

Short Report

A further study of the high incidence of the median artery of the forearm in Southern Africa

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ABSTRACT

Sixty-two forearms from 36 cadavers of South Africans of European extraction were dissected. The frequency of the median artery per forearm was 27.4%. There was neither bilateral difference nor sexual dimorphism in the incidence of the artery. These findings compare well with a previous study of black South Africans (Henneberg & George, 1992) where frequency per forearm was 27.1%. Our findings are much higher than those of earlier studies. This discrepancy may be explained either by differences in the thoroughness of the observations or regional variation, or by the occurrence of a secular trend in the development of vasculature.

The median artery is one of the common anatomical variants. In a recent study (Henneberg & George, 1992) we reported a very high frequency (27.1%) of this artery in the forearms of black South Africans. This is a much higher frequency than any previously reported (Adachi, 1928; McCormack et al. 1953; Misra, 1955). The question arose as to whether our finding reflects a population peculiarity (racial characteristic) or a microevolutionary trend of increasing incidence of the artery. It could also be suggested that our results differ from those of other authors because of disparate criteria for identification of the artery as an *arteria comitans nervi mediani*. We have therefore extended our investigation to include South Africans of European origin and to apply more stringent criteria for identification of the artery.

MATERIAL AND METHODS

Thirty-six white cadavers (19 males, 17 females, aged 44–92 y) were available for observation in the Department of Anatomy and Human Biology, University of the Witwatersrand, and the Department of Anatomy, University of Pretoria. Both forearms of 14 cadavers were carefully dissected by the authors. Limbs of the remaining 22 cadavers were subjects of

routine student dissections. Students removed or damaged arteries in some limbs and therefore in 10 cases only 1 forearm was available for the study. Altogether 62 forearms were studied. Cadavers were embalmed with mixture of ethanol and formaldehyde.

All dissections extended from the distal upper arm to the fingers of the hand, thus enabling us to observe the entire length of the median artery and the distribution of its terminal branches. The median artery, as distinct from the *arteria comitans nervi mediani*, was considered present on 3 criteria: (1) when it was shown by dissection to supply structures in the hand, (2) when it had a minimum diameter exceeding 1 mm, and (3) when its diameter at origin exceeded 2 mm.

Sections for light microscopy were taken through the median neurovascular bundle of the forearm from immediately above the flexor retinaculum since this was the level at which the smallest diameter of the artery most frequently occurred. They were fixed in 10% buffered formal saline, processed through graded alcohol concentrations and embedded in wax. Sections (5 µm) were stained with Weigert's elastic stain and haematoxylin and eosin. Subsequently they were examined at low magnification by light microscopy in order to detect any histological peculiarities.

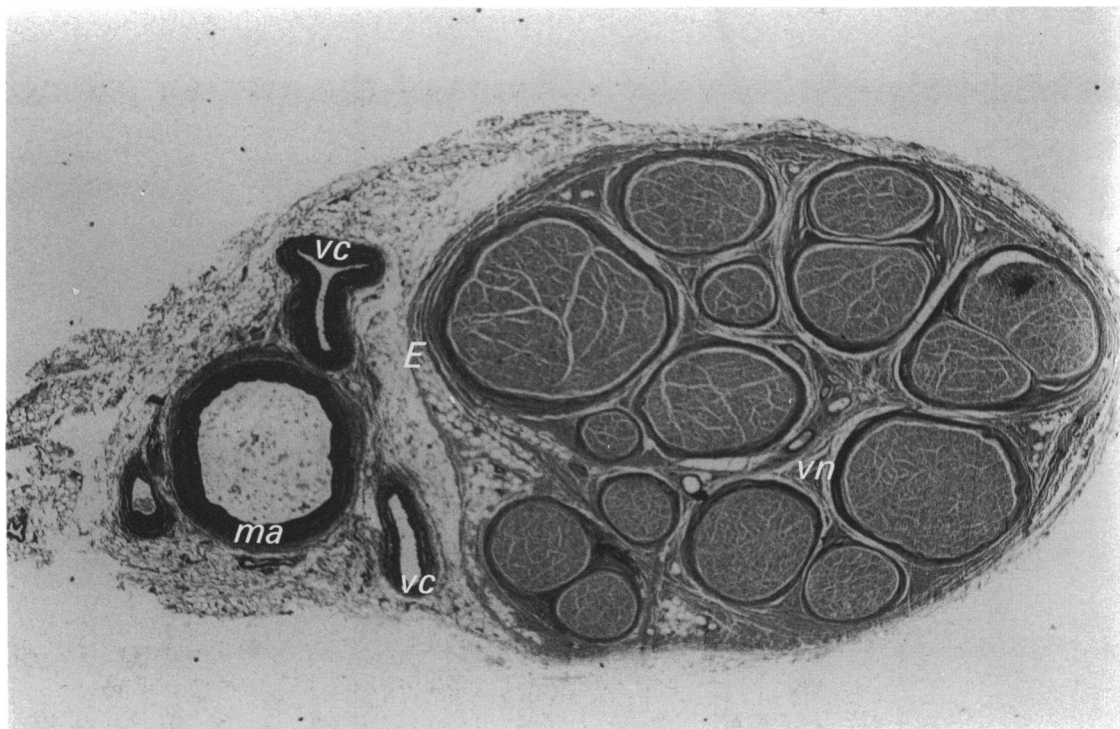


Fig. 1. Cross section of the median neurovascular bundle of the forearm just above the flexor retinaculum from an individual with a macroscopically identifiable median artery. *ma*, median artery; *vc*, venae comitantes; *E*, epineurium; *vn*, vasa nervorum. $\times 10$. Weigert's elastic stain.

The χ^2 test and confidence intervals of percentage frequencies were used for comparisons between sexes, antimeres and samples. The level of significance was set at 0.05.

RESULTS

In those cases in which the median artery was considered to be present on macroscopic criteria, histological examination revealed that the artery, with its venae comitantes, was situated outside the epineurium (Fig. 1). When the artery was absent macroscopically vasa nervorum lay between fascicles or on the periphery of the nerve but within the epineurium (Fig. 2).

The frequency of the median artery in the entire sample was 27.4%. There was no significant difference between males and females, nor between antimeres (Table). The artery usually originated several centimetres below the cubital fossa. The median artery in all cases arose in the vicinity of the origin of the interosseous arteries: directly from ulnar (1/5 of cases), from common interosseous (1/5 of cases) and from anterior interosseous (3/5 of cases). In all cases radial and ulnar arteries were present. The artery supplied digits of the hand either by forming the superficial palmar arch by joining the terminal part of

the ulnar artery and thus replacing an absent superficial branch of the radial artery (63% of cases) or, in the absence of the superficial palmar arch, by sending terminal branches directly to the radial 2–3 digits.

There was no marked tendency for the artery to occur bilaterally or unilaterally. In those 26 cadavers of which both forearms were available the artery was present bilaterally in 6 cases (23.1%), unilaterally in 5 cases (19.2%) and was bilaterally absent in 15 cases. This gives a frequency of 32.7% per forearm or 42.3% per individual.

DISCUSSION

The frequencies found in the present sample are not significantly different from those previously found (Henneberg & George, 1992) in a sample of black South Africans. Confidence intervals (95%) show a wide overlap. The χ^2 value for comparison of frequencies by forearm is 0.00, while comparison of frequencies by individual yields χ^2 0.63. Both values are clearly not significant. Therefore the frequency of the median artery is not related to race.

The lack of statistically significant differences between the results for the 2 samples allows us to calculate a joint frequency for the entire material. In

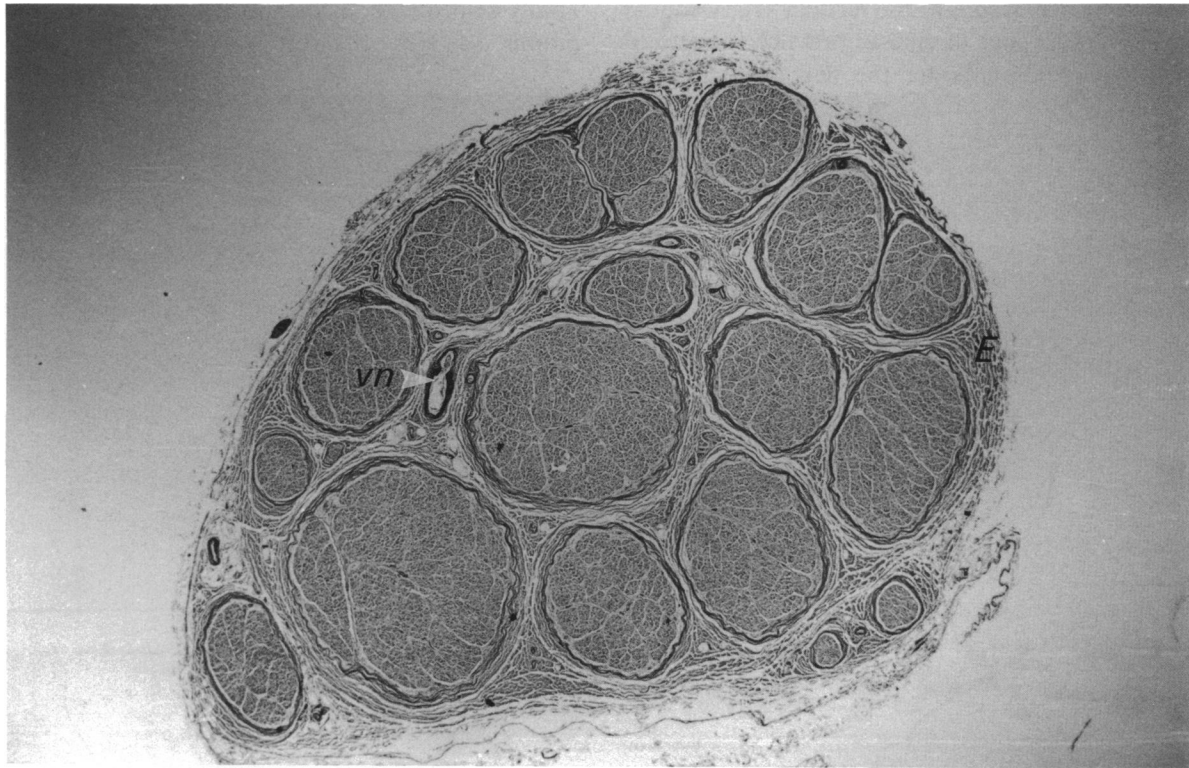


Fig. 2. Cross section of the median neurovascular bundle in the forearm just above the flexor retinaculum from an individual without a macroscopically identifiable median artery. *E*, epineurium; *vn*, vasa nervorum. $\times 10$. Weigert's elastic stain.

Table 1. Frequency of the median artery of forearm by sex and by antimer

Forearms	Sex				Side			
	Male		Female		Right		Left	
	N	%	N	%	N	%	N	%
With the artery	9	27.3	8	27.6	8	26.7	9	28.1
Without the artery	24	72.7	21	72.4	22	73.3	23	71.9
Total	33	100.0	29	100.0	30	100.0	32	100.0

the total of 158 forearms examined by us there were 43 forearms with a median artery. This yields a frequency of 27.2% per forearm, the lower limit of the 95% confidence interval being 20.3% and the upper 34.1%. In the entire material there were 60 individuals for whom both forearms were available. Among these, 22 individuals possessed the artery either unilaterally or bilaterally. Thus the frequency per individual was 36.7% with a confidence interval of 24.5% to 48.9%. These figures support our previous statement that the median artery of the forearm cannot be considered as a relatively rare variant. Instead, it should be acknowledged that there are various common modes of the arterial blood supply to the hand, some involving 2, some 3 arteries.

The high frequency of the median artery in recent

samples as compared with earlier reports could be explained in several ways. It may be that less exacting techniques of observation were applied by previous authors. Another possibility is that a high incidence of a trait is a regional phenomenon peculiar to Southern Africa. Finally, it is possible that a secular trend in the development of vascular pattern occurs. Secular trends are known to change gross morphology, for instance body height, or the rate of sexual maturation, substantially over several decades. It is conceivable that quite a simple alteration of early intrauterine development could result in the retention of sizable median arteries until adulthood. Whether such an alteration could have occurred recently more often than earlier, and what its possible causes might be, would require further investigation.

The frequent presence of the median artery should be taken into account in clinical practice for several reasons. Its presence under the flexor retinaculum may cause symptoms of the carpal tunnel syndrome (e.g. Barfred et al. 1985); it may be a useful route of blood supply to the hand in radial or ulnar artery injuries; and finally, because of its accessibility, it could conveniently be harvested for replacement of arteries elsewhere in the body.

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