Study Of Palmar Dermatoglyphics In Essential Hypertension

Deepa G

Assistant Professor, Department of Anatomy, Navodaya Medical College, Raichur.Karnataka. 584103

Abstract : Background & Objectives:This study was done to identify people with the genetic predisposition to develop essential hypertension, to determine significant dermatoglyphic parameters applicable to essential hypertension, to develop an inexpensive tool for screening cases of essential hypertension and thereby reducing mortality and morbidity.Methods: 100 patients (50 males and 50 females) were taken as subjects from the NMCHospital, Raichur and equal number of healthy subjectsfrom the general population as controls who matched for genders, lifestyle and economic status as that of patient. Fingerprint pattern of all of them was recorded using duplicating ink. The prints were then subjected to dermatoglyphic analysis.Results:Significant dermatoglyphic findings were observed in hypertensives compared to control viz. decreased a-b ridge counts, decreased 'adt' angle, lower 'dat' angle value, higher ridge count value, and more arches and least loops than controls.Conclusion:Significant findings of dermatoglyphic features were observed in hypertensives compared to control group. Dermatoglyphics provide a simple, inexpensive means of determining the diseases which have a strong hereditary basis, and can be employed as a method of screening for essential hypertension. [Deepa G et al NJIRM 2013; 4(3) : 61-65]

KEY Words: blood pressure, dermatoglyphics, fingers, hand, hypertension

Author for correspondence: Dr.Deepa G, Assistant Professor, Department of Anatomy, Navodaya Medical College, Mantralayam Road,Raichur. Karnataka state. India-584103. Email: drdeepagadwal@gmail.com

Introduction: Dermatoglyphics is the scientific study of epidermal ridges and their configurations on palmar region of hand and fingers and plantar region of foot and toes. It is also known as 'Epidermal ridge configurations'. The term dermatoglyphics was coined by Cummins and Midlo in 1926. It was derived from the Greek words-derma (skin) and glyphics (curve) [1].

In 1892 Sir Francis Galton demonstrated that epidermal ridge configuration did not change throughout postnatal life. The fact that ridge configurations are not affected by environment or by age, has been an important framework in genetic studies[2]. Abnormal dermatoglyphic pattern have been observed in several non chromosomalgenetic disorders or other diseases whose etiology may be influenced directly or indirectly by genetic inheritance[3]. There are thousands of diseases known to be caused by abnormal genes. If there is any abnormality in the genetic makeup of parents, it is inherited to the children and is reflected in dermatoglyphic patterns. It has been observed that dermatoglyphic shows definite diagnostic changes in those disorders which show genetic basis[1].

Dermatoglyphics are also used in the branch of forensic science for individual identification. It is a valuable research tool in the field of physical anthropology, human genetics and medicine. The present attempt is to study the correlation between hypertension and dermatoglyphics.

Essential hypertension is defined as sustained high blood pressure not attributable to a single cause but reflecting the interactions of multiple genetic and environmental influences such that siblings of hypertensive parents stand a higher chance of developing hypertension in later life[4]. In about 80-95% of cases cause of hypertension (chronic elevation in blood pressure >140/90) is idiopathic or primary and these cases are referred as essential hypertension[5]. Its incidence vary markedly in different regions with rates as low as 3.4% (men) and 6.8% (women) in rural India.

The importance of dermatoglyphics is not to diagnose, but to prevent by predicting a disease, not for defining an existing disease but to identify people with the genetic predisposition to develop certain diseases. Also dermatoglyphics helps in the early detection of cases of essential hypertension.

Material and Methods: Approval of the Institute Research Council and Ethical Committee was obtained prior to commencement of the study. One hundred Patients (50 male and 50 female) with Essential hypertension attending outpatient and in-patient medicine department of Navodaya

Medical College Hospital, Raichur (Karnataka) were included in the study as test group. Another 100 healthy Subjects (50 male and 50 female) who matched for gender, lifestyle and economic status as that of patients were included as members of control group.Materials usedfor the study include duplicating ink, stamp pad, roller, bond paper, hand lens and a protractor.

The modified Purvis-Smith method using a stamp pad, bond papers and roller was used to collect samples[6]. Patients were asked to wash both their hands with soap and water, so as to remove any oil or dirt. The duplicating ink is smeared on both hands uniformly over the palm and digits by the roller taking care that hollow of the palm and the flexor creases of the wrist were uniformly inked. The hand of the patient was then placed on the bond paper from proximal to distal end. The palm was gently pressed between intermetacarpal grooves at the root of fingers and on the dorsal side corresponding to thenar and hypothenar regions. The procedure was repeated with the other hand on a separate paper (Fig. 1 & Fig 2).

The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens and protractor and ridge counting was done with the help of a sharp needle (Fig. 3).The quantitative analysis was done with parameters that included Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), ridge count of individual fingers, a-b ridge count, angles atd, dat, adt and main line index. The statistical methods applied include descriptive statistics, contingency table analysis and analysis of variance-two way. The qualitative tests included finger print patterns, palmar patterns, C-main line type, main line terminations and palmar flexion creases. The master chart thus prepared was subjected to statistical analysis. Statistical calculations were done by SPSS v16.0.A p-value less than 0.05 considered as significant and 0.01 as highly significant.

Result:

Various dermatoglyphic parameters were considered in the palms and fingers of 100 hypertensives and compared the same with 100 control subjects (50 Hypertensive Males, 50 Hypertensive Females; 50 control Males, 50 control Females).

Fig 1: Fingerprint Documentation Of Right Hand

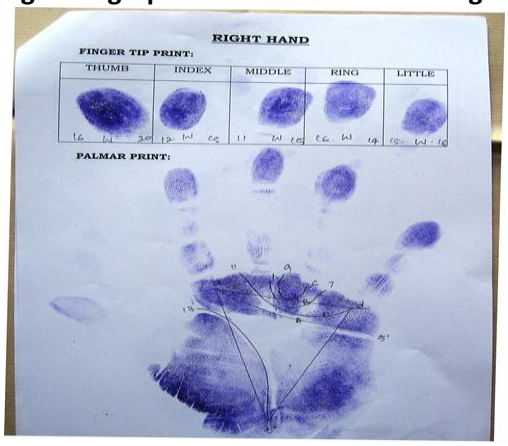
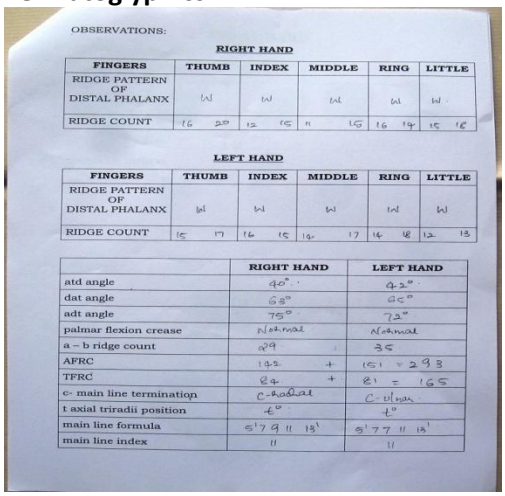


Fig 2: Fingerprint Documentation Of Left Hand

Fig 3: Proforma For Assessment Of Dermatoglyphics



The parameters include TFRC (Total Finger Ridge Count), AFRC (Absolute Finger Ridge Count), Ridge count of individual fingers, a-b ridge count, angles (atd, dat, adt) and Main line index for quantitative analysis and finger print patterns(whorls, loops, arches), palmar patterns, C-main line termination type, main line terminations, palmar flexion creases (major creases) and t-axial triradii position are included for qualitative analyses.

In the present study, significant findings of hypertensive compared to control include:

- Decreased a-b ridge counts in hypertensives.
- Decreased 'adt' angle in hypertensives.
- Hypertensive had lower 'dat' value than control.
- In first digit (D1) and fifth digit (D5), hypertensive had higher ridge count value than control.
- In second digit (D2), in left hand control had higher ridge count value and in right hand,hypertensive had higher ridge count value than control group. In second digit (D2), female hypertensive had more whorls and loops and least arches than controls.

In case of hands combined, second digit (D2) in male hypertensive showed more arches and least loops than controls.

In left hand, in male subject, c-ulnar and c-radial were more in control group than hypertensive whereas in female subject, c-absent and c-ulnar were more in hypertensive than control group, c-radial were more in control group.

In combined hand, c-ulnar were more in control group than hypertensive in male subject whereas c-radial were more in control than hypertensive in female subject. In left hand, 11 9 7 5' 13' were more in control in both male and female.

Significant findings of male hypertensive compared with control include:

- In first and fourth digit, male hypertensive showed more whorls and arches and least loops than control.
- Male hypertensive showed more 11 9 7 5' 13' than control.
- Decreased a-b ridge counts.
- Decreased 'atd' angle.
- Increased fingertip ridge count in D1, D3 and D5.

Significant findings of female hypertensive compared with control include –

- Increased 'dat' angle.
- Hypertensive had more whorls and arches and least loop in D1.
- More 11 9 7 5' 13' main line formula type frequency in control than hypertensive.
- Significant findings of dermatoglyphics parameter of male (hypertensive and control included) compared with female include –
- Female had significantly higher a-b ridge counts compared to male.
- Male had higher 'atd' and 'adt' value compared to female.

Discussion: Total and absolute finger ridge counts: The present study showed that in first digit (D1) and fifth digit (D5), hypertensive had higher ridge count value than control. In second digit (D2), in left hand control had higher ridge count value and in right hand, hypertensive had higher ridge count value than control group. In a study by Reed T, hypertensive co-twins showed lower ridge counts on the left hand than the controls[7]. Pursnani ML et al. reported increased TFRC in hypertensives compared to controls[8].

a-b ridge counts: It was not included in any of the previous studies. In this study, a significant difference was observed between patient and control group.

Ridge Counts of individual fingers: In hypertensives, there was increased fingertip ridge count in D1, D2, and D5 of right hand compared to left hand. But, in the study by Reed T, hypertensive co-twins showed lower ridge counts on the left hand than the controls[7].

Angles (atd, dat, adt): In our study, controls are found to have higher 'adt' angle value than patients. Godfrey KM et al. analysed people with long hands and a narrow palmar angle are found to have higher systolic pressures[9]. Jain PK et al. reported decreased 'atd' angle in hypertensive cases in both sexes as compared to controls[10]. Kulkarni DU revealed the same result in their study[11].

Main Line Index (MLI): This parameter was not included in earlier studies and in the present study, more 11 9 7 5^{l} 13^{l} main line formula type frequency was observed in female controls than hypertensives.

Fingertip patterns (Whorls, Loops, and Arches): Rashad MN et al. study showed that the individuals with myocardial infarction had a significantly higher frequency of whorls and correspondingly lower frequency of ulnar loops than the control group[12]. Godfrey KM et al. study revealed that whorls on the right hand were more strongly associated with higher systolic pressure than whorls on the left, mean systolic pressure rising by 2.2 mm Hg for each additional whorl on the right hand[9]. Jain PK et al. reported that whorls were dominant in essential hypertension subjects, followed by first blood relatives with essential hypertension compared to first blood relatives without essential hypertension and controls and ulnar loops were dominant in controls followed by first blood relatives without essential hypertension. A significant difference was also found regarding arches between the essential hypertensive subjects and the controls[10].

C-main line termination: This parameter was not included in earlier studies. In our study, there were no significant observations found in C-main line termination type.

Main line formulae: In this study, in left hand, 11 9 7 5^{l} 13^{l} main line formula was more in control in both males and females.

t-axialtriradii position :In the present study, significant associations were observed between t-axial triradii position frequency and groups, for males and females, left and right hands. Pursnani ML et al. analysed that axial triradii were absent in both the palms of the hypertensives exclusively compared to controls[8]. Jain PK et al. reported that 't' axial triradius was present in majority of controls compared to essential hypertensive subjects and a significant difference was observed in both right and left hands when first blood relatives with essential hypertensive and the cases of essential hypertensive were compared with controls[10].

Abnormalities in the epidermal ridges result either from genetic disease or foetal pathology, occurring sometime around the first trimester. Usually such changes occur during organogenesis period. From 'Cradle to grave' until the body decomposes, fingerprints remain unchanged. On this basis, any epidermal ridge alteration, present in a hypertensive patient, would be present since birth. Inspection of skin ridges, therefore, promises to provide simple, inexpensive means of determining whether a given patient had a particular chromosomal defect.

In the present study, we have aimed to determine significant palmar Dermatoglyphic parameters in essential hypertensives. These parameters can be used not only for early detection of Hypertension but also in suggesting various control measures to prevent the ill effects of the disease. The parameters studied will help us in setting the dermatoglyphic markers for hypertension.

Conclusion: In the present study, significant findings in dermatoglyphics were observed in hypertensiveswhen compared to control group. In the present study only palm and finger print dermatoglyphics were studied. A study of plantar prints can provide additional information. Many more studies are essential, using essential hypertension cases, toknow whether the dermatoglyphic findings are universally observed in these patients irrespective of age, sex and race. In addition to dermatoglyphic study in essential hypertension, cytogenetic study should be carried out to rule out chromosomal abnormality.

References:

1. Cummins H., Midlo C. Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics. New York:Dover. 1943.
2. William J Babler. Embryologic Development of Epidermal Ridges and their configurations. Birth defects: original article Series. 1991 27(2): 95-112.
3. Gupta UK, Prakash S. Dermatoglyphics: a study of fingertip patterns in bronchial asthma and it's genetic predisposition. Kathmandu University Medical Journal 2003; 1(4): 267-271.
4. Igighi PS, Msamati BC, Ng'ambi TM. Plantar and digital dermatoglyphic patterns in Malawian patients with diabetes, hypertension and diabetes with hypertension. Int. J Diabetes and Metabolism 2001; 9:24-31.
5. Eugene braunwald. Hypertension. In:Harrison's Manual of Medicine. 17th ed. New York: McGrawHill Medical. 2009: 693.
6. Ravindranath R, Thomas IM. Finger ridge count and finger print pattern in maturity onset diabetes mellitus. Indian J Med Sci 1995; 49: 153-6.
7. Reed T. On the association between adult blood pressure and dermatoglyphics as prenatal markers of development. J Hypertins. 1995; 13(6):595–601.
8. Pursnani ML, Elhence GP, Tibrewala L. Palmar dermatoglyphics in essential hypertension. Indian Heart Journal 1989; 41(2):119-122.
9. Godfrey KM, Barker DJP, Peace J, Cloke J, Osmond C. Relation of fingerprints and shape of the palm to fetal growth and adult blood pressure. British Medical Journal 1993; 307:405–409.
10. Jain PK, Sharma BK, Mathur BD. Dermatoglyphics in essential hypertension. Journal of Association of Physicians India 1984; 32(4):335-337.
11. Kulkarni DU, Herekar NG. Dermatoglyphics in Essential hypertension in Western Maharashtra Population. Journal of the Anatomical society of India 2005–06; 54(2):1.
12. Rashad MN, Mo MPP. Dermatoglyphic traits in patients with cardiovascular disorders. American Journal of Physical Anthropology 1976; 42:281-283.

Conflict of interest: None
Funding: None