

salis pedis, whilst the flexor brevis hallucis and the flexor brevis minimi digiti belong to the intermediate layer.

So far there can be no dubiety; but to which layer are we to relegate the three plantar interosseous muscles? In two short abstracts of portions of this Report which I published in the *Journal of Anatomy and Physiology*,¹ I placed these three muscles in the plantar layer, and therefore, classed them with the adductor obliquus and adductor transversus hallucis. In doing so I followed in a great measure the views of Meckel.² Such views, however, I now consider to be erroneous, and I believe that the plantar interossei in reality belong to the intermediate or flexor group of muscles. This opinion is based upon the following facts:—

(1) In the quadrumana we have traced the gradual disappearance of all the adductor muscles except those belonging to the great toe.

(2) We find plantar interossei not only in those apes which have a complete adducting apparatus (*e.g.* *Cynocephalus*), but also in those in which it is only represented by the adductors of the hallux and fibrous bands (*e.g.* Orang), and in those in which it is reduced, to the adductors of the great toe alone (*e.g.* Gorilla).

(3) Ruge³ has pointed out that the deep division of the external plantar nerve, as it runs inwards across the sole, is placed between the adducting muscles and the other

¹ *Intrinsic Muscles of the Manus of Thylacine, Cuscus, and Phascogale*, *Jour. Anat. and Phys.*, vol. xiii. p. 443. *Intrinsic Muscles of the Mammalian Foot*, *Jour. Anat. and Phys.*, vol. xiii. p. 12.

² The views held by J. F. Meckel regarding the homologies of the intrinsic muscles of the human hand and foot may be gathered from the following quotations from his work entitled "Descriptive and Pathological Anatomy," translated from the French by A. S. Doane, M.D., and published in 1839. In Vol. I. p. 283, he says:—"The proper muscles of the thumb and little finger are only the lumbricales or interossei muscles largely developed and divided into several fasciculi. We must consider the flexor pollicis brevis muscle as the first lumbricalis. The abductor pollicis brevis and the opponens pollicis correspond to an external (*i.e.* dorsal); the adductor represents an internal (*i.e.* palmar) interosseous muscle. The abductor and flexor brevis minimi digiti muscles form only one muscle, which represents the last external interosseous muscle. The adductor minimi digiti (opponens) muscle is only an enlarged internal interosseous muscle." Then in page 318 he advances the following opinions regarding the intrinsic muscles of the foot: "The muscles of the large and the small toes may be referred to the other muscles of the foot, as we have seen those of the thumb and little finger could be to the other muscles of the hand. The abductor pollicis pedis is the first external interosseous muscle, and the posterior belly of the abductor? (adductor obliquus) the first internal interosseous muscle. The anterior belly of the latter (adductor transversus) represents the first lumbricalis. . . . The abductor minimi digiti is the last external interosseous muscle. Finally, the flexor brevis minimi digiti may be considered as belonging to the flexor digitorum communis, because of the slight development of the fourth tendon of the latter in most subjects." The words in brackets have been introduced by myself.

The close association of the flexor brevis pollicis and the flexor brevis minimi digiti with the long flexor tendons has evidently suggested to this author the view that these muscles in the hand are simply exaggerated and highly developed lumbrical muscles. It is not borne out, however, by an examination of the same muscles in the hand and foot of lower animals; indeed a totally different view of the case is suggested. We have seen that the short flexors of the marginal digits in many animals lie in series with three other muscles, which have precisely the same relation to the index, medius and annularis as they have to the first and fifth digits. It is reasonable, therefore, to conclude that they all belong to one group. But an additional argument is afforded against Meckel's theory by Dr. Young of Manchester, in his paper upon the "Intrinsic Muscles of the Marsupial Hand" (*loc. cit.*). In his dissection of the hand of the yellow-footed Rock Kangaroo he noticed that the pollex was furnished with a lumbrical muscle in addition to its two-headed flexor brevis.

³ "Upon the Comparative Anatomy of the Deep Muscles in the Sole of the Foot" (*loc. cit.*, p. 645).