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The fine slips of cutaneous muscle extending from the ventrolateral trunk to the brachium in the rat

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Abstract

A fine slip separated from the external surface of the cutaneous trunci muscle was often found around the axillary region of the rat. However, there has been scarce report concerning such muscular bundle. The aim of this study was to examine it anatomically. The slip extended from the ventrolateral trunk to the fascia of brachium. It covered the thoracic mammary glands in female and the adipose mass in male. The nerve supply from the caudal pectoral nerve was expected, although the true innervation was not clearly identified. Moreover, it was suggested that the murine commonly possesses this type of muscle. The anatomical knowledge about this muscular slip will probably diminish the inconveniences during the skin experiment using rats.

Key words: skin, cutaneous trunci muscle, rat, anatomy, innervation

Introduction

Rat is one of the popular animals used for the skin experiment including the creation of artificial skin wound[1–2)] and validation of skin flap design[3–5)]. Similar to other mammals, the rat has the cutaneus trunci muscle (CTM) that the human never possesses[6–7)]. To appreciate the morphological difference between the laboratory animals and the human in performing the skin experiment, we have studied the subcutaneous structures macro-anatomically[8–9)].

When we exposed the external surface of the CTM at the axillary region of the rat in the previous studies, a certain muscular slip was often found out there. We searched description concerning such muscular bundle in anatomical textbooks of the rodents[6–7,10)] and literature of comparative myology[11–12)]. However, there was no descriptive text explaining about it.

The axillary region is frequently incised during the skin experiments intended to the flap design and muscle reflex[13–15)]. At that time, the slip seems likely to be injured unconsciously. Therefore, we planned to examine the cutaneous muscle further focusing on the region from the flank to the forelimb. The aim of this study was to record the muscular slip separated from the CTM of the rat in detail and to confirm its anatomical property.

Materials and Methods

The animals used in this study were two male and two female Wistar rats of 8 weeks of age. They were sacrificed for the control experiment of cerebral arteries by Dr. S. Okuyama[16)] in 2004. After the experiment, the dead bodies were handed us for exhaustive utilization of animal resources. Immersed in 10% formalin solution for enough fixations, the dermis was excised and the CTM was exposed. Subsequently

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to identification of the muscular slips, all specimens were observed macroscopically and photographed. The anatomical nomenclature of muscles in this study followed the Nomina Anatomica Veterinaria Japonica[17] and Ura[18].

Preliminarily we inquired anew about the use of rat specimens for a member of the Animal Experimentation Committee of Kagoshima University, and obtained the answer that it is not necessary to submit the experimental plan to use of such recent dead body.

Result

The thin muscular slips split from the external surface of the CTM in the ventrolateral side of the trunk and extended cranially (Figs.1, 2). Its origin strode over the boundary area between the humeroabdominalis (HA) and humerodorsalis (HD) muscles18). The muscle bundles were sparse and thin, and entire contour was longish trapezoidal. The insertion was on the brachial fascia or within the subcutaneous tissue of the arm to end diffusely. The averages of 8 sides were 17 mm in width at the origin, 35 mm in maximum length, and 0.6 mm in thick at the center of origin. This slip covered the second and third thoracic mammary glands in female and the whitish adipose mass in male (Fig.1). Both organs passed through the CTM at a hiatus between the HA and HD. To confirm the supplying nerve to the slip, the caudal pectoral nerve arising from the brachial plexus and the cutaneous branches of the thoracic nerve were pursued intensively. However, we could not identify the innervation with clarity (Fig.3).

Discussion

The muscular slip examined in this study has scarcely described in the past. It was separated from the external surface of the CTM. Ura[18] referred such muscle bundle as to the superficial derivative layer of the CTM. We made literature retrieval again based on his viewpoint, and picked up four descriptions of similar muscles. First one is supramammary muscle of the carnivorous animals[19–20], which is homologous to the preputial muscle in male, covering the mammary gland. However, its origin is closely related to the external genital organs. The second is the muscle found in the hystricomorphic rodents, originating at the ventral surface of the CTM and extending to the shoulder[21]. However, its insertion attaches to the proximal part of the humerus. The third is the muscle found in the axillary fold of a species of marsupials, chironectes minimus. Although Ura[18] interpreted it an anlage of the derivative layer, he was negative about the relationship between the development of the CTM and the mammary gland. Lastly there is a short description on the muscular slip of the lemming. Meinertz[22] reported the slip in a male Greenland lemming splitting off from the lateral side of the CTM and extending to the arm and shoulder. It covered the pad of fat and interlaced partly with the platysma. His description is brief, but it is the most similar to the muscular slips found in this study among the newly retrieved cases. In addition, we have also detected the slips of similar configuration in two laboratory mice (unpublished data). Thus, there is a possibility that the murine commonly possesses the muscle bundle of this type.

In this study, we could not identify the innervation of this slip. Nevertheless we would speculate based on positional relation that it is supplied by a branch of the caudal pectoral nerve running downward just inside the boundary area between the HA and HD (Fig.3). If it is true, the innervating nerve will be coursed recurrently directing cranialward along the muscular bundle. It should be continued to search for the supplying nerve to clear whether the slip is a derivative layer of the CTM or not.

This slip is very delicate and is almost covered over by the forelimb in normal body posture. Even allowing the rat in a supine position during a skin experiment, the slip may provoke some confusion to an unskilled practitioner such as misunderstanding of subcutaneous layers or bleeding from the mammary gland. Moreover, there is a possibility that the slip is injured to cause unnecessary contraction or to delay wound healing[13–15]. Therefore, the anatomical knowledge about this muscular slip will probably diminish these inconveniences.

Conclusions

In this study, it is suggested that the fine slips of cutaneous muscle extending from the ventrolateral trunk to the brachium exist not only in the rat but in the common murine animals. For elucidation of phylogenetic origin and its function, further investigation is necessary. Even so, an attention to the muscular slip will improve the procedure of the skin experiment associated with the axillar region of the rat.

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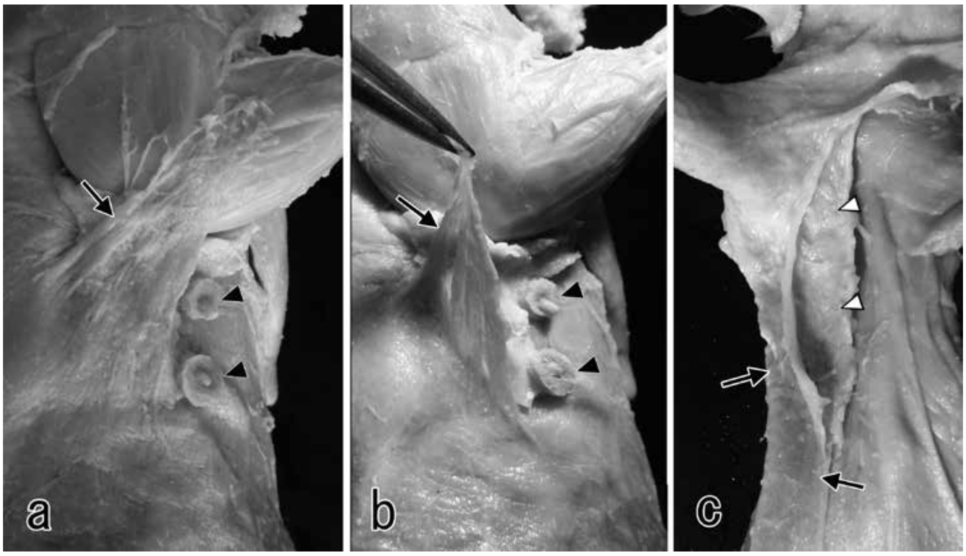

Fig. 1 Photographs of the fine muscular slip in the right side extending from the ventrolateral trunk to the brachium. a (external aspect) and b (the slip is picked up): female specimen showing the slip (arrows) and second and third mammary glands (black arrowheads). c: male specimen showing the slip (arrows) and adipose mass (white arrowheads).

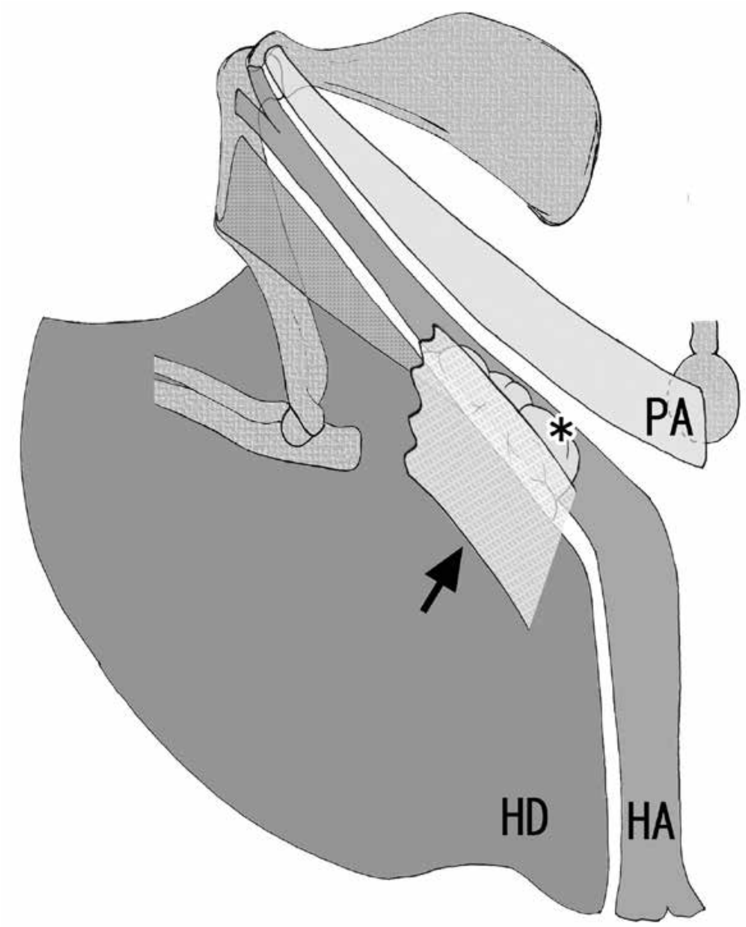

Fig. 2 Schematic drawing of the cutaneous trunci muscle system with skeleton of right forelimb and xiphoid process. The mammary gland (asterisk) is partly hidden by the muscular slip (arrow). HA, humeroabdominalis; HD, humerodorsalis; PA, pectoralis abdominalis.

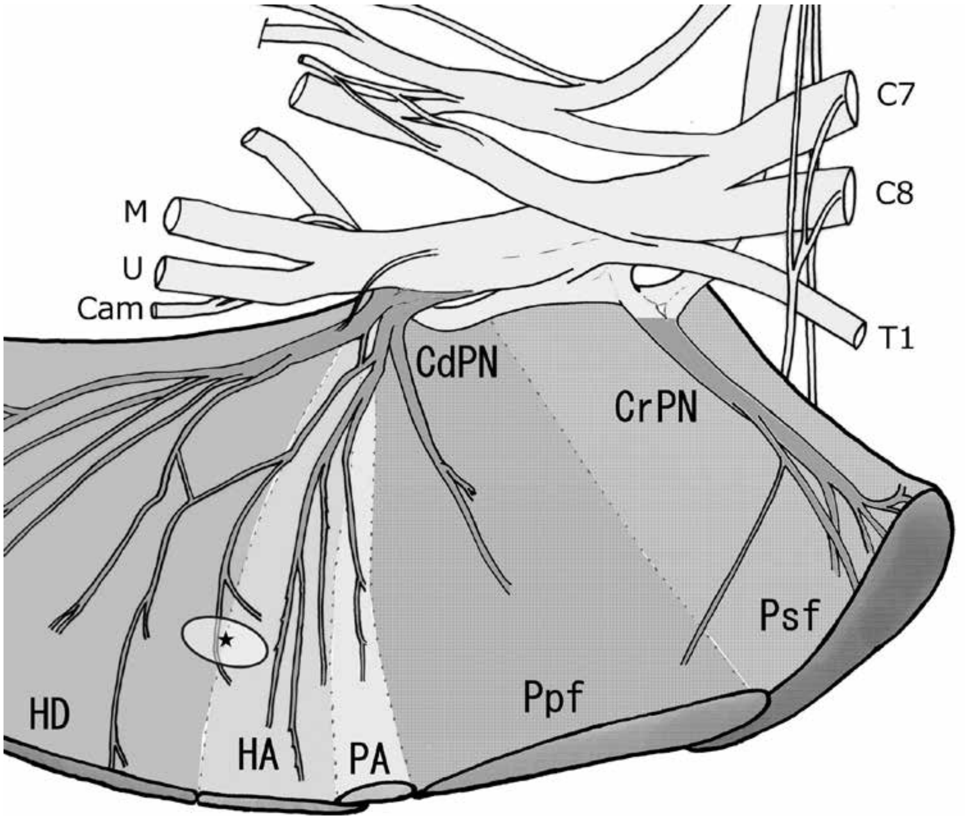

Fig. 3 Schematic drawing of the typical branching pattern in the caudal brachial plexus and a series of pectoralis muscles. Left half viewed from the dorsal side. Black star and circle indicate the origin of the muscular slip outside the HA and HD. C7-T1, ventral branch of the spinal nerves; Cam, medial antebrachial cutaneous nerve; M, median nerve; U, ulnar nerve; CdPN, caudal pectoral nerve; CrPN, cranial pectoral nerve; HA, humeroabdominalis; HD, humerodorsalis; PA, pectoralis abdominalis; Ppf, pectoralis profundus; Psf, pectoralis superficialis.

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