Statistical analysis was carried out using MINITAB Release 13.31 and Microsoft EXCEL. For comparing frequencies, frequency Chi-square test has been used. Test for equality of averages has been carried out using two sample t-test and paired t test, as necessary, and proportions have been tested assuming asymptotic normality.

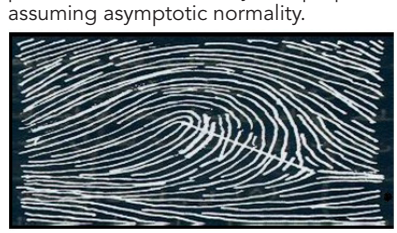

Figure 1: Showing how to count the ridges of a loop-shaped fingerprint

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RESULTS

The relative frequencies of dermatoglyphic patterns of fingers are presented in Table 1. The 'loop' pattern occurred with highest frequency for both males and females (57.34% in male patients and 64.93% in female patients; 62.25% in male controls and 63.61% in female controls). On the other hand, the 'arch' pattern was least observed among both patients and controls (4.33% in male patients and 9.04% in female patients; 5.25% in male controls and 1.70% in female controls). For males, there was no significant difference in relative frequencies of patterns between the patients and the controls (χ^2 = 2.652, p-value = 0.266). But significant difference in the same was noted between female patients and controls (χ^2 = 32.327, p-value <0.001). In fact, the occurrence of arch-type fingers was significantly higher in female patients than in female controls (p-value <0.001), while the occurrence of whorl- type fingers was significantly lower in female patients as compared to female controls (p-value = 0.001).

Tables 3 and 4 make a comparative study of the mean finger ridge counts (FRCs) of the patients and the control group for males and females respectively. It was observed that the mean finger ridge counts (FRCs) of the thumb and ring fingers were higher for the control group and also for the female patients in comparison to the other fingers in both hands. However, for male patients, though the mean FRCs were higher in the thumb and ring fingers of the left hand, for the right hand the mean FRCs of the index and the ring fingers showed higher values than those of the other fingers. The average TFRC for female patients (169.438) was noted to be significantly smaller (p-value =0.033) than the average TFRC for female controls (195.66). Further, the female patients showed a significantly lower mean TFRC in the left hand than that in the right hand (81.21, 88.23; p-value = 0.005), but no significant difference between the two were indicated for female controls (96.60, 99.06). On the other hand, the mean TFRCs of male patients (200.433) and male controls (176.75) differed insignificantly. Also, no significant difference was noted between mean TFRCs of left and right hands of male patients (101.57, 98.87), but male control showed a significantly lower mean TFRC of the left hand as compared to that of the right hand (85.55, 91.20; p-value = 0.008).

The average asymmetry of finger ridge count (AFRC) was obtained as 20.0 for female patients, 23.7 for male patients, 19.0 for female controls and 17.75 for male controls. This indicated a significantly higher mean AFRC for male patients as compared to male controls (p-value = 0.026).

DISCUSSION

Established risk factors for primary glaucoma are age, race, intra ocular pressure (IOP), central corneal thickness (CCT), high myopia and a positive family history (Tielsch et al.,1994, Wolfs et al.,1998). Extensive genetic studies conducted in recent years on the genetic contribution to glaucoma have revealed an association with twenty genetic loci and three genes (Koolwijk et al., 2007). In this study, chromosomal studies were not conducted on cases or controls; however, the dermatoglyphic variations in glaucoma patients were investigated to identify any additional evidence that could support a genetic cause in the aetiology of glaucoma, and also to provide a screening tool for persons susceptible to primary glaucoma.

The study shows that female primary glaucoma patients are more inclined to having arch pattern fingers but less inclined to whorl pattern as compared to female controls. Further, the total finger ridge count of a female patient is expected to be lower than that of a female control. For a male patient, the asymmetry measure of finger ridge count is likely to be higher than that of a male control. These may provide as screening tools for persons susceptible to primary glaucoma.

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Table-1: Relative frequencies of dermatoglyphic patterns of fingers in patients with primary glaucoma and controls

	No.	Arch(%)	Loop(%)	Whorl(%)
Male Patients	30	4.33	57.34	38.33
Male Controls	40	5.25	62.25	32.50
Female Patients	73	9.04	64.93	26.03
Female Controls	47	1.70	63.61	34.69

Table-2: Comparison of frequencies of different types of fingerprints between male patients with primary glaucoma and male controls

Types of Fingerprints	Male Primary Glaucoma Patients No. (%)	Male Controls No. (%)	Chi-square	Inference
Loop	172(57.34%)	249(62.25%)		
Whorl	115(38.33%)	130(32.50%)	2.652	Not significant
Arch	13(4.33%)	21(5.25%)		(p-value =0.266)
Total	300	400		

Table-3: Comparison of frequencies of different types of fingerprints between female patients with primary glaucoma and female controls

Types of Fingerprints	Female Primary Glaucoma Patients No. (%)	Female Controls No. (%)	Chi-squares	Inference
Loop	474(64.93%)	299(63.61%)		
Whorl	190(26.02%)	163(34.69%)	32.327	Significant
Arch	66(9.04%)	8(1.70%)		(p-value <0.001)
Total	730	470		

Table-4: FRC in male primary glaucoma patients and male controls

Types of Fingers	Male Glaucoma Patients		Male Controls	
	Left Hand No. (Mean)	Right Hand No. (Mean)	Left Hand No. (Mean)	Right Hand No. (Mean)
Thumb	725(24.17)	593 (19.77)	755(18.87)	908(22.70)
Index	555(18.50)	632(21.07)	614(15.35)	549(13.72)
Middle	497(16.57)	575(19.17)	675(16.87)	772(19.30)
Ring	22(24.06)	666(22.20)	837(20.92)	837(20.92)
Small	48(18.26)	500(16.67)	541(13.52)	582(14.55)

Table-5: FRC in female primary glaucoma patients and female controls

Types of Fingers	Female Glaucoma Patients		Female Controls	
	Left Hand No. (Mean)	Right Hand No. (Mean)	Left Hand No. (Mean)	Right Hand No. (Mean)
Thumb	1417((19.41)	1610(22.05)	1127(23.97)	1256(26.72)
Index	907(12.42)	1163(15.79)	902(19.19)	926(20.34)
Middle	1094(14.99)	1152(16.00)	926(19.70)	853(18.14)
Ring	1455(19.93)	1401(19.19)	1012(21.53)	998(21.23)
Small	1055(14.55)	1105(15.13)	686(14.59)	623(13.25)

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REFERENCE

1. Dogramaci A.C., Savas N., Bagriacik M.A., Dermatoglyphs in patients with beta-thalassemia major and their thalassemia carrier parents. Coll Antropol. 2009; 33(2):607-11. | | 2. Glaucoma is second leading cause of blindness globally. Bulletin of the World Health Organization 2004; 82: 811-890. | | 3. Koolwijk M.E., Leoneke, Desprich D.G., Dominick, Kaur Kiranpreet, Parikh S., Rajul, Manda, Anil K., Genetic Contribution to Glaucoma. Heritability of Intraocular pressure, Retinal Nerve fibre Larger Thickness, and Optic Disc Morphology, Investigative Ophthalmology and Visual Science 2007; 48: 3669-3676. | | 4. Milicić J., Bujas Petković Z., Bozikov J., Dermatoglyphs of digito-palmar complex in autistic disorder: family analysis. Croat Med J. 2003; 44(4):469-76. | 5. Novak-Laus K., Milicić J, Tedeschi-Reiner E., Iveković R., Mijić V., Masnec-Paskvalin S., Zrinsćak O., Mandić Z., Analysis of the Quantitative Dermatoglyphics of the Digito-Palmar Complex in patients with Primary Open Angle Glaucoma. Coll.Antropol.2005; 29(2):637-642. | | 6. Novak-Laus K., Milicić J., Tedeschi-Reiner E., Iveković R., Korsić J., Zrinsćak O., Mandić Z., Analysis of the Qualitative Dermatoglyphics of the Digito-Palmar Complex in patients with Primary Open Angle Glaucoma. Coll.Antropol.2006; 30:163-170. | | 7. Pour-Jafari H., Farhud D.D., Bagher-Nejad S., Dermatologyphical comparison of mental retarded children and exceptional talents with students of the usual schools in Hamadan. Abstract book, First National congress on Human Genetics, Shahrekord, Iran, 2000; p. 22. | | 8. Schaumann B., Alter M,. Dermatoglyphics in Medical Disorders. Springer- Verlag, NY,1976. | | 9. Tielsch J.M., Katz J., Sommer A., Family history and risk of primary open angle glaucoma, The Baltimore Eye Survey. Arch.Opthalmol.1994; 112: 69-73. | | 10. Wolfs R.C., Klaver C.C,, Ramrattan R.S., Genetic risk of primary open angle glaucoma: population based familial aggregation study.Arch.Opthalmol.1998;116:1640-1645. |