Original Research Article

QUALITATIVE AND QUANTITATIVE ANALYSIS OF DIGITAL DERMATOGLYPHICS IN FEMALE REPRODUCTIVE CANCERS

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ABSTRACT

Introduction: Dermatoglyphics is the scientific study of ridges present on fingers, palms and soles. Female reproductive cancers shorten lifespan in women because of high mortality and morbidity. Detection at pre-invasive and micro-invasive stages makes near 100% survival of cancer patients. Genes that take part in the development of finger and palmar dermatoglyphics distinguish cancer patients from general population. It is possible that these genes also predispose to the development of malignancy.

Materials and Methods: Materials for the study consists of finger prints of outpatients and inpatients of the Department of OBG, Tirupati and Cancer Hospitals in and around Tirupati, Nellore and Kadapa. The ink prints of each finger were collected from 76 female patients who were diagnosed of having reproductive system cancer by histopathology report. 76 normal females of 30 – 60 years of age who are apparently normal are chosen randomly as control group.

Results: Present study on different female reproductive cancers, 76 normal and 76 female reproductive cancer cases were studied. Among the 76 cancer cases 49 are of cancer cervix and other 27 cancer cases are from other types of female reproductive system cancers that include endometrial, ovarian, vulval, vaginal, tubal and a combination of cervix and vagina. For statistical analysis, the total cases were categorized into control, cancer cervix and female reproductive cancers other than cancer cervix.

Conclusion: Since many investigations are needed to confirm the diagnosis of cancers, dermatoglyphics can be used as a screening procedure to define indications for laboratory procedures.

KEY WORDS: Dermatoglyphics, Digital Patterns,Female Reproductive System Cancer, Ridge Count.

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INTRODUCTION

Raised epidermal ridges with narrow grooves in between on the hairless skin of hands and feet are called finger prints. Cummins and Midlo [1] coined the term "Dermotoglyphics" for scientific study of fingerprints.

The dermal ridges on fingers develop during 10th week of gestation and are completed by 24th week. Chance, environment and heredity play

an important role in the development of individual's fingerprints. A finger print is unique to an individual and no two fingers have the same pattern even in identical twins. Finger-prints remain unchanged during life time.

Dermatoglyphic studies on palms of hand involves observation of two areas i.e., fingers and palms. Study of each area is by two methods – Qualitative and Quantitative dermatoglyphics.

Qualitative digital dermatoglyphics is the study of patterns on finger tips. These were classified [2,3] into three main types i.e., arches, loops and whorls depending on the number of triradii present with each having subtypes. Arches can be plain or tented. Loops depending on their direction are called radial and ulnar loops. Whorls have number of types called - plain, central pocket whorl, double Loop, accidental whorl and composites.

Quantitative dermatoglyphics is the study of number of ridges (ridge count) on the digits by drawing a line from triradius to the center of the pattern and counting the number intersecting the two points. v Arches have a ridge count of zero as they have no triradius. Loops have one triradius where as whorls have two triradii, hence higher ridge count.

Total finger ridge (TFRC) is the total sum of ridges on 10 digits. Absolute finger ridge count (AFRC) is obtained by addition of ridge counts of both radial and ulnar loops over fingers. TFRC determines the size of pattern and AFRC determines both pattern size and pattern intensity at same time [2]. The ridge count of a whorl consists of both the ridge counts and the higher one is considered as TFRC. When both ridge counts are considered, it is taken as AFRC. TFRC and AFRC are same if no whorls are present.

In the palm of hand the number of ridges between the triradii a and b are the commonly counted morphometric parameter. The a – b ridge count is normally taken along a straight line connecting triradius a with b. The count excludes the ridges forming the triradius.

Incidence of cancers in world and India: The estimation of cancer burden is valuable to set up priorities for disease control. The comprehensive global cancer statistics from the International Agency for Research on Cancer indicate that gynaecological cancers account for 19% of the 5.1 million estimated new cancer cases, 2.9 million cancer deaths and 13 million 5-year prevalent cancer cases among women in the world in 2002 [4]. Gynaecological cancers are a group of different malignancies of the female reproductive system which include cancers of ovary, cervix, uterus, vulva and vagina [5,6] and continue to be a major cause of morbidity as well as mortality in women worldwide [7]. In developing countries like India inspite of network of registries, a realistic estimate on gynaecological cancers is lacking due to poor knowledge about these cancers and health care seeking behaviour of the patients [8,9]. The available records reveal that majority of cancer cases present at an advanced stage [10] reducing the chances of survival even after treatment. Therefore, prevention, early detection and treatment seeking pattern for cancer needs more attention and it requires enhancement of knowledge and skills in the above areas [9]. Though the cancer incidence rate in India is less than that of the Western countries the magnitude of the problem is alarming due to large population size [10].

There is limited awareness on cervical malignancy as a threat to the health of middle aged women in the most productive period of their life [11]. Cervical cancer is the only gynaecological malignancy for which a screening modality is widely accepted and recommended to all women [12]. Being a laboratory based test, Pap smear requires appropriate infrastructure and skilled manpower. This is a cost effective procedure too. In Indian perspective, low-cost options are more acceptable. So we are making an attempt to correlate cancer with dermatoglyphics.

The most important parameter of dermatoglyphics is the inheritance. All the physical features of the human body including dermatoglyphics are inherited as per the laws proposed by Mendel [13]. Holt [14] formulated the theory of polygenic inheritance of total ridge count (summed ridge counts for all ten digits) with completely additive effects.

The objective of the present study is to analyze the finger prints in different cancers and

compare with controls for observing the differences in digital pattern.

MATERIALS AND METHODS

The present work is prospective as well as retrospective, observational and analytical study started after the approval by Institutional Ethical Committee of S.V. Medical College, Tirupathi. The material for the study consists of finger prints of outpatients and inpatients of the Department of OBG, Tirupati and Cancer Hospitals in and around Tirupati, Nellore and Kadapa. The ink prints of each finger were collected from 76 female patients who were diagnosed of having reproductive system cancer by histopathology report. 76 normal females of 30 – 60 years of age who are apparently normal are chosen randomly as control group.

RESULTS

In the present study on different female reproductive cancers, 76 normal and 76 female reproductive cancer cases were studied. Among the 76 cancer cases 49 are of cancer cervix and other 27 cancer cases are from other types of female reproductive system cancers that include endometrial, ovarian, vulval, vaginal, tubal and a combination of cervix and vagina. For statistical analysis, the total cases were categorized into control, cancer cervix and female reproductive cancers other than cancer cervix.

Analysis of finger print patterns on the digits presented a decrease in ulnar loops, increase in the whorls and other patterns in cancer cases when compared to controls in both hands. But they are not statistically significant. On digit- wise and side-wise analysis of qualitative parameter of finger print pattern, 1st and 2nd digits only presented statistically significant differences between controls and female reproductive cancer patients in the present study.

Patterns on 1st digit: Ulnar loops (53.7% vs 48.7%), whorls (28.2% vs 34.5%) and composite (9.2% vs 6%) patterns only were observed in that order on 1st digit of both hands in both control and cancer cervix cases respectively. The commonest pattern in other female reproductive cancers was found to be ulnar loops, whorls and composites in that order on 1st digit of both hands. One interesting observation is the absence of radial loop on the first digit of right hand in cancer patients when compared to controls in the present study. On the left 1st digit, the differences in the three groups with regard to the patterns (table.1) are found to be statistically significant (P=0.012; S).

Patterns on 2nd digit:

On the right 2nd digit the commonest pattern was found to be ulnar loop (47.3%, 48.9%, 40.7%) and whorl (32.8%, 38.7%, 33.3%) in that order in control, cancer cervix and female reproductive cancer cases other than cancer cervix respectively. On the left 2nd digit the commonest pattern was found to be ulnar loop (34.2%, 51%, 37%) and whorl (30.2%, 34%, 29%) in that order in control, cancer cervix and female reproductive cancer cases other than cancer cervix respectively. The differences with regard to the patterns are found to be statistically not significant (P=0.65; NS) on the right side. The differences in the three groups with regard to the patterns are found to be statistically significant (P=0.025;S) on the left side (Table.2).

In the present study, the mean Total Finger Ridge Count (TFRC) is found to be higher in normal group compared to cancer cervix and other cancers group. The mean Absolute Finger Ridge Count (AFRC) was found to be higher in cancer cervix compared to normal group and other cancers group. However, the differences in the mean TFRC as well as AFRC among the various groups are found to be not statistically significant (P>0.05; NS) (Table.3).

The a-b ridge count in the three groups ie., controls, cancer cervix and other than cancer cervix was not significant (Table 4) in the present study.

Table 1: First digit patterns of left hand in the groups.

Digit & Pattern	Normal group (N=76)	Cancer cervix (N=49)	Other cancers (N=27)	P value and Significance
UL	42(55.2%)	26(53%)	9(33%)	
W	18(23.6%)	19(38.7%)	5(18.5%)	χ2=194; P=0.012; S
C	13(17%)	3(6%)	9(33%)	
A	2(2.6%)	1(2%)	3(11.1%)	
RL	1(1.3%)	0	1(3.7%)	

Table 2: Second digit patterns of left hand in the groups.

Pattern	Normal group (N=76)	Cancer cervix (N=49)	Other cancers (N=27)	P value and Significance
UL	26(34.2%)	25(51%)	10(37%)	
W	23(30.2%)	17(34%)	8(29%)	$\chi2=17.5$; P=0.025; S
C	10(13.1%)	1(2%)	2(7%)	
A	8(10.5%)	2(4%)	7(25%)	
RL	9(11.8%)	4(8%)	0	

Table 3: TFRC and AFRC seen in different groups.

Ridge count	Normal group (N=76)	Cancer cervix (N=49)	Other cancers (N=27)	P value and Significance
TFRC (Mean ± SD)	114.2 ± 39.5	112.7 ± 37.2	102.1 ± 42.5	F= 0.96; P=0.38; NS
AFRC (Mean ± SD)	146.7 ± 66.1	151.8 ± 63.3	133.7 ± 63.3	F= 0.63; P=0.53; NS

Table. 4: a-b ridge counts seen in different groups in both hands.

Type of Angle	Normal group (N=76)	Cancer cervix (N=49)	Other cancers (N=27)	P value and Significance
Rt. a-brc (Mean ± SD)	34.0 ± 4.82	33.5 ± 4.69	34.7 ± 4.99	F= 0.56; P=0.57; NS
Lt. a-brc (Mean ± SD)	33.5 ± 5.43	34.0 ± 5.27	34.9 ± 4.36	F= 1.29; P=0.27; NS

Table 5: Percentage incidence of Female reproductive cancers.

Type of cancer	Novak [11] TB reference	Shaw in India [21] TB reference	Sarkar et.al., [8] kolkata, India n=113(9)	Present study in Andhra state n=76
Cervix	60%	80%	-61.90%	64%
Ovary	5-10%	10-15%	-23.90%	14.40%
Endometrium	2-3%	5-7%	-5.30%	9.20%
Vagina	1-2%	0.20%	-1.80%	3.90%
Vulva	3-5%	1-5%	-1.80%	4%
Fallopian tube	0.30%	0.30%	-	1.30%
Others (vaginal,.....etc)	-	-	-5.30%	3.90%

DISCUSSION

Gynaecological cancers are a group of different malignancies of the female reproductive system which include cancers of the ovary, cervix, uterus, vulva and vagina.

There is no data on cancer incidence and distribution from Andhra Pradesh (A.P) and especially Rayalaseema region. Of the four studies registered in India by cancer registries identified in the literature review addressing cervical cancer incidence and mortality data, none was conducted in Andhra Pradesh or Gujarat [15]. Cervical cancer surveillance in Gujarat and Andhra Pradesh is incomplete and the data that are available were not used [16].

The percentage incidence of cancer cervix is almost equal in world, Kolkata and Andhra Pradesh when compared to high incidence in whole India (Table.5). Cancer ovary incidence is higher in Kolkata where as incidence of cancer endometrium, vagina and fallopian tube are more in A.P. in the present study. Vulval cancer is also of higher incidence in A.P. than in whole India coinciding with the text book reference of Novak [11]. This shows that the rarer cancers are of high incidence than normal cancers in A.P.

In the literature, significant increase in frequency of whorls (P< 0.05) in cancer cervix was reported [17]. Kasinathappa based on his observations in 110 cases [18] reported significant high frequency (p<0.001) of whorls and low frequency of ulnar loops in both hands of carcinoma cervix group. But in the present study (n=76), there is an increase in whorls but were not statistically siginificant. This may be due to the smaller sample size in the present study or the population difference.

Pal [19] observed significant high frequency for arches and low frequency for ulnar loops in women with cancer cervix. The observations in the present study are in agreement with those reported in literature [19]. In the present study, high frequency of whorls and low frequency of ulnar loops in both hands and increased frequency of arches in left hand when compared to right hand (8.4% vs 3.85) were observed. These findings are in agreement with that reported by Inamdar [20]. Bukovic et.al., [21] observed high percentage of arches (right-10% and left-11%) in ovarian cancers when compared to controls(4% and 5%) in his study. Increase in TFRC was reported in literature [19-21]. But our study has correlated with the study of Pal [19] and Kalpana [22] where TFRC is decreased in cancer cervix patients. A significant increase in AFRC in carcinoma of cervix group as compared to control group was observed in Kasinathappa's [18] study. AFRC is increased in cancer cervix, endometrium, vulva and combined cervix and vaginal cancer in the present study but the differences are not significant statistically.

In our study, ulnar loops followed by whorls, composites, arches and radial loops are the common patterns but varied in their percentage, being more in right hand in cancer patients than in controls. A decrease in frequency of ulnar loops and composites is seen in cancer patients than controls. But we did not get the statistically significant difference. Our results correlates with Inamdar, Pal and Bukovic [19-21] but differ in the value of percentage as there is increase in whorls and decrease in loops.

No significant difference was reported for a-b ridge count in carcinoma of cervix, cancer groups and control group in literature. Our study relates with Inamdar [20] who has not observed any significant difference in a-b ridge count in carcinoma of cervix and controls.In the present study when analysed separately for normal, cancer cervix and other cases a-b ridge count was greater on right side than left side in controls.In cancer cervix patients, right a-b ridge count is less than left a-b ridge count.In other cancers, right a-b ridge count is almost equal to left a-b ridge count. There are no reports on detailed analysis of dermatoglyphic patterns in female reproductive cancers to compare the observations of present study. The sample size of other than cervical cancer is also small in the present study.

Kobyliansky et.al., [23] reported higher values for all the parameters in left hand than in right hand in control population in their study. In our study also, the parameters in controls are coinciding with that reported in literature [23]. But in cancer endometrium, vagina and vulva, right values are higher than left and there are no reported studies in literature to compare.

In literature, a-b ridge count is increased in the study of Bat (24) and decreased in Floris [25] study in Cancer endometrium. In the present study, mean of right a-b ridge count of cancer patients is greater than controls and left a-b ridge count is lesser than controls. In the present study, there is decrease in a-b ridge count in all cancer patients but increase is seen in cancer vagina when compared to controls which is not reported in literature.

INTERPRETATION AND CONCLUSION

The present study could establish a way to utilize the dermatoglyphic principle in identifying the cancer. But the significance is obtained in digital patterns of left first and second digits only. We may not conclude that dermatoglyphics is an effective method in all parameters. But as we observed significance in such a small sample, definitely there is scope for accurately establishing relation between dermatoglyphics and cancer by increasing the sample size, applying various dermatoglyphic parameters and applying statistical tests for calculating significance.

Conflicts of Interests: None

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