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ABSTRACT

Novel Classification Model of Normal Palmar Creases

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Anatomically the term "creases" are epidermal flexure lines present on palmar or plantar surfaces and its importance has been widely published. However, despite elaborate literatures on the clinical and anthropological implications of palmar creases there is still dearth of studies providing simplified and holistic classification for normal palmar creases. Thus this study is therefore aimed at providing a concise, simplify and holistic classification model of palmar creases using Nigerian subjects. In this cross-sectional and observational study, 360 subjects were randomly sampled from Rivers and Delta States of Nigeria without consideration to ethnicity. Using Oghenemavwe and Osaat (2015) dermatoglyphic capture method, palm print was obtained and palmar creases were subsequently observed, identified and classified. Descriptive statistics was then used to determine proportionality difference in the percentage distribution of the variant types of palmar creases. Normal palmar creases were classified by adopting a One system classification model and a Three system classification model. In the one system classification there was high prevalence of Type 2 (55.14%), followed by Type 3 (44.30%) and the least observed was Type 1 (0.56%). Similarly, Type M (58.61%) was predominant over Type V (41.39%), and Type Y (78.19%) over Type X (21.81%). The distribution of Three system classification model follows: Type 2MY =36.25%; Type 3MY = 18.61%; Type 3VY = 13.16%; Type 3VX = 10.97%; Type 2VY = 9.58%; Type 2VX = 6.25%; Type 2MX = 3.06%; Type 1VY = 0.28%; Type 1VX = 0.14%; Type 1MY = 0.28%. Variations exist in the distribution of palmar creases and may be classified using either a One system classification model or a Three system classification model.

Keywords: Palmar creases, Classification, Model

INTRODUCTION

Anatomically the term "creases" are epidermal flexure lines present on palmar or plantar surfaces. They are fixed and permanent line that is related to connective tissue attachments with the underlying structures or to the extensions of the underlying muscle fibres in the dermis of the crease site which provide support and reinforcement for the skin to fold without bunching up and making it difficult to grab items ^{1,2}. Palmar creases are believed to be line of formations of the palm at about the 10th to 13th weeks of foetal development ^{3,4} and are readily evident at birth ^{1,5,6,7}. Interestingly palmar creases cannot be destroyed by superficial skin injuries, and remain unchanged throughout life. However, deep injury and scars can distort their pattern ^{6,8,9,10,11,12,13,14,15,16}.

Major and Minor creases have been identified ^{17,18,19}. The Major (primary) palmar creases are: Proximal transverse crease which begins at the radial side of the palm and runs medially, slightly curving proximally to terminate at the medial border of the hypothenar eminence; Distal transverse crease begins proximal to the interdigital space between the index and middle fingers (curving gently wrist-ward) and runs to the

ulnar side of the palm; Radial longitudinal crease originate at or slightly below the proximal transverse crease and runs proximally towards the wrist, curving laterally^{2,20,21,22}.

The Minor palmar creases are palm creases which are narrower than the major creases and either cross major creases, lead to major palm creases or are apart from major creases. They include: Middle longitudinal (Mid or Middle finger) crease is the crease (or two or more creases) in the middle or anywhere around the central region of the palm. Ring finger crease, Little finger crease and Ulnar longitudinal crease have also been identified^{2,20,21,22}.

Despite elaborate literatures on the clinical and anthropological implications of palmar creases ^{23,24,25}, and few attempt to classify palmar crease, there is still dearth of studies providing simplified and holistic classification for normal palmar creases.

Aim: This study is therefore aimed at providing a concise, simplify and holistic classification model of palmar creases using Nigerian subjects.

MATERIALS AND METHODS

Study Sample: In this cross-sectional and observational study 360 subjects were randomly sampled from Rivers and Delta States of Nigeria without consideration to ethnicity. Sample size was determined using Cochran, (1963) sample size (SS) determination formulae;

$$SS = \frac{z^2 x p x q}{d^2}$$

Where; SS = Sample Size, p = Proportion of family size, z = Z value = 1.96 (for 95% confidence level), q = 1-p, d = Confidence interval = 3% (tolerance level of confidence of 0.03)

Criteria for Subject Selection: Subjects selected were between the ages of five (5) and above. Subjects selected had no form of anatomical abnormality of any of the palms and creases.

Ethical Consideration: Ethical clearance was obtained from the University of Port Harcourt Research Ethic Committee of with the reference number UPH/CEREMAD/REC/MM71/007. After detailed explanation of the research purpose, procedure and benefits to participants, an informed consent was issued

before being recruited for this study.

Methods of Data Collection: Palm print was obtained using Oghenemavwe and Osaat²⁶ dermatoglyphic capture method. In this procedure the palms were placed on the scanning surface of Hp G3110 Photo (print) scanner connected to a laptop via a USB cord and powered with 100watt solar power inverter connected to 12volts rechargeable battery. The stored captured palm image was magnified and the variant pattern types of palmar creases were observed, identified and classified.

Methods of Data Analysis: Descriptive statistics was used to determine proportionality difference in the percentage distribution of the variant types of palmar creases.

RESULTS

From the observation, normal palmar creases were classified by adopting two systems of classification- a One system classification model and Three system classification model.

One system classification model:

Table 1: Variant types based on pattern of origin of major palmar creases

Туре	Description	
Type 1	This is a crease pattern with a single (one) head of origin of Radial longitudinal (R), Proximal transverse (P) and Distal transverse (D) creases or fusion of Radial longitudinal, Proximal transverse and Distal transverse creases at their point of origin.	Arrow show point/pattern of origin
Type 2	A crease type with a single (one) head of origin or fusion of Radial longitudinal (R) and Proximal transverse (P), but a separate origin of Distal transverse (D) Creases.	Arrow heads show points/pattern of origin

Type 3	In this type separate heads of origin or non -fusion of Radial longitudinal, Proximal transverse and Distal transverse Creases were seen.	D P R
		Arrow heads show points/pattern of origin

Table 2: Variant types based on pattern shape/appearance of palmar creater the state of palmar creater the state of the
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Туре	Description	
Type M	This is a crease pattern resembling letter "M" in shape and appearance.	
Type V	This denotes any other appearance/shape other than letter "M"	

Туре	Description	
Type Y	This denotes a crease pattern with one or more Middle longitudinal creases present.	Arrow show meeting point of MLC
Type X	This is a pattern without Middle longitudina 1 crease.	<i>MLC (Y) absent</i>

Table 3: Variant types based of	presence/absence of Middle longitudinal crease	(MLC)	
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Three system classification Model: In this classification model, the three variants or categories of the one system classification were combined to have a simplified sub-variants of Types 1, 2 and 3.

Туре	Description	
Туре	This is a Type 1 crease with "M" shaped	
IMX	appearance but without middle longitudinal	
Type 1MY	A Type 1 crease with "M" shaped appearance and extra middle longitudinal crease.	Arrow head shows single point of origin of D,P&R Y is two MLC: Arrow points at "M" shape crease
Type 1VX	A Type 1 crease without both "M" shaped appearance and middle longitudinal crease.	Arrow shows single point of origin of D,R&P without
Type 1VY	A Type 1 crease without "M" shaped appearance but having middle longitudinal crease.	MLC(1) and M snape appearance

Table 4: Sub-variant of Types 1 with respect to shape/appearance and Middle longitudinal crease

Туре	Description	
Type 2MX	This denotes a Type 2 crease with "M" shaped appearance but without extra middle longitudinal crease.	Extra MLC (Y)(other than the one forming the "M" shape) absent
Type 2MY	Denotes a Type 2 crease with both "M" shaped appearance and extra middle longitudinal crease.	Extra MLC (Y)(other than the one forming the "M" shape)
Type 2VX	A Type 2 crease without both "M" shaped appearance and middle longitudinal crease.	MLC (Y) and "M" shape appearance absent

Table 5: Sub-variant of Types 2 with respect to shape/appearance and Middle longitudinal crease

Туре	Description	
Type 3MX	This is a Type 3 crease with "M" shaped appearance but without extra middle longitudinal crease.	Extra MLC (Y)(other than the one forming the "M" shape) absent
Туре ЗМҮ	This denotes a Type 3 crease with both "M" shaped appearance and extra middle longitudinal crease.	Extra MLC (Y)(other than the one forming the "M" shape)
Type 3VX	Denotes a Type 3 crease without both "M" shaped appearance and middle longitudinal crease.	<i>MLC (Y) and "M" shape appearance absent</i>

Table 6: Sub-variant of Types 3 with respect to shape/appearance and Middle longitudinal crease

Types of head of origin	Right Hand		Left Hand		Total	
	Total no	Percentage (%)	Total no	Percentage (%)	Total no	Percentage (%)
Type 1	2	0.56	2	0.56	4	0.56
Type 2	197	54.72	200	55.56	397	55.14
Type 3	161	44.72	158	43.88	319	44.30

 Table 7: Distribution based on pattern/Types of origin of major palmar creases

 Table 8: Distribution based on shape pattern/appearance

Types of shape	Right Hand		Left Hand		Total	
	Total no	Percentage (%)	Total no	Percentage (%)	Total no	Percentage (%)
Type M	210	58.33	212	58.89	422	58.61
Type V	150	41.67	148	41.11	298	41.39

Table 9: Distribution based on Presence/Absence of Minor Longitudinal Crease

Presence/Absence of MLC	Right Hand		Left Hand		Total	
	Total no	Percentage (%)	Total no	Percentage (%)	Total no	Percentage (%)
Type Y	273	75.83	290	80.56	563	78.19
Type X	87	24.17	70	19.44	157	21.81

Figure 10: Distribution of pattern types based on three system classification model

Three system model	Right Hand		Left Hand		Total	
	Total no	Percentage (%)	Total no	Percentage (%)	Total no	Percentage (%)
Type 1MX	0	0.00	0	0.00	0	0.00
Type 1MY	1	0.28	0	0.00	1	0.14
Type 1VX	1	0.28	0	0.00	1	0.14
Type 1VY	0	0.00	2	0.56	2	0.28
Type 2MX	12	3.33	10	2.78	22	3.06
Type 2MY	128	35.56	133	36.94	261	36.25
Type 2VX	25	6.94	20	5.56	45	6.25
Type 2VY	32	8.89	37	10.28	69	9.58
Type 3MX	3	0.84	5	1.38	8	1.11
Type 3MY	66	18.33	68	18.89	134	18.61
Type 3VX	44	12.22	35	9.72	79	10.97
Type 3VY	48	13.33	50	13.89	98	13.61

Table 7 showed high prevalence of Type 2 (55.14%), followed by Type 3 (44.30%) and the least observed was Type 1 (0.56%). Similarly, as seen in Tables 8 and 9 there was more of Type M (58.61%) than Type V (41.39%) and more of Type Y (78.19%) than Type X (21.81%). The distribution of variants of palmar creases using three system classification model is as follows: Type 2MY = 36.25%; Type 3MY = 18.61%; Type 3VY = 13.16%; Type 3VX = 10.97%; Type 2VY = 9.58%; Type 2VX = 6.25%; Type 2MX = 3.06%; Type 1VY = 0.28%; Type 1VX = 0.14%; Type 1MY = 0.28%.

DISCUSION

There is variation in the pattern of origin of the major palmar creases. Most frequently observed was two heads of origin (Type 2) and the least observed was Type 1(single head of origin) while three heads of origin (Type 3) was relatively seen.

The point of origin observed for each of the major creases is in line with the description of some study 25,21 . Also this classification is similar to the observation and classification adopted by 21 , where the relationship of

each of the major creases were examined and they came up with closed, open and meeting creases. However, in this study, Type 2 crease corresponds to the closed or meeting creases observed by ²¹, while Type 3 correspond to open crease. Furthermore, Type 1, Type 2 and Type 3 corresponds to the Transverse flexion creases II (TFC II), Transverse flexion creases III (TFC III) and Transverse flexion creases XIV (TFC XIV) respectively, identified by ¹⁹.

Similarly based on shape, "M" shaped pattern (Type M)

was also more distributed than a non-"M" shaped crease (Type V). In related study, in their study of palmar creases of Nigerians "M" type of crease was identified but non-"M" shaped of crease was not classified/reported⁵.

Interestingly, considering Middle longitudinal crease most of the study population had Middle longitudinal crease (Type Y) whereas few had no Middle longitudinal crease (Type X). This observation and classification approach expanded Park²¹, and Cummins and Milton description of Minor creases as reported by 5 .

A comprehensive but simplified classification (a Three system model) factoring in pattern of origin of major palmar creases, palmar crease shape and middle longitudinal crease showed that Type 2MY was the most prevalent followed by Type 3MY, Type 3VY, Type 3VX, Type 2VY, Type 2VX, Type 2MX, Type 1VY in that order. But the least observed was Type 1VX and Type 1MY while Type 1MX was not observed among the study population.

CONCLUSION

Variations exist in the distribution of palmar creases and thus this study attempted to classify palmar creases by developing a One system classification model and Three system classification model.

The One system classification model was based on; pattern of origin of major palmar creases (as Type 1, Type 2 and Type 3), palmar crease shape (as Type M and Type V), and presence/absence of middle longitudinal crease (as Type Y and Type X). While the Three system classification model was based on; variation of Type 1 with respect to palmar shape and presence/absence of middle longitudinal crease (as Type 1MX), variation of Type 2 with respect to palmar shape and presence/absence of middle longitudinal crease (as Type 2VX, Type 1MY and Type 1MX), variation of Type 2 with respect to palmar shape and presence/absence of middle longitudinal crease (as Type 2VY, Type 2VX, Type 2MY and Type 2MX), variation of Type 3 with respect to palmar shape and presence/absence of middle longitudinal crease (as Type 3VY, Type 3VX, Type 3MY and Type 3MX).

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the manuscript; 'Authors B' (Osunwoke, Emeka A 'reviewed the design protocol; 'Author C' (Edibamode, Innocent E) examined the intellectual content of the manuscript. All authors read and approved the final manuscript.

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