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Study of digital and palmar dermatoglyphic patterns of Nigerian women with malignant mammary neoplasm

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ABSTRACT
Objective: To examine the relationship between malignant mammary neoplasm and dermatoglyphic patterns of hands.
Methodology and results: Palmar and digital prints from 20 women with histologically proven malignant mammary neoplasm (case group) were compared to palmar and digital prints from 25 women with no history of any malignant diseases (control group) to establish a relationship with dermatoglyphic patterns of hands. Of the patterns analyzed, ulnar loop showed a statistically significant association with malignant mammary neoplasm in 8 out of 10 digits, which has the highest, mean percentage frequency of digital pattern followed by whorls, arch and lastly the radial loop. In addition, women with malignant mammary neoplasm showed significantly high mean DAT angle (62.70 ± 2.85 and 61.66 ±2.56) for right and left hand respectively, and a reduced total ridge count (12.61 ± 2.21).
Conclusion and application of findings: The results demonstrate that dermatoglyphic patterns and values could be used as a noninvasive anatomical marker of malignant mammary neoplasm. However, further studies are needed to confirm these findings for Nigerians, possibly using a larger population.

Key words: Malignant mammary neoplasm, dermatoglyphics, DAT angle.

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INTRODUCTION

Breast cancer is a malignant tumor that often manifests with fibrosis, causing retraction of the nipple, necrosis and ulceration of the overlying skin (Waugh and Grant, 2001). It is the most common malignancy among women after ovarian cancer (Saxena *et al*., 2005), and its genetic base is well established. BRCA1, BRCAC and p-53 genes have been extensively studied as underlying the development of breast cancer (Grabowski *et al*., 1996; Saxena *et al*., 2005; Saxena *et al.*, 2006; Chitamani *et al*., 2007). A family history of breast cancer has been documented as an important factor for development of the disease. About 180,000 cases are diagnosed each year in the United States (Grabowski & Totora, 1996).

The incidence of breast cancer in sub-Saharan Africa is small at 20 per 100,000 compared to 90 per 100,000 people in the West. The reason for this geographic disparity has much to do with protective behaviors that inadvertently minimize estrogen exposure, such as reproductive

patterns, body build, and dietary patterns (Fregene & Newman, 2005).

Research has shown a positive correlation exists between some disease conditions, especially those that have a genetic basis and dermatoglyphic patterns (Stevenson *et al.*, 1997; Than *et al.*, 1998), which may aid in diagnosis of such conditions (Schmidt & Nitowsky 1981). Dermatoglyphic pattern determinations and linkage to diseases could be an important diagnostic tool in diagnosis of genetic disorders (Ponchekina *et al.*, 2000; Bosco *et al.*, 2001). Some research has shown that a family history of breast cancer might be associated with specific dermatoglyphic patterns (Gilligan *et al.*, 1985; Chitmani *et al.*, 2007). A pattern of 6 or more digital whorls has been used to identify women with breast cancer (Murray *et al.*, 1990; Chitamani *et al.*, 2007). Floris *et al.* (1990) reported an increase in whorls and decreases in the *a-b* ridge count for women with breast cancer and cervix carcinoma.

Research has also shown that a right loop thumb print was more likely to indicate a first degree family history of breast and ovarian cancer than an arch, whorl, tent or left loop thumb print pattern. Further research has shown ulnar loops pattern to be significantly associated with breast cancer (Bierman *et al.*, 1989). Although determination of the dermatoglyphic pattern of the fingers and palm is genetic (though reported to be affected by environmental factors in the first trimester of pregnancy but remains more or less constant after birth), it could serve as a suitable parameter for differentiating individuals (Murray *et al.*, 1990).

This study was carried out to identify dermatoglyphic patterns of finger and palm of Nigerian women with malignant mammary neoplasm to serve as a baseline for early detection, treatment and prevention of breast cancer.

MATERIALS AND METHODS

Study location and population: The study was a cross-section work undertaken primarily in the University of Port Harcourt Teaching Hospital (UPTH), Choba from April 2006 to November 2007. The subjects were all Nigerians. Fingers and palmar prints of 20 women with historically proven malignant mammary neoplasm (case group) and 25 women with no history of any malignant disease were examined. The age of the study population was between 20-60 years, with a total sample size of 45.

Data collection: An ink-print palmer and finger print method was used with both hands (right and left) initially washed with water, soap, and later wiped dry before taking prints in order to remove dirt from the hands. The white duplicating papers containing the prints were screened with the aid of magnifying glass in accordance with Cummin's method (Cummins *et al.*, 1929). The digital patterns were recorded as whorls (W), ulnar loop (UL), radial loop (RL) or arch (A).

A meter rule and pencil were used to map out ATD and DAT angles of both hands. The angles were then measured with the aid of a protractor (Figure 1). Digital ridge counts were determined by counting the number of ridges that cross a straight line drawn from the core of a digital pattern to the digital triradius. The total ridges over all ten fingers were calculated as total ridge count (TRC). All measurements were taken as defined by Penrose (1965). The right and left hands were designated as "R" and "L" respectively while the various digits were designated as: Thumbs – I; Index Finger – II; Middle Finger – III; Ring Finger – IV and the little finger – V.

Data analysis: The student t – test and chi-square test were used for statistical analysis at significance level of 0.05 (p=0.05).

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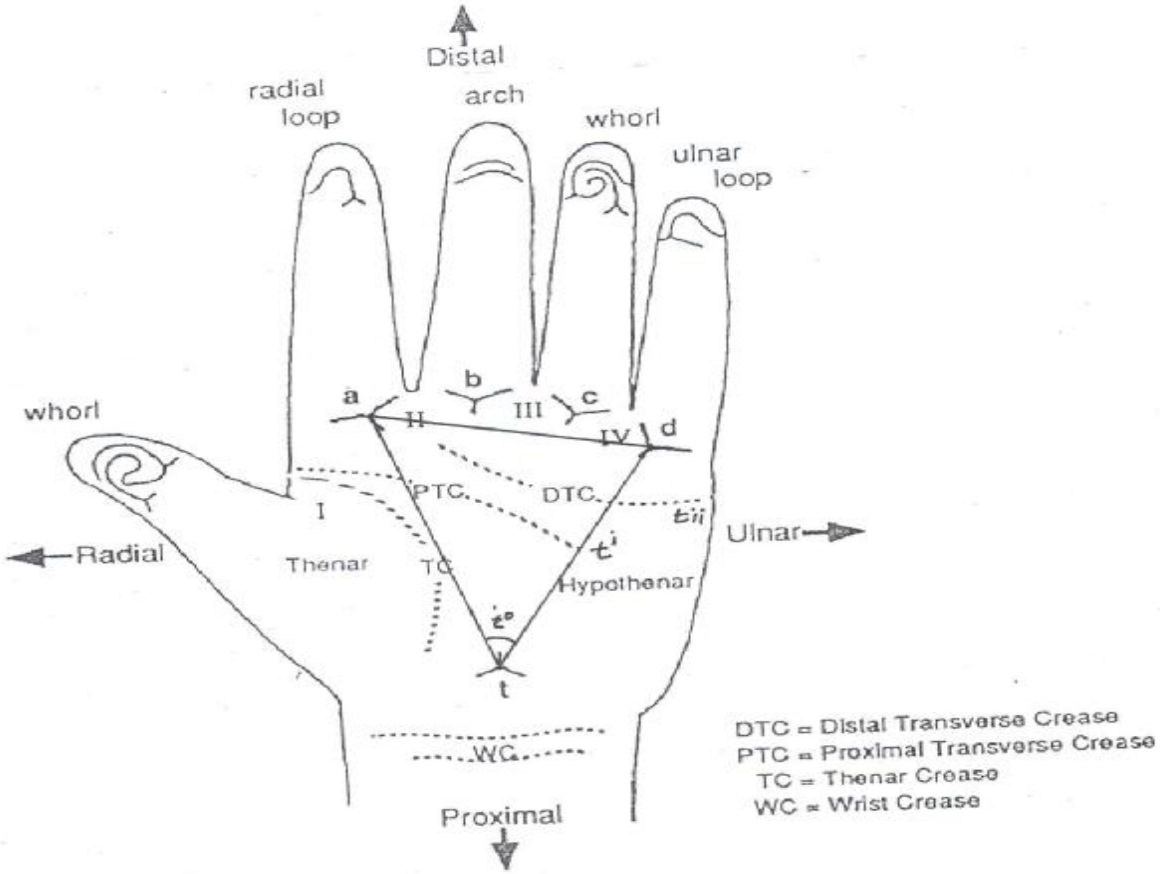

Figure 1: Scheme showing digital patterns, a, b, c, d and triradii, ATD and DAT angles.

RESULTS

There was a significant difference ($p < 0.05$) in the percentage frequency of digital patterns between women with malignant mammary neoplasm and normal subjects (table 1 & 2). The mean percentage of digital patterns: ulnar loop, radial loop, whorl, and arch on the right hands of women with malignant mammary neoplasm were 54, 2.4, 34, and 8% respectively; while on the left hands they were 34, 12, 24, and 20%, respectively.

The mean frequency of the digital patterns of women with malignant mammary neoplasm on the right hand is greater than that on the left hand for ulnar loop and whorl, while for radial loop and arch pattern the left hand values are greater. It was also observed that women with malignant mammary neoplasm had greater mean frequency of digital patterns than the normal except for the whorl pattern where the normal subjects had higher mean frequency.

There were significant differences in the mean ATD and DAT angle in the right hand (Table 3). On the right hand of women with malignant mammary neoplasm the mean ATD angle (38.78 ± 2.08) was significantly ($p < 0.05$) lower than the mean ATD angle (42.44 ± 2.18) of normal subjects while on the right hands of women with malignant mammary neoplasm, the mean DAT angle (62.90 ± 2.85) is significantly ($p < 0.05$) greater than the mean DAT angle (58.2 ± 2.60) of normal subjects.

The mean ATD angle of women with malignant mammary neoplasm (39.90 ± 1.87) was non-significantly ($p \geq 0.05$) lower than the mean ATD angle (40.36 ± 2.27) of normal subject in the left hand. The mean DAT angle of the left hand of women with malignant mammary neoplasm (61.65 ± 2.56) was significantly ($p < 0.05$) higher than the mean DAT angle of normal subjects (58.67 ± 2.21). The mean total ridge count showed a significant difference (table 4), with the mean total ridge count of women with malignant mammary neoplasm being significantly lower than that of the normal subjects ($p < 0.05$).

Table 1: Percentage (%) frequency of digital patterns of the right hand. Data compares women with (M) and without (N) malignant mammary neoplasm.

Patterns	Ri (M)	Ri (N)	Rii (M)	Rii (N)	Riii (M)	Riii (N)	Riv (M)	Riv (N)	Rv (M)	Rv (N)	mR (M)	mR (N)
Ulnar Loop	50.00	20.00	50.00	30.00	50.00	52.00	50.00	48.00	70.00	76.00	54.00	45.20
Radial Loop	0.00	8.00	8.00	8.00	4.00	4.00	0.00	0.00	0.00	0.00	2.40	4.00
Whorl	50.00	68.00	30.00	44.00	30.00	32.00	40.00	52.00	20.00	24.00	34.00	44.00
Arch	0.00	4.00	10.00	12.00	10.00	12.00	10.00	0.00	10.00	0.00	8.00	5.6 0

P < 0.05; Sample size = 45 (M = 20; N =25) M = malignant mammary neoplasm; N = normal subjects; i – v = IST to 5th digits; R = right hand; mR – mean percentage frequency of digital/pattern for right hand.

Table 2: Percentage of digital patterns of the left hand, comparing women with (M) and without (N) malignant mammary neoplasm.

Patterns	Li (M)	Li (N)	Lii (M)	Lii (N)	Liii (M)	Liii (N)	Liv (M)	Liv (N)	Lv (M)	Lv (N)	mL (M)	mL (N)
Ulnar Loop	30.00	20.00	40.00	28.00	18.00	36.0	60.00	40.00	70.00	76.00	43.60	40.00
Radial Loop	0.00	4.00	0.00	16.00	60.00	4.00	4.00	4.00	0.00	0.00	12.80	5.60
Whorl	60.00	68.00	30.00	48.00	10.00	48.0	20.00	52.00	10.00	24.00	26.00	48.00
Arch	10.00	8.00	30.00	8.00	20.00	15.0	20.00	4.00	20.00	0.00	20.00	7.00

P < 0.05; Sample size = 45 (M = 20; N =25) M = malignant mammary neoplasm; N = normal subjects; i – v = IST to 5th digits; R = right hand; mL – mean percentage frequency of digital/pattern for left hand.

Table 3: Summary of mean ATD and DAT angles (º) of the right and left hands of women with (M) and without (N) malignant mammary neoplasm.

Parameters Mean)	R (M)	R (N)	L (M)	L (N)
ATD Angle (^{0})	38.78 ±. 08	42. 44 ± 2.18	39.90 ± 1.8	40.36 ± 2.27
			P > 0.05	
DAT Angle (^{0})	62.90 ± 2.85	58. 24 ±2.60	61.65 ± 2.56	58.67± 2.21
Sample Size	20	25	20	25
	P < 0.05			

Table 4: Summary of mean total ridge counts of the right and left hand digits of women with (M) and without (N) malignant mammary neoplasm.

Parameters	M	N
Mean	12.76 ± 0.21	15.51 ± 0.58
Sample Size	20	25
	P < 0.05	

M = Malignant mammary neoplasm and N = Normal subjects

DISCUSSION

Developing a non invasive method for identifying women who are either at risk or already have a given illness is a most cost effective way of providing quality health care. Non-invasive diagnostic methods are especially important in areas with large and increasing populations.

Studies examining dermatoglyphics in relation to cancer patients in general, have noted an increase of whorls (Wainwright, 1937; Baines *et al.*, 1986). Other studies on patients with different cancers showed whorls to be present. Furtehrmore, studies of high risk kindred have also found whorls and an increased proportion of loops in cancer patients (Seidman *et al.*,

1982; Hung, 1987). Some studies have also specifically confirmed a correlation between digital whorl subtypes and breast cancer (Bocalossi & Veronesi, 1957; Singh *et al.*, 1979; Selzer *et al.*, 1982). However, other research has showed ulnar loop to be significantly associated with breast cancer (Beirman *et al.*, 1989).

In our study we observed a significant difference ($p < 0.05$) in the presence of ulnar loop in all ten (10) digits except the right and left third digits, showing a significant correlation between ulnar loop and breast cancer (malignant mammary neoplasm) which is in concordance with the finding of Bierman *et al.* (1989). Also our study showed that ulnar loop had the highest mean percentage frequency of digital pattern, followed by whorl, arch and radial loop pattern, which agrees with Cummins (1926) and Boroffice (1978).

Besides, our study has shown the mean DAT angles of women with malignant mammary neoplasm to be significantly higher than that of normal subjects. This agrees with the work of Oladipo *et al.*, (2005) for schizophrenic subjects that stated the mean DAT angle to be 63.12^0, which is higher than our findings for mean DAT angle. Our study has further shown a significantly lower total ridge count for women with malignant mammary neoplasm than normal subjects.

We conclude, therefore, that women with malignant mammary neoplasm have significant association with ulnar loop in 8 out of 10 digits in Nigerians. We have also demonstrated that women with malignant mammary neoplasm have significantly higher mean DAT angles, and reduced total ridge count. It is hoped that in future these dermatoglyphic findings will serve as a baseline in the identification of women who are at increased risk of developing breast cancer and perhaps aid subsequent early treatment of the disease.

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