

On the Breadth of Dermal Ridges in Sardinians

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Introduction

One of the dermatoglyphic traits used in population analyses is the breadth (or thickness) of dermal ridges (normally the black lines seen in digital and palmar prints recorded with the ink method, separated by thin white lines, the furrows, which together with the black lines constitute dermatoglyphics, Cummins and Midlo, 1961). Initially the ridge breadth was calculated from the number of ridges present in 1 cm in various digital-palmar areas (i.e. 10 areas, 5 digital and 5 palmar: Cummins *et al.*, 1941 in males and Ohler and Cummins, 1942 in females). Subsequently the following formula was applied (due to Penrose and Loesch, 1967, re-used among others by Jantz and Parham, 1978; Kamali *et al.*, 1994; Floris and Marini, 1995): ridge breadth=distance (mm) a-b/a-b ridge count + 2. In other words, the relationship between the distance in mm between triradius a and triradius b (at the base of the index and middle fingers respectively and thus in the second palmar interdigital area), given as the sum of the right and left values, and the count of the ridges that intersect the line joining the two triradii plus 2 because the two triradii are not counted. A new method, based on ridge density, consists in counting the ridges inside a well-defined area, i.e. a 5x5 mm square situated directly above the centre of the digital figure. This method considers both the ridge thickness and the distance between the furrows that separate them (Acree, 1999, re-used by Gutiérrez-Redomero *et al.*, 2008; Gungadin, 2007; Nayak *et al.*, 2009). Similar methods have been used in the study of paleodermatoglyphics (a term coined by Bartsocas, 1982), aimed at classifying subjects who left their fingerprints on ceramic articles as males or females, juvenile or adults (Kralik and Novotny, 2003). These studies have shown that women have more ridges than men in a given area and thus have thinner ridges. The drawback of this method is that it is valid only for digital dermatoglyphics.

Materials and Methods

In the present study, we considered a new method of calculating the breadth of palmar dermal ridges by

examining the A-d distance in the hypothenar area (figure 1), defined thusly by Glanville, 1965: "The A-d ridge count was made by tracing line A from its source in triradius a..A compass was then used to draw an arc which had triradius a at its centre, through triradius d to the point where the arc cut line A...". We used the formula: A-d ridge breadth= distance (mm) A-d/A-d count + 2, the plus 2 being due to the fact that triradius d and line A were not counted. We examined the ridge breadths in a-b and A-d areas in 60 males and 60 females less than 16 years old and in 60 males and 60 females older than 16 years. All four samples consisted of Sardinians. Since many studies (see among others Chattopadhyay, 1966; David, 1981; Bansal *et al.*, 1984; Pesce Delfino *et al.*, 1975) have shown that the distance (not the counts!) between two triradii, like the size of the patterns, increase with age, we considered the age of 16 years as the end of the growth period (in height, 16-18 years in males and 14-16 years in females, Nicoletti *et al.*, 2004).



Fig. 1. A left palm illustrating reference points for a-b and A-d measurements.

Results

			a-b ridge breadth			
	Males				Females	
	<16 years		≥ 16 years		<16 years	≥ 16 years
Mean	0.5282		0.5728		0.5202	0.5291
S.D.	0.0575		0.0527		0.0430	0.0369
t		4.37**				1.22
			A-d ridge breadth			
Mean	0.5818		0.6692		0.5910	0.6048
S.D.	0.0667		0.0811		0.0749	0.0661
t		6.45**				1.07
			a-b vs A-d			
t	4.72**		7.66**		6.35**	7.35**
			a-b and A-d			
r	0,43**		0,39**		0,42**	0,30**

* p≤0,05 ** p≤0,01

Tab. 1. a-b and A-d ridge breadth.

Table 1 reports the means and standard deviations of ridge breadths recorded for both the a-b and A-d areas and the results of the comparisons of the two age classes, the two sexes and the two breadths. In both sexes and in the two age classes, the ridge breadth is greater in A-d area than in a-b area, and the differences are always highly significant. In both sexes, the values are higher in the over-16 age class than in the under-16 one, but the differences is significant only in males. There is a significant positive correlation (in the over-16 females) or highly significant positive correlation (in the other cases) between the ridge breadths in a-b and A-d areas.

Discussion

Ohler and Cummins (1942) concluded that females have thinner ridges than males, a conclusion supported by Kamali et al. (1994), Floris and Marini (1995), Acree (1999) and others. Our study confirms the smaller ridge breadths in females, except in A-d area in the under-16 years class, in which the breadth was greater in the females. The high correlation of ridge breadth between different palmar area confirms the common embryological origin, although the differences between the two areas cautions against any deduction based on a single palmar area.

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