

Discussion on traditional Chinese medical ideas and the etiology of some common chronic diseases from the perspective of comparative anatomy

Xiaoqing Wang¹, Ling Wang¹ and Junhua Yang^{2*}

¹School of Clinical Medicine, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People's Republic of China

²Department of anatomy, School of Biosciences & Biopharmaceutics, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People's Republic of China

Abstract

As we all know, humans evolve from animals, whose anatomical and structures are related to mammal animals. However, the habits between them are different, especially upright walking and sleeping on your back. Animals appeared earlier than humans, so physiological habits animals physiological habits may be more in line with the laws of nature, which may lead to the use of some organs or systems of human beings not in line with the laws of natural evolution. In fact, humans often suffer from some common chronic diseases that rarely occur in animals. Such as varicocele and prolapse of inter-vertebral disc, this phenomenon may be related to the humans position of special activities and rest. For example, the standing position increases gravity load of the lumbar disc and increases the distance of blood drainage from the spermatic venous, while sleeping on your back aggravates the compression on the spermatic venous.

In addition, a series of clinical medical studies prove that sleeping on your back is more harmful compared to sleeping on your side in a variety of disease states

These modern medical evidence well support a point in traditional Chinese medicine: it is better to sleep on your side This paper aims to deepen the understanding of traditional Chinese medicine (TCM) and the etiology of some common chronic diseases from the perspective of comparative anatomy between human beings and mammals.

Introduction

In the course of natural evolution, animal behaviors may be more adapted to nature. Human beings and animals are both part of nature and are closely related. But their habits related to body posture are different, such as human beings upright walking and sleeping on one's back which may lead to the fact that human beings may suffer from some from some chronic diseases that rarely occur in animals. And the standing position increases gravity load of the lumbar disc obviously. So, the writer decided to discuss the relationship between body posture and some chronic diseases from the perspective of comparative anatomy. The following are the results of comparative anatomy about vascular structures between human beings and animals.

Comparison of vascular structure between human body and animal

Cattle is cited as an example in this paper for these following reasons: first of all, cattle and human beings both belong to chordate, vertebrate subphylum, mammalia and eutheria, which are closely related. Secondly, although non-human primates are more closely related to humans, many of the diseases that humans suffer also occur in their bodies, such as humans suffers from spinal diseases more commonly than non-human primates [1], which means that primates suffer from diseases as well. At the same time, human beings and non-human primates have similar behaviors and habits such as chimpanzees upright walking, which is contrary to the perspective selected in this paper. Therefore, cattle among mammals were selected as the comparison object.

By consulting human anatomy and animal anatomy, it is found that the structure of the trunk circulation between human beings and animals is relatively similar. Due to the greater mobility of the limbs and head, the author didn't discuss their comparison in this paper. The results are as follows: anatomically, the anterior and the posterior of human body correspond to the ventral and the dorsal of animals, while the superior and the inferior correspond to the anterior and the posterior. In human body, the relationship between the artery and the vein in vital organs such as spleen, lung and kidney is as follows: the artery is superior and near the posterior side while the vein is inferior and near the anterior side. And in cattle, the artery is closer to the dorsal side while the vein is closer to the ventral side. According to the principle of fluid mechanics, the direction of fluid flow from high to low is consistent with the direction of gravity. When the trunk of human body is in an upright position, the arteries are in a superior position, and the blood in the portal area flows from the artery to the organ and then to the vein, that is, from high to low, which is in line with the natural flow trend.

*Correspondence to: Junhua Yang, Department of anatomy, School of Biosciences & Biopharmaceutics, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People's Republic of China, E-mail: jhyang2018@gdpu.edu.cn

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Another example is the route of lymphatic duct injection into vein. The route in human body is as follows: The thoracic duct begins inferior to the diaphragm at the level of vertebra L2 and ascends to the base of the neck. The inferior segment of the thoracic duct lies anterior to the vertebral column, slightly to the right of the midline. From its origin anterior to the second lumbar vertebra, it penetrates the diaphragm with the aorta, at an opening known as the aortic hiatus. At the level of vertebra T5 the thoracic duct shifts slightly left and ascends along the left side of the esophagus to the level of the left clavicle. After collecting lymph from the left bronchomediastinal trunk, the left subclavian trunk, and the left jugular trunk, it empties into the left subclavian vein near the base of the left internal jugular vein. Cattle: It goes along the right upper part of the thoracic aorta, the right inferior direction of the right azygos vein and extends forward, then passes through the left side of the esophagus and trachea to descend forward and inject the anterior vena cava in the front of the chest. In the human body, the ureters are a pair of muscular tubes that extend inferiorly from the kidneys for about 30 cm (12 in.) before reaching the urinary bladder. As the ureters extend to the urinary bladder, they pass inferiorly and medially over the psoas major muscles. The ureters penetrate the posterior wall of the urinary bladder without entering the peritoneal cavity. They pass through the bladder wall at an oblique angle, and the ureteral opening is slit-like rather than rounded. This shape helps prevent backflow of urine toward the ureter and kidneys when the urinary bladder contracts. Cattle: The ureter runs posteriorly outside the peritoneal cavity and once into the pelvis, then runs across the dorsal side of the vas deferens posteriorly. The direction of the thoracic duct and ureter which is from high to low in the human body is also consistent with the natural flow of fluid. Before human upright walking, top to bottom, that is, front to back, so these are also consistent with the natural flow of fluid in cattle.

In the human body, the aorta arises from the left ventricle, and the initial segment is the ascending aorta, which moves diagonally upward from the origin to the height of the second thoracic costal joint on the right side and migrates to the aortic arch. The aorta is arched and goes left and posteriorly to the lower margin of the 4th thoracic vertebra passing down as the descending aorta. While the common carotid artery on either side passes up the lateral side of the esophagus, trachea, and larynx. Cattle: The ascending aorta ascends between the pulmonary trunk and the left and right atria, and once away from the pericardium then extends as the aortic arch. The aorta is arched and goes upwards and posteriorly to the ventral side of the 5th thoracic vertebra, continuing as the descending aorta. While the common carotid artery extends forward along the left side of the esophagus and the right side of the trachea. The comparisons show that the relationship between the position of the portal arteries and portal veins in the important organs in the human body and cattle, as well as the movement of the trunk arteries and other pipelines are relatively similar.

The similarity of pipeline structure has nothing to do with the diseases mentioned below, which can only account for that the related postures and behaviors of animals are perhaps even more adapted to nature, more conducive to health in the process of natural evolution, but for human beings, owing to the habits of upright walking and sleeping on your side, the anatomic structure of many organs mentioned before may not exert best physiological function or can't get the best repair under the condition of disease. That is human beings may suffer from these diseases easily because of the different habits. The following analysis about common chronic diseases in humans also provides the similar hints.

The analysis of some diseases or physiological phenomena

Varicocele

The causes of varicocele include congenital anatomical factors and acquired factors. This article mainly discusses the etiology from the perspective of the anatomical structure of human vascular. Veins from testis and epididymis form the racemose venous plexus of spermatic cord, which enter the groin canal through the groin hypodermic ring and gather into 3-4 veins. Then they enter the peritoneum through the inner ring and merge into 1-2 internal spermatic veins. Finally, the right internal spermatic vein enters the inferior vena cava obliquely and the left enters the left renal vein at right angles. Clinically, varicocele on the left side is the most common. The reasons are: 1) the left spermatic vein enters the left renal vein at right angles, which brings the great resistance of blood flow; 2) the human upright posture affects the return of the spermatic vein; 3) the connective tissue around the internal spermatic vein is weak; the valve is defective or incomplete; 4) the internal spermatic vein is compressed by the front sigmoid colon, the superior mesenteric artery and the aorta compresses the left renal vein when they are pulsing and it affects the return of the left internal spermatic vein. Anatomically, varicocele caused by obstruction of spermatic vein blood return that these mechanical compressions make will be ameliorated under the behaviors and habits advocated by the traditional Chinese medical concept, taking side sleep position as an example, which can prevent these compressions and thereby reduce the incidence of varicocele and prevent the severity of the disease.

Atherosclerosis of abdominal aorta

Compared with thoracic aortic sclerosis, atherosclerosis of abdominal aorta is more likely to occur. Their difference is that the abdominal aorta is located in the abdominal cavity and the thoracic aorta is located in the thoracic cavity. Diaphragm is the boundary of them. Why is there a little bit difference, the incidence is so different? The analysis shows that the thoracic aorta is located in the thoracic cavity, whose pressure is negative pressure, so the pressure on the thoracic aorta is small. While the abdominal aorta is located in the abdominal cavity, which is under great pressure. From the perspective of body posture, maybe we can reduce the pressure on the abdominal aorta by side sleep position, which can reduce the pressure on the abdominal aorta caused by abdominal contents compared with supine position. So, side sleep position may better prevent atherosclerosis of abdominal aorta.

Ventilation/perfusion ratio

It refers to the ratio of alveolar ventilation per minute to volume of blood flow per minute. Exactly speaking, it is an index to measure lung ventilation function in physiology, which does not belong to the category of disease. However, because it is different when human beings are in a different position which is related to the efficiency of gas exchange when the human body is breathing normally, it is also used as an example in this paper. When normal adults are quiet, the ratio is about 0.84, which means that the ratio is appropriate, and the gas exchange rate is high. Whether the ratio increases or decreases, it indicates that the matching between them is not good, and the exchange efficiency of gas will decrease, resulting in the retention of oxygen or carbon dioxide, especially the lack of oxygen. In recent years, with the further improvement of people's understanding about ARDS, prone ventilation began to receive more and more attention. In prone position, the heart, large blood vessels and abdomen are placed in a supported position, which prevents their weight pressing

on the lungs, so more lung tissues are not compressed than in supine position. The compliance of chest wall decreased in prone position, and the position of trachea and bronchial tree is favorable for secretion drainage. All these factors contribute to a more balanced distribution of transpulmonary pressure in the prone position, which allows for a more balanced distribution of lung tissue between the exposed and uncompressed, thereby improving the ventilate blood flow ratio and ultimately achieving oxygenation [2]. The fact that the ratio of ventilation and blood flow in the prone position is better and more conducive to lung function also confirms that the sleep positions of animals may be more adapted to nature and more conducive to play the physiological function.

Prolapse of intervertebral disc

It is one of the most common spinal diseases in clinic. The main reason is that there are different degrees of degenerative diseases in the components of the disc (nucleus pulposus, annulus fibrosus and cartilaginous plate), especially nucleus pulposus. Under the influence of external factors, the fibrous ring of the disc ruptured, and the nucleus pulposus protrudes or falls out from the ruptured place or the rear or lateral rear or spinal canal, thus causing the adjacent tissues, such as spinal nerve root and spinal cord, to be stimulated or oppressed, causing a series of clinical symptoms such as the pain and numbness in neck, shoulder, hips and legs etc. It can be seen from the changes of the internal pressure of the lumbar disc in different postures of the human body that the internal pressure of the lumbar disc in upright standing and upright sitting position is smaller than that in other standing and sitting positions, which can better alleviate the disc prolapse [3]. Compared with the lateral position, although the internal pressure of the lumbar disc in the supine position is smaller, prolapse of intervertebral disc is common in backward or posterolateral. When lying on the back, it is easier to push the disc backward, and the internal pressure required for the backward prolapse of the lumbar disc is smaller, which is easier to cause prolapse, that is to say, side sleep position is better. Therefore, as for the prevention and rehabilitation of disc herniation, “standing like loose”, “sitting like a clock”, “lying as a bow” advocated by the traditional Chinese medical concept has a good effect. In addition, “standing like loose, sitting like a clock” is an ancient physician’s description of the best posture of sitting and standing, which has been regarded as a standard for thousands of years. The description of human posture by a few figures is also in line with the contemporary biomechanics, and the damage to the spine is the smallest under this posture.

The significance of viewpoint in this paper

When the body is in different positions, due to the effects of gravity, the relative positions of organs and structures in the body, their physiological functions and the interactions between are impacted and they affect human health. Taking the example of sleeping on one’s side, it is a sleep position highly recommended in TCM. In addition to the above examples of chronic diseases, there is also a series of clinical medical studies proving that sleeping on your back is more harmful compared to sleeping on your side in a variety of disease states. From the perspective of modern medicine, there are theoretical support for the

benefits of side sleep position as well. Side sleep position is significantly protective of walking cervical and scapular or arm pain, which is also significantly associated with sleep quality rating compared with other sleep positions [4]. Side sleep position has evolved to optimize waste removal during sleep and glymphatic transport was most efficient in this position compared with the supine or prone positions [5]. And left-lateral decubitus positioning is also a conservative therapy of superior mesenteric artery syndrome [6]. It can be shown that side sleep position is significantly beneficial to human health in a way and the idea of body posture in TCM is reasonable. The discussion of the relationship between diseases and postures gives important enlightenment to the prevention of diseases. In addition, the patient’s posture may also have a significant effect on the outcome of the operation during the procedure. So, the importance of body posture should not be neglected whether in health status or morbid state.

Notes on contributors

Xiaoqing Wang is a college student in Class 3, Grade 2018, School of Clinical Medicine, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People’s Republic of China.

Ling Wang is a college student in Class 2, Grade 2019, School of Clinical Medicine, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People’s Republic of China.

Junhua Yang, Ph.D., is a teacher lecturer in the Department of anatomy, School of Biosciences & Biopharmaceutics, Guangdong Pharmaceutical University, Guangzhou, Guangdong, People’s Republic of China. He teaches anatomy.

Declaration of interests

The authors declare that there are no conflicts of interest.

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