

Neurophysiologic basis of Front-Mu points

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ABSTRACT

Front-Mu points are specific acupuncture points located on the ventral surfaces of chest and abdominal wall. Acupuncture to Front-Mu points is used for treating diseases related with visceral organs. Applying acupuncture on Front-Mu points regulates visceral functions. In this article we tried to explain the effect mechanism of Front-Mu point acupuncture by corresponding these points with the segmental autonomic innervation of internal visceral organs. Changes in the visceral organs caused by application of acupuncture can be explained by viscerocutaneous, cutaneo-visceral autonomic reflexes and modulation of sympathetic and parasympathetic systems by these reflexes. © *Neuroanatomy*. 2009; 8: 32–35.

Key words [Front-Mu point] [sympathetic system] [parasympathetic system]

Introduction

Acupuncture at certain points on the body has been shown to have therapeutic effects in the treatment of various diseases [1–4]. Effect mechanism of acupuncture, electroacupuncture, and physical agents and their connections with the central nervous system have been the interest of many researchers. Integrity of the peripheral and central nervous systems is essential for acupuncture to be effective. It is generally thought that acupuncture, by stimulating the receptors in the area of acupuncture points, transmits a signal to a particular level of the central nervous system, which in turn influences the target organ. Somatosensory inputs from the skin and/or muscle have been shown to be involved in the control of various autonomic functions [5,6].

In acupuncture application, Front-Mu points which are located on the ventral surface of the body are used in the treatment of visceral disease. In treatment, they are used to regulate the activity of internal organs either by tonifications or sedations [7]. The autonomic nervous system controls the visceral functions of the body. Acupuncture application is based on the fact that Front-Mu points stimulate related segmental autonomic nerves. In this report, we describe the relationship between the location of Front-Mu points and the autonomic nervous system.

Autonomic Nervous System

The human internal environment is regulated in large measure by the integrated activity of the autonomic

nervous system and endocrine glands [8]. Autonomic nervous system helps control arterial pressure, gastrointestinal motility, gastric acid secretion, cardiac heart rate, urinary bladder emptying, sweating, body temperature, and metabolic functions [9]. There are numerous medical diseases that implicate this system; like hypertension, asthma, cardiac conduction disorders, sphincteric dysfunction and gastrointestinal motility disorders.

The modern physiologic investigations on the impact of somatosensory input on autonomic functions have been reviewed in a very comprehensive monograph by Sato et al [10]. After Sato's study, there have been reports that specifically investigate the effects of spinal stimulation on autonomic or visceral function. Early investigations assumed that transection of the cervical spinal cord eliminated somatosympathetic reflex at the supraspinal level [11]. Later, many investigators have confirmed the existence of both spinal and supraspinal reflex centers. Kimura et al demonstrated that in CNS, intact anesthetized rats, noxious mechanical stimulation of the skin elicits significant responses in heart rate [12]. A single study conducted by Sato and Swenson investigated the effects of mechanic stimulation of the spine on blood pressure, heart rate and renal sympathetic nerve activity. The application of lateral stress to the lower lumbar or lower thoracic spine produced changes in the monitored parameters that outlasted the length of stimulation. The results were clearly shown as the result of activation of

spinal afferents [13]. Also new evidences suggest that muscle spindles in paraspinal muscles are capable of eliciting somatoautonomic reflexes [14].

Sympathetic afferent fibers conveying nociceptive information from thoracic and abdominal viscera travel via the cardiac and splanchnic nerves. The cell bodies of origin of sympathetic afferent fibers are located in posterior root ganglia at levels T1 to L2. They may ascend or descend one or two spinal levels in the posterolateral fasciculus before terminating in laminae I and V or laminae VII and VIII. In general, viscerosensory fibers that enter the spinal cord at a particular level originate from structures that receive general visceral efferent input from the same spinal level [9,15,16,17].

Viscero-cutaneous Reflex

There is a convergence of somatic and visceral afferent information onto the pools of posterior horn neurons, the axons of which ascend to higher levels of neuroaxis. A functional or organic disease of the viscera causes pain, hyperalgesia, tension, or irritation to a particular area of the skin. Sensory inputs arising from visceral structures are referred to the areas of skin innervated by the same spinal segment(s) (referred pain resulting from reflex phenomena). The convergence of deep and cutaneous afferents on the same dorsal horn cells, coupled with the fact that cutaneous afferents are far numerous than the visceral afferents and have the direct connections with the thalamus, is the probably responsible for the phenomenon. Since the nociceptive receptors and nerves of visceral or skeletal structure may project upon the dorsal horns of several adjacent spinal or brainstem segments, the pain from these structures may be widely distributed [18].

Cutaneous-visceral Reflex

Irritation of a skin point influences the organ functionally as the cutaneous area is connected to the neurotomes. Somatosensory inputs from the skin and/or muscle are involved in the control of various autonomic functions [19–21]. In acupuncture application, front-mu points are used in the treatment of visceral disease [22]. Utilizing acupuncture on the front-mu points awakens the cutaneous-visceral reflexes, and this causes a regulated effect on related organ.

Many researches regarding cutaneous-visceral reflexes on gastrointestinal function have been performed. In some of those investigations, there is evidence indicating the importance of cutaneous-sensory inputs in the autonomic control of gastrointestinal motility. In anesthetized rats, for instance, it was shown that cutaneo-gastric reflexes mediate the inhibition and stimulation of gastric motility via sympathetic and parasympathetic afferents, respectively [21–24]. It was revealed that the cutaneo-sensory stimulation induced by pinching the abdominal skin of rats inhibits gastric motility by increasing sympathetic activity. Conversely, cutaneo-sensory stimulation induced by pinching the hind limb enhances gastric motility by increasing vagal activity [23].

Front-Mu Points

Specific acupuncture points on the ventral chest and abdominal wall are called the Front-Mu points. Front-Mu

points are mainly effective to the problems of visceral organs such as stomach, small intestinal, large intestinal, gall bladder, urinary bladder. Applying acupuncture on Front-Mu points affects visceral organs in many ways, for example, dilatation of the bronchus, heart beat, stomach and intestinal motility, stomach acid levels, release of pancreatic secretions, visceral vessel dilatation, and urinary bladder contractions [25–27].

Front-Mu points are important not only in the treatment of diseases of the internal organs, but they also are of clinical significance in the diagnosis of visceral organ disorders. When any of the visceral organs malfunction, positive reactions such as sensitivity or tenderness will be manifested at the corresponding Front-Mu point. Palpation of sensitive or tenderness points can be a useful aid to diagnosis [7,27]. Stimulating techniques such as acupuncture, moxibustion, or massage may be applied to these points to relieve disorders of the corresponding organs [22,28]. For instance, a sensitivity or tenderness may appear in Riyue (GB24) if the gallbladder is affected. A sensitivity or tenderness may appear in Zhongwan (Ren12) if the stomach is affected. If the lung is diseased, there is tenderness in Zhongfu (Lu1). If the large intestinal is diseased, there is a tenderness in Tianshu (St25). Liver disorders associated with hypochondriac pain may be treated by needling Qimen (Liv14) [27].

Correlation of the Autonomic Nervous System and the Front-Mu System

There is a relationship between the Front-Mu points and the distribution of segmental neurons of the spinal cord. *Zhongfu* (Front-Mu point of the lungs, Lu1). Superolateral to the sternum at the lateral side of the first intercostal space.

Tanzhong (Front-Mu point of the Pericardium, Ren17). On the anterior midline, at the level with the fourth intercostals space, midway between the nipples.

Juque (Front-Mu point of the Heart, Ren14). On the midline of the abdomen, 6 cun above the umbilicus.

Qimen (Front-Mu point of the Liver, Liv14). Directly below the nipple, in the sixth intercostal space.

Riyue (Front-Mu point of the Gallbladder, G24). One rib below Liv 14, directly below the nipple, in the seventh intercostal space.

Zhangmen (Front-Mu point of the Spleen, Liv13). On the lateral side of the abdomen, below the free end of the eleventh floating rib.

Zhongwan (Front-Mu point of the Stomach, Ren12). On the midline of the abdomen, 4 cun above the umbilicus.

Jingmen (Front-Mu point of the Kidney, G25). On the lateral side of the abdomen, on the lower border of the free end of the twelfth rib.

Tianshu (Front-Mu point of the Large Intestine, S25). 2 cun lateral to the centre of the umbilicus.

Guanyuan (Front-Mu point of the Small Intestine, Ren4). On the midline of the abdomen, 3 cun below the umbilicus.

Zhongji (Front-Mu point of the Bladder, Ren3). On the midline of the abdomen, 3 cun below the umbilicus.

Table 1. Sympathetic and parasympathetic innervation of organs, Front-Mu points and dermatomes.

Front-Mu Point	Dermatome	Related viscera	Sympathetic innervation
L1	T1	Lung	T1-T4
Ren17	T4	Pericardium	T1-T5
Ren14	T6	Heart	T1-T5
Liv 14	T8	Liver	T8-T11
G 24	T9	Gall bladder	T8-T11
Liv13	T11	Spleen	T8-T11
Ren12	T8	Stomach	T5-T12
G25	T12	Kidney	T10-L2
St25	T10	Large intestine	T8-L2
Ren4	L1	Small intestine	T8-L2
Ren3	L1-S4	Bladder	T11-L2 S2-S4 (parasympathetic)

The Front-Mu points described above are closely correlated to the dermatomes of spinal nerves supplying autonomic innervation to the related organ. The sympathetic neurons that innervate the lungs are located at the level of T1 through T4, also L1 of the Front-Mu point of the lungs is situated at the level of the first thoracic vertebra. The sympathetic neurons that innervate the pericardium are located at the level of T1 through T5, also Ren17 of the Front-Mu point of the pericardium is situated at the level of the fourth thoracic vertebra. The sympathetic neurons that innervate the liver are located at the level of T8 through T11, also Liv14 of the Front-Mu point of the liver is situated at the level of the eighth thoracic vertebra. The sympathetic neurons that innervate the gall bladder are located at the level of T8 through T11, also G24 of the Front-Mu point of the gall bladder is situated at the level of ninth thoracic vertebra. The sympathetic neurons that innervate the spleen are located at the level of T8 through T11, also Liv13 of the Front-Mu point of

the spleen is situated at the level of the eleventh thoracic vertebra. The sympathetic neurons that innervate the stomach are located at the level of T5 through T12, also Ren12 of the Front-Mu of the stomach is situated at the level of the eighth thoracic vertebra. The sympathetic neurons that innervate the kidney are located at the level of T10 through L2, also G25 of the Front-Mu point of the kidney is situated at the level of the twelve thoracic vertebra. The neurons that innervate the large intestinal are located at the level of T8 through L2 (take branch from at the level of L4), also S25 of the Front-Mu point of the large intestinal is situated at the level of the tenth thoracic vertebra T10. The neurons that innervate the small intestinal are located at the level of T8 through L2, also Ren4 of the Front-Mu point of the small intestinal is situated at the level of the first lumbar vertebra. The sympathetic neurons that innervate the urinary bladder are located at the level of T8 through L2, also Ren3 of the Front-Mu point of the urinary bladder is situated at the level of second lumbar vertebra. The parasympathetic neurons that innervate the urinary bladder are located at the level of S2 through S4, also Ren3 of the Front-Mu point of the urinary bladder is situated at the level of the 2th sacral foramen (Table 1) [9, 29-31].

The sympathetic neurons that innervate the heart are located at the level of T1 through T5, also Ren14 of the Front-Mu point of the heart is situated at the level of the sixth thoracic vertebra. Ren14 which is the Front-Mu point of the heart does not correspond to the sympathetic innervation of the heart but the other two acupuncture points that are commonly used for cardiac disease are located at the dermatomes of T1-T5 segments which supply the sympathetics to the heart.

The aim of this article is to emphasize that the autonomic innervations levels of the lung, pericardium, liver, gall bladder, spleen, and stomach, and urinary bladder correlate well with the Front-Mu acupuncture points which are used to treat the diseases these organs. This indicates a close relationship between the autonomic system and Front-Mu points. From these data, we can conclude that regulating the sympathetic and the parasympathetic activity related with a particular organ is one of the strong effect mechanisms of acupuncture to Front-Mu points that are used to treat the diseases of visceral organs.

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