

Expression of nitric oxide-containing structures in the rat carotid body



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ABSTRACT

The carotid body (CB) is a major peripheral arterial chemoreceptor organ that evokes compensatory reflex responses so as to maintain gas homeostasis. It is dually innervated by sensory fibers from petrosal ganglion (PG) neurons, and autonomic fibers from postganglionic sympathetic neurons of the superior cervical ganglion (SCG) and parasympathetic vasomotor fibers of intrinsic ganglion cells in the CB. The presence of nitric oxide (NO), a putative gaseous neurotransmitter substance in a number of neuronal and non-neuronal structures, was examined in the CB, PG and SCG of the rat using nicotinamide adenine dinucleotide phosphate diaphorase (NADPH-d) histochemistry, nitric oxide synthase (NOS) immunohistochemistry and retrograde tracing. One week after injecting the retrograde tracer Fast Blue (FB) in the CB, we found that a subset of perikarya in the caudal portions of the PG and SCG were FB-labeled. Histochemistry and immunohistochemistry revealed that the majority of large- and medium-sized PG and SCG cells were NADPH-d positive and displayed a strong NOS immunostaining. We also observed that many varicose nerve fibers penetrating the CB and enveloping the glomus cells and blood vessels were NADPH-d reactive and expressed the constitutive isoforms of NOS, nNOS and eNOS. In addition, some autonomic microganglion cells embedded within, or located at the periphery of the CB, and not glomus or sustentacular cells were nNOS-immunopositive while CB microvasculature expressed eNOS. The present results suggest that NO is a transmitter in the autonomic nerve endings supplying the CB and is involved in efferent chemoreceptor inhibition by a dual mechanism.

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1. Introduction

The carotid body (CB) is a polymodal chemosensory organ that plays an essential role in initiating respiratory and cardiovascular adjustments to hypoxia, hypercapnia and acidosis (González et al., 1994; Nurse, 2005). It consists of small clusters called glomeruli, and is composed of two cell types, neuron-like glomus and glial-like sustentacular cells. They are interspersed by blood vessels and nerve bundles, and separated by connective tissue (Atanasova et al., 2011). The chemosensitive glomus cells are of neural crest origin, share many characteristics with neurons of the peripheral nervous

system as well as adrenal chromaffin cells and are dually innervated by both sensory and autonomic fibers (see Kumar and Prabhakar, 2012 for references). The sensory innervation of the rat CB is provided by nerve fibers of primary afferent neurons in the petrosal ganglion (PG) through the carotid sinus nerve, while the autonomic innervation is carried out by postganglionic sympathetic fibers from the adjacent superior cervical ganglion (SCG) via the ganglioglomerular nerve as well as by parasympathetic fibers from intrinsic ganglion cells which receive a preganglionic input via the glossopharyngeal nerve (Gerard and Billingsley, 1923; McDonald and Mitchell, 1975; Kynda, 1976; Ichikawa, 2002). Moreover, it is known that the autonomic cells also contribute to CB vascular innervation (McDonald and Mitchell, 1975).

It has been proposed that in response to significant changes in the blood chemical levels the chemoreceptor glomus cells may release a variety of neurotransmitters, including catecholamines and neuropeptides, which contribute to the increased sympathetic outflow to systemic vascular beds and to a heightened action potential activity on the carotid sinus nerve (Nurse, 2005, 2014; Nurse and Piskuric, 2013). Furthermore, there is recent evidence that nitric oxide (NO) is an important mediator in oxygen sens-

Abbreviations: CB, carotid body; FB, Fast Blue; eNOS, endothelial nitric oxide synthase; iNOS, inducible nitric oxide synthase; nNOS, neuronal nitric oxide synthase; NADPH-d, nicotinamide adenine dinucleotide phosphate diaphorase; NO, nitric oxide; NOS, nitric oxide synthase; PG, petrosal ganglion; SCG, superior cervical ganglion.

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ORIGINAL PAPER

Acupuncture causes serotonin release by mast cells

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Abstract

Mast cells (MCs) are important object in experimental acupuncture due to their putative involvement in local reactions to needling. In the rat, they are shown to contain in their granules, among other tissue mediators, serotonin, also called 5-hydroxytryptamine (5-HT). The aim of this study is to examine the normal distribution of 5-HT-containing MCs in soft tissues of Zusanli (ST₃₆) acupuncture point (acupoint) and their morphological changes caused by experimental acupuncture. We observed 5-HT-immunopositive MCs in the tissues and in the vicinity of the needle tract formed after acupuncture. As a result of acupuncture needling, the tissue integrity is disrupted and certain folds are formed in the direction of the needle tract. Connective tissue in the vicinity of the needle tract gets compressed and displaced, together with the 5-HT-immunoreactive MCs seen there. Some of those 5-HT-immunopositive MCs showed signs of degranulation with numerous discharged granules, some of them found at a considerable distance from the cell. Furthermore, 5-HT-immunopositive MCs are unevenly distributed in soft tissues of ST₃₆ acupoint. Larger numbers of 5-HT-containing MCs were visualized in subcutis and dermis, compared to the observed in striated muscles. Placing the acupuncture needle into the rat skin caused a formation of an apparent needle tract, tissue displacement and degranulation of 5-HT-immunopositive MCs. The demonstrated serotonin release by means of MC degranulation might be involved in the local tissue response to acupuncture.

Keywords: ST₃₆, mast cells, rat, 5-HT, needle tract, acupoint.

Introduction

Mast cells (MCs) are associated mainly with their involvement in innate immunity and the mechanisms of defense against parasite infections, immunomodulation of the immune system and tissue repair [1]. MCs are derived from hematopoietic stem cells and distributed throughout tissues, particularly near surfaces exposed to the environment [2]. MCs have a crucial role in innate and adaptive immunity, including immune tolerance [3]. Studies have shown that the MCs, which are located beneath the basal layer of the epidermis in the normal skin in rats, are involved in wound healing of the skin [4]. Their tight involvement with the skin makes them an important subject for research in acupuncture points and acupuncture meridian lines [5–9]. MCs are important object in experimental acupuncture in rats [5, 9–12]. They are found to be involved in reactions not only to classical acupuncture using a steel needle, but also in laser acupuncture [13]. Serotonin, also known as 5-hydroxytryptamine (5-HT), is one of the most extensively examined neurotransmitters in the central nervous system, and also present in a variety of peripheral tissues in constituents of the immune system. Functions of 5-HT include T-cell and natural killer (NK)-cell activation, delayed-type hypersensitivity responses, production of chemotactic factors, and natural immunity delivered by macrophages [14]. 5-HT has been demonstrated in the granules of rat MCs [15–17]. Its expression in the

tissues of acupuncture points (acupoints) is generally limited to 5-HT-positive MCs [18]. In acupoints, they are predominantly located in the dermis, which is comprised of an integrated system of fibrous and amorphous connective tissue that accommodates MCs, among nerve and vascular networks, epidermal derived appendages, fibroblasts, and macrophages [19]. In our previous research, we determined the normal histology of Zusanli (ST₃₆) acupoint, *i.e.*, the epidermis, dermis, subcutis, fascia, epimysium, muscle, blood vessels and nerves. We found clusters of MCs in certain areas of the dermis, subcutis, fascia and striated muscle [20].

Materials and Methods

The aim of this study is to examine the normal distribution of 5-HT-immunopositive MCs in soft tissues of ST₃₆ acupoint and their morphological changes caused by experimental acupuncture in rats. The method we developed enables the investigator to demonstrate the tissues in a circumstance, maximally close to the condition during the needling process, without additional staining and/or processing. The moment of intervention remains “frozen in time” [21]. Changes in epithelium, blood vessels, nerves, elastic and collagen fibers, fascia, and muscle can be followed. Furthermore, it allows the visualization of degranulated 5-HT-containing MCs in the vicinity of the needle tract. The experiments were carried out on 10 adult male Wistar rats weighing between



MAST CELL DISTRIBUTION AROUND THE NEEDLE TRACT FOLLOWING ACUPUNCTURE IN ZUSANLI (ST36) ACUPOINT IN RATS

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Summary

Dimitrov, N. D., D. Y. Atanasova, N. S. Tomov, Y. A. Staykova-Pirovska, I. G. Ivanova & D. P. Sivrev, 2017. Mast cell distribution around the needle tract following acupuncture in Zusanli (ST36) acupoint in rats. *Bulg. J. Vet. Med.* (online first).

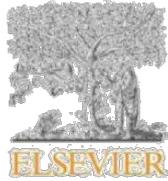
The aim of this study was to investigate mast cell (MCs) distribution in the vicinity of the needle tract formed after acupuncture in Zusanli (ST₃₆) acupoint in rats. MCs were detected by histochemistry, immunohistochemistry and transmission electron microscopy, and evaluated quantitatively. It was established that after acupuncture in ST₃₆ acupoint the integrity of the epithelium, dermis, subcutaneous connective tissue, fascia, epimysium and striated muscles was disrupted and folded to the direction of the needle tract. In the thickened connective tissue MCs were observed close to the needle tract, without visible differences in their number along the tract, but most of them were with signs of degranulation, possibly due to acupuncture. It could be presumed that acupuncture in ST₃₆ caused recruitment and activation of MCs followed by degranulation which most probably influenced the local microenvironment.

Key words: acupuncture, degranulation, mast cells, needle tract, Zusanli (ST₃₆)

INTRODUCTION

Acupuncture is a commonly used method of the Traditional Chinese Medicine. Zusanli (ST₃₆) acupuncture point (acu-point) is one of the most important for treatment of both humans and animals. ST₃₆ can be used in experimental acupuncture by applying the method of standard proportions of anatomical structures

under the control of an apparatus measuring skin resistance (White *et al.*, 2008; Dimitrov *et al.*, 2009). Mast cells (MCs) are resident mainly in the connective tissue, particularly in vicinity of small blood vessels and nerves. Their usual localisation is in proximity to surfaces that interface the external environment. Biological



Short communication

Immunohistochemical localization of angiotensin AT₁ receptors in the rat carotid bodyDimitrinka Y. Atanasova^{a,b,d}, Angel D. Dandov^b, Nikolay D. Dimitrov^b, Nikolai E. Lazarov^{a,c,e}^a Institute of Neurobiology, Bulgarian Academy of Sciences, Sofia 1113, Bulgaria^b Department of Anatomy, Faculty of Medicine, Trakia University, Stara Zagora 6003, Bulgaria^c Department of Anatomy and Histology, Medical University of Sofia, Sofia 1431, Bulgaria^d Department of Genes and Behavior, Max Planck Institute of Biophysical Chemistry, Göttingen 37077, Germany

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ABSTRACT

The carotid body (CB) is a major peripheral arterial chemoreceptor that initiates respiratory and cardiovascular adjustments to maintain homeostasis. Recent evidence suggests that circulating or locally produced hormones like angiotensin II acting via AT₁ receptors modulate its activity in a paracrine-autocrine manner. The aim of this study was to examine the immunohistochemical localization of AT₁ receptor in the CB of adult rats and to compare its expression in vehicle-treated animals, and after the long-term application of its selective blocker losartan. Immunohistochemistry revealed that a subset of CB glomeruli and the vast majority of neurons in the adjacent superior cervical ganglion (SCG) were strongly AT₁ receptor-immunoreactive. In the CB immunostaining was observed in the chemosensory glomus cells typically aggregated in cell clusters while the nerve fibers in-between and large capillaries around them were immunonegative. Exogenous administration of losartan for a prolonged time significantly reduces the intensity of AT₁ receptor immunostaining in the CB glomus cells and SCG neurons. Our results show that AT₁ receptors are largely expressed in the rat CB under physiological conditions, and their expression is down-regulated by losartan treatment.

1. Introduction

The carotid body (CB) is a polymodal chemosensory organ that plays an essential role in initiating respiratory and cardiovascular adjustments to maintain homeostasis (Gonzalez et al., 1994). It consists of small clusters called glomeruli composed of two cell types, neuron-like glomus and glial-like sustentacular cells (Atanasova et al., 2011). Being one of the most irrigated organs in the body, a profuse capillary network travels in the connective tissue walls and intimately intermingles with the CB glomeruli. The chemoreceptor glomus cells are dually innervated by sensory nerve fibers through the carotid sinus nerve (CSN) and autonomic fibers of both sympathetic origin from the closely located superior cervical ganglion (SCG) via the ganglioglomerular nerve and parasympathetic fibers branching from intrinsic ganglion cells (McDonald and Mitchell, 1975; Kanda, 1976; Ichikawa, 2002). In response to significant changes in the blood chemical levels these cells may release a variety of neurotransmitters, which activate the afferent nerve to relay chemosensory information to the brain (Nause, 2005;

Nause, 2014). Besides, there is recent evidence that the sustentacular cells may actively participate in paracrine signaling during chemo-transduction (Nause, 2014). On the other hand, the CB is responsive to locally produced signaling molecules and circulating hormones via their corresponding receptors on the chemosensory cells which modulate their activity in an autocrine-paracrine manner (Fung, 2015).

Angiotensin II (Ang II) is a vasoactive peptide hormone that plays an important physiological role in the regulation of sympathetic nervous activity, maintenance of blood pressure, electrolyte and fluid homeostasis (Peach, 1977), and also in the pathophysiology of various cardiovascular diseases (reviewed by Parrilla, 2006). Its physiological effects are mediated by at least two distinct receptor subtypes, designated as Ang II type 1 (AT₁) and type 2 (AT₂) receptors (Linnemann and Smith, 1994). In addition to these main receptors, two other subtypes have been identified, namely the AT₃ and AT₄ receptors, although they are not fully pharmacology characterized, and also the designation AT₅ is not widely recognized (Unger et al., 1996).

Ang II and its receptors are major components of the renin-

Abbreviations: Ang II, angiotensin II; AT₁, Ang II type 1 receptors; AT₂, Ang II type 2 receptors; CB, carotid body; CSN, carotid sinus nerve; NO, nitric oxide; RAS, renin-angiotensin system; ROS, reactive oxygen species; SCG, superior cervical ganglion

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DISTRIBUTION OF SEROTONIN POSITIVE MAST CELLS
IN THE INTRAPULMONARY AIRWAYS OF RATS

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Abstract

Based on the scarce information about the expression of serotonin by mast cells in normal rat lung, we aimed to describe in detail the distribution of these cells in the wall of bronchi and bronchioles, as well as in the interalveolar septa. To visualize serotonin-positive mast cells a toluidine blue staining was performed immediately after the immunohistochemical staining on the same sections. Thus, we estimated the density of mast cell in different layers of intrapulmonary airways and in alveolar parenchyma. A reduction of mast cell numbers from bronchi to bronchioles, and then to alveolar septa was detected. In conclusion, detailed information about the density of serotonin positive mast cells in the layers of the wall of intrapulmonary airways and alveolar parenchyma is presented. Our findings confirm the role of these cells as one of the main sources of serotonin, which participate in maintaining the homeostasis in the lung.

Key words: serotonin, mast cells, lung, rat

Introduction

The role of biogenic amine serotonin [5-hydroxytryptamine (5-HT)] in the lung is associated with the constriction of smooth muscle cells in the wall of pulmonary vessels and bronchi [¹].

Das et al. [¹] reported that lungs are also the place of inactivation of this hormone. The vasoconstrictor effect of serotonin in the lung was reported to be achieved by two pathways. One of them is via serotonin receptors: 5-HT1B and 5-HT2A - G protein-coupled receptors (GPCR), localized in the pulmonary vessels [²]. Eddahibi et al. [³] revealed another pathway of serotonin action on pulmonary smooth muscle of rodents via serotonin transporter (5-HTT).

ANANDAMIDE-INDUCED EXPRESSION OF CB1 CANNABINOID
RECEPTORS IN THE RAT MESENCEPHALIC TRIGEMINAL NUCLEUS
AFTER SHORT-TERM THERMAL STRESS

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Abstract

The mesencephalic trigeminal nucleus (Me5) neurons are centrally displaced ganglion cells that play a crucial role in orofacial proprioception, and receive synaptic input from various brainstem regions which regulate feeding behavior. The vast majority of them, mostly large pseudounipolar neurons, utilize glutamate for synaptic transmission while a subset of smaller multipolar cells is GABAergic. Evidence shows that cannabinoid (CB) receptors and their endogenous ligands are widely distributed in brainstem areas that are involved in pain sensation and feeding by influencing glutamate and GABA neurotransmitter systems. This study aims at investigating the presence of CB1 receptors, the major cannabinoid receptor subtype in the brain, in Me5 neurons after acute exposure to thermal stress and application of their selective agonists and antagonists. We found that the administration of the endogenous CB1 agonist anandamide evokes strong expression of CB1 receptors in the mesencephalic trigeminal neurons in rats exposed to short-term (up to 1 hour) thermal stress at 32-36°C, while the injection of the synthetic CB1 antagonist AM251 decreases their expression in the hot-plate test. Our results suggest that mild thermal stress triggers endocannabinoid release in the Me5 neurons and that possibly plays a role in the regulation of feeding behavior.

Key words: acute thermal stress, anandamide, cannabinoid receptors, endocannabinoids, mesencephalic trigeminal neurons, rat



Mini-review

MODERN DAY PLASTINATION TECHNIQUES – SUCCESSOR OF ANCIENT EMBALMMENT METHODS

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ABSTRACT

The purpose of this study is to find, analyse and systematise the basic ways of embalmmment and their application in contemporary methods of plastination. In most of the ancient mummies the internal organs and the brain were removed. Usually the best-preserved samples were under additional protective circumstances - low temperatures, dry air, draught, or isolating cover of the body. Chinchoros used NaCl and, later on, fire for drying of body cavities. The dehydration factors in the Pacific mummies were warmness and smoke, while ancient Egyptians used sodium salts. Chinchoros covered the whole body with manganese dust, brilliant ochre or clay. The skin of the mummies from Melanesia was coated with fats mixed with red ochre, and Egyptians impregnated the dead bodies and linen bandages with herbal oils derived from Cedar Tree (*Cedrus atlantica*). The ancient principles of embalmmment – dehydration and impregnation are used also in modern plastination technologies, including plastination with products of type "Biodur Sn".

Key words: Anatomy, Biodur, mummies, organs, corpse

INTRODUCTION

For many centuries scientists have tried to create effective and health-safe method of conservation and long-lasting preservation of corpses. Mummies and anatomic preparations created in the past have had many disadvantages, which is the reason for continuous research today

GOAL AND TASKS

The goal of this study is to find, analyse and systematise the various basic ways of embalmmment and their application in contemporary methods of plastination.

BASIC INFORMATION

According to Gwinn et al. (1) embalmmment is a complex process of treating dead bodies with balsams to protect them against actions of putrefying bacteria and tissue enzymes,

thereby creating mummies.

According to SBE (2) the embalmmment is "...artificial conservation of corpse to

prevent it from rotting. Balsams, resins, ether oils, spirit, formalin, carbolic, glycerin and sublimate are used."

Mummification (3) can be a result of natural causes (spontaneous, natural mummification) or result of deliberate human activity (artificial mummification, embalmmment)

Spontaneous mummification often happens in one of the following cases:

- When human bodies fall into peat bogs or alpine, or Arctic glacier.
- After quick, deliberate or accidental drying of the dead body in hot or cold, but dry deserts.

Tens of bog mummies have been found during XIX and XX centuries in Northwestern Europe (Table 1). Though some of them are older than 2,000 years, yet most are in excellent physical conditions (4).

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From Mummification to Plastination

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The authors analyze and systematize the principals and the methods of embalment and some factors that were used for conservation of the of corpses through the ages and now.

Key words: Mummy, Mummificatin, Plastination, Biodur.

Introduction

For many centuries scientists have tried to create effective and safe for human health method of conservation and long-lasting preservation of corpses. Mummies and anatomic preparations created in the past have had many disadvantages, which is the reason for the continuation of research in this area. There is a succession between mummification and plastination as a modern scientific method for conservation of organic matter.

Basic information

The Mummies of Chinchoros. Auf der heide et al. [3] inform about seven mummies from the northern Chilean coast. One of the bodies is the oldest naturally preserved mummy aged 9000 years. Allison [1] and Standen [12] describe in detail the funeral techniques used by Chinchoros in 149 well preserved mummies. Embalmers took out the internal organs, remove soft tissues and replace them with texture. There are two styles of mummification [2]: 1) "Black style"(manganese mask). The earliest well preserved mummy of this style "The child of valley Camarone", situated 70 kilometers south of city Arica in Chile, is from 5050 BC; 2) "Red style" (red ochre cover). The child from El Morro near Arica is in this style.

Pacific mummies. Auf der heide [4] describes 14 of the well-preserved pacific mummies from Melanesia, Papua New Guinea, Australia and the islands of Torres.

Embalmers take out fats and internal organs, smoke the body and rub into the skin its own fats and red ochre. Few times a day the body is massaged until it has

CESSATION OF THE POSTMORTAL BIOLOGICAL FACTORS EFFECTS BY PLASTINATION PROCEDURES

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ABSTRACT. Decay is a vital process in nature but an impediment to morphological studies, teaching, and research. Many scientists tried experiments for anatomical preservations in the ages. Plastination is developed by Dr. Gunther von Hagens in Heidelberg, Germany in 1978. In this process, water and lipids in biological tissues are replaced by curable polymers which are subsequently hardened, resulting in dry, odorless and durable specimens.

KEYWORDS. plastination. biological factors, Biodur

INTRODUCTION

Anatomy is a fundamental educational science in Medical Universities. Usually we use natural anatomical preparations for practical learning of human and animal morphology. They are made from bodies of dead humans and animals. The biological material has a quick destruction. This is a great problem for the modern anatomy.

Physical and chemical changes begin in tissues of organisms after their dead. Decay is a vital process in nature but an impediment to morphological studies, teaching, and research. This is a big difficult for preservation of the bodies and for anatomical education. All organic compositions destroy irreversible by the action of microbes and proteolytic enzymes. Part of microbes enter in the body from surroundings after dead because the protection is absent. Saprophytes are constantly in cavities of organism. They both saprophytes and putrides activate and develop in the tissues since there are proper conditions for their development - nutrition and humidity. It has always been a goal to find suitable preservation techniques, especially for anatomists.

A Fair Demonstration of Acupuncture Points Location on Human Body Surface

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INTRODUCTION

Chinese traditional medicine, **zhongyi** is a natural, effective and comparatively innocuous art that recovers the balance in human body and it restores to health. Chinese medicine bases on harmony of organism-microcosms – between its parts and with environment, Universe-macrocosms. This medicine includes four science tendencies: **zhenjiu**, acupuncture and moxibition, **zhongyao** – herbs and natural products, **tuina** – massage and manual therapy, and **qi-gong** – balance of **qi**-energy in human body.

AIM

The aim of this investigation is to demonstrate availability and position of acupuncture points, and show their internal microstructure

MATERIAL AND METHODS

Needle-, **zhenfa** and **moxibution**, **jiufa** are based on an effect upon active points of body surface by metal needles and local temperature. Many objective methods are used for location of acupuncture points:

Principles of Treating Rotator Cuff Injuries in Swimmers by Methods of Chinese Medicine

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Chinese Medicine *Zang/Fu* Organ Principles

To treat this condition, one must understand the dynamics of the swimming movements and the key muscles involved with this particular stroke. First, one needs to focus on scapular stability. There are no other muscles that can really compensate for the m. serratus anterior, as it fires continuously throughout the stroke. Another area of importance is called the "anterior wall," which is the first muscular layer for joint protection, and the primary muscle involved is the m. subscapularis. Typical pain-avoidance pattern involves the scapular muscle, upper part of m. trapezius and shoulder-joint muscles: the deltoids (anterior/middle) and infraspinatus.

Using and understanding the principles of Chinese medicine (CM) is paramount for results at this level of treatment. Protocol treatments do not work in these circumstances. In this arena, you either get results or you don't, but you better know what you are doing, because you don't get a second chance.

The age, training schedule, nutrition, social support and family support network the athlete has can affect various *zang/fu* organs and channels, creating various pre-existing conditions. Treating the whole body is imperative. This relates in CM to not only the *qi* and blood, but also channels/vessels, collaterals and *zang/fu* organs. In this type of

Clinical Study on Physical and Chinese Methods for the Treatment of Multiple Sclerosis

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Clinical data

General data

In the series, 28 inpatients (33 cases/times) in this hospital were enrolled. Among them, one patient had been hospitalized three times, three patients had been hospitalized twice; there were 12 male cases/times and 21 female cases/times, the ratio of males to females being 1:1.75; ranging 13-68 years in age, averaging 39.4 ± 12.8 years; the course of disease was 1 day-168 months with a mean of 41.1 ± 52.6 months. In the series, all patients were divided into 4 types:

- the recurrent remission type 24 cases/times (72.7%).
- the chronic progressive type 6 cases/times (18.2%).
- the secondary progressive type 3 cases/times (9.1%).
- the benign type zero case/time.

Among them, 16 cases/times (48.5%) had no obvious predisposing cause, and 17 cases/times recurred and exacerbated mainly due to external affect (7 cases/times, 21.2%), mental stimulation (3 cases/times, 9.1%), fatigue (3 cases/times, 9.1%), viral infection (2 cases/times, 6.1%), pregnancy and seasonal changes (each one case/time, 3.0% each). None of the patients had a family history of MS.

Effect of a Modern Combination between Local Applications of Acupuncture Needle Pricks and Electromagnetic Treatment

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INTRODUCTION

Methods of Traditional Chinese Medicine include zhenjiu, needle- and moxa- affects upon acupuncture points for adjustment of qi-balance in human body.

We think that it is possible to take a more strong effect with a combination between local application of acupuncture needle prick and an electromagnetic treatment.

The aim of this investigation is to determine an utility of this combination for the human health. It is possible to take a more strong effect with a combination between local application of acupuncture needle prick and an electromagnetic treatment.

Chronic Fatigue Syndrome Treated by Acupuncture at Eight Influential Points and Cupping Therapy

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The chronic fatigue syndrome (CFS) refers to a series of symptoms manifested mainly by chronic or repetitive periods of extreme fatigue, which are accompanied by headache, sore throat, myalgia and arthralgia, insomnia and many other psychoneuroses without other chronic organic or mental diseases. The etiological factor (cause of a disease, origin of a disease) and pathogenesis of CFS are not yet clear in modern medicine and there have been no effective medicines for it. Since 1998, were treated 60 cases of CFS with acupuncture and moxibustion at eight influential points and cupping therapy on the back side of body, and achieved good therapeutic effects.

Clinical data

Criteria for diagnosis

Diagnosis was made according to the following:

- 1) Severe sustaining and repetitive periods of fatigue without causes, lasting for 6 or more than 6 months, which was not alleviated after sufficient rest, there was considerable decline in the ability to work, follow education and self-care in life and to take part in social activities, compared with before.
- 2) At least four of the following eight symptoms were exhibited:
 - a) decline of memory or attention;



Original Contribution

**TOPOGRAPHOANATOMICAL CHARACTERISTIC of the ACUPUNCTURE
POINT LI4 (Hegu) and IRRADIATION of the FEELINGS DURING
MANIPULATION**

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ABSTRACT

The main goal of this study is to explain the specific feelings that accrue during acupuncture stimulation of Hegu (LI₄). The main data about the topographic anatomical structure of the area of the hand was collected, systematized and analyzed. The anatomical area of the point was studied layer by layer in details during dissections and in literature and all information was used to explain the classical formulation of the traditional Chinese medicine (TCM). As results we established that there is correspondence between the anatomical structures in the area that and the irradiation that has not been taken under attention so far.

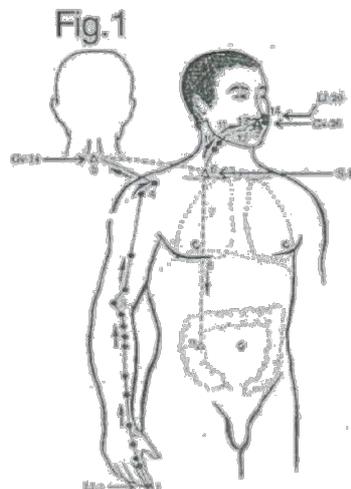
Key words: GI₄, LI₄, TCM, anatomy, acupuncture.

INTRODUCTION

The acupuncture as a method of treatment is becoming more and more popular and its role in every day practice is growing. The responsibility is growing as well, and all questions that are not absolutely clear need to be examined.

The Hegu point GI₄ (LI₄) is one of the most important and most frequently used, however there is not enough information about the topography and the anatomical structures involved in the formation of the feelings, and the healing effect as well. According to TCM the point Hegu belongs to the canal of the large intestine and is one of the four main points of the human body. Generally the feelings during stimulation of an acupuncture point go along the canal that the point is from. The large intestine canal is situated on the external site of the upper extremities and has external and internal course. The external course starts from the radial nail edge of the index finger goes on the radial edge of the

finger, passes trough LI₄ point, continues on the anterior-lateral side of the upper extremities and reaches the supraclavicular fossa. From here the external course continues up on the lateral side of the neck crosses the lower jaw goes around the upper lip and ends next to the contra lateral of the nose in the LI₂₀ point. From supraclavicular fossa the internal course of the canal is started. It goes through the lung, the diaphragm and reaches the colon [2]. Fig. 1, Fig. 2.



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Original Contribution

**СРАВНИТЕЛЕН МОРФО-ФИЗИКАЛЕН АНАЛИЗ НА
БИОЛОГИЧНОАКТИВНИТЕ ТОЧКИ**

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**A COMPARATIVE MORPHOLOGIC-PHYSICAL ANALYSIS of BIOLOGICAL
ACTIVE POINTS**

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ABSTRACT

The results are from some biologically active points, located on the Sanjiao (Qihai RN6; Tienshu ST25) and Dazhui DU14).

Histologically in the BAP the connective tissue is 3 times thinner compared with the areas outside of them. We established a specific position of the collagen, as well as increased number of blood vessels and there are not differences between free receptors in both parts of the skin.

The physical examination results in the BAP are: QihaiRN6 - 780k Ω , TienshuST25 - 800k Ω , DazhuiDU14 - 787k Ω . The resistance in the areas outside of the BAP was at the rate of 6715 Ω .

Key words: BAP, acupuncture, energy channels, skin resistance, histology

ВЪВЕДЕНИЕ

Биологичноактивните точки и енергийните канали са използвани в Древен Китай още при династията Чан (XVI-XI век пр. н.е.) [5]. Съвременната наука многократно се е опитвала да докаже тяхното съществуване чрез обективни научни методи, предимно – при животни [4, 6]. Повечето изследователи, обаче се задоволяват с описанието на клиничния ефект от въздействието върху определени БАТ [1, 3, 9, 14]. С малки изключения [12] почти не се срещат теоретични публикации, свързани с физичната, а още по-малко – с морфологичната характеристика [7, 8] на биологичноактивните точки [10, 11].

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ЦЕЛИ ЗАДАЧИ

Целта на това изследване е да се анализира и сравнят морфологичните и някои пасивни физичните параметри на биологичноактивните точки, и съседните им участъци.

За изпълнението на поставената цел набелязахме за изпълнение няколко основни задачи:

1. Установяване на разлики в хистологичното устройство на БАТ и съседните им участъци;
2. Измерване на съпротивлението в БАТ и съседните тъкани;
3. Сравнителен анализ на получените резултати.

МАТЕРИАЛ И МЕТОДИ

Хистологичните изследвания са направени върху пресни човешки трупове, като материал за изследване е взет от областта на санджiao (цихай, тиеншу) и ладжуй.



Original Contribution

МУСКУЛНО-СУХОЖИЛНА ВАРИАЦИЯ ОКОЛО M. ABDUCTOR POLLICIS LONGUS, M. EXTENSOR POLLICIS BREVIS И M. EXTENSOR POLLICIS LONGUS – СТРУКТУРНО-ФУНКЦИОНАЛНА ХАРАКТЕРИСТИКА

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A MUSCLE-TENDON VARIETY NEAR ABDUCTOR POLLICIS LONGUS, EXTENSOR POLLICIS BREVIS AND EXTENSOR POLLICIS LONGUS – A STRUCTUROFUNCTIONAL CHARACTERISTIC

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ABSTRACT

We are presenting to your attention a case found on a dissection exercises with second course medical student at the Faculty of Medicine, Thracian University, Stara Zagora - Bulgaria. It is concerning a variety of the number and the place of attachment of the heads of some extensor muscles of the forearm. The variety was found in the area of the wrist on both the upper limbs of the same corpse, of a 75 years old woman, died out of an acute heart and respiratory deficiency.

Keywords: muscle variety, supernumber, anatomy, forearm, de Quervain.

ВЪВЕДЕНИЕ

Мускулите от задната група на предмишницата, които са предимно ексензори на ръката, са разпределени в два слоя – повърхностен и дълбок. Те са от огромно значение за всекидневната дейност на човека, особено тези, които участват в движението на палеца и го противопоставят на останалите пръсти. Това движение позволява да се хванат различни предмети, което е свързано с всекидневната трудова дейност и е в основата на човешката цивилизация. Останалите мускули на предмишницата участвуват във фините движения на китката и ръката, и също вземат участие в

създаването на материални и духовни блага. Доброто познаване, както на нормалния строеж, така и на особеностите в броя, разположението и залавянето на предмишничните мускули е важно за всички медицински специалности, и е свързано с правилното лечение на хирургични и ортопедични заболявания в тази област.

ЦЕЛ И ЗАДАЧИ

Целта на това изследване е да се опише и даде публичност на интересен, рядко срещан случай на свръхброен мускул в областта на предмишницата на двете ръце, и да се анализира неговата функция. За изпълнението на поставената цел набелязахме за изпълнение няколко основни задачи:

1. Описание на нормалния макростроеж на мускулите от задната група на предмишницата.

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Histological Verification of the Biological Active Points Characteristics (BAP)

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We tried to find some histological indications for existence of BAP. Usually there is a small skin pit covered with thin epithelium in point areas (HE). The connective tissue under the BAP is thinner compared with the areas outside of them (Mallory trichrome), and we established small quantity and a specific position of the collagen fibers, as well as increased number of blood vessels and nerve terminals (AgNO₃).

Key words: acupuncture, Mallory, connective tissue, epithelium, active points.

Introduction

The Biological Active Points and the energy channels are used in ancient China even at the time of the Chan dynasty (16th- 11th c. BC) [9, 10, 11, 12]. The modern science is trying to prove their existence using objective methods and analysis [1]. Most of the explorers use physic approaches (measuring the changes in the skin resistance) [4, 12], or merely the description of the clinical effect due to the stimulation of particular BAP [3, 7]. Many authors touch the pain as a big medical problem [2, 5, 6, 11] or describe alternative curative methods [8]. Publications concerning the special features of the tissue structure are rare. We didn't find any material about acupuncture point structure.

The object of this study is to estimate the presence of histological differences between the BAP and the tissues next to them. For the fulfillment of this object we selected a few major goals:

1. Estimation of the distinction between the structure and the thickness of the epithelial layer.
2. Proving the differences in the structure of the dermal connective tissue.
3. Comparative observation of the quantity of vascular and nerve elements in BAP and the tissues next to them.

ПРИЛОЖЕНИЕ НА АЮРВЕДА И КИТАЙСКИТЕ ЛЕЧЕБНИ ТЕХНИКИ В СЪВРЕМЕННАТА МЕДИЦИНСКА ПРАКТИКА

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APPLICATION OF AYURVEDA AND TRADITIONAL CHINESE MEDICINE IN THE PRESENT MEDICAL PRACTICE

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Abstract

Together and simultaneous use of different healing techniques and methods has always been an interesting question for discussion. The aim of this article is to show without doubt how Ayurveda and the Traditional Chinese medicine (TCM) are used together with the present techniques of the western medicine. Examples given are not proposal for the future, but affirmative every day practice used with great success and popularity. Conclusion is that the mutual integration is already a fact and only leads to improvement of the medical services offered. What is needed to fully complete this process are expanding of the scientific understanding behind the ancient techniques and common international standards for practicing Ayurveda and TCM.

Key words: *Ayurveda, TCM, examples, standards*

Въведение

Както Аюрведа – индийската медицина [1], така и Джуни – китайската медицина [5] са изкуство за лечение, профилактика и превенция на здравето от изтока с дълбоки корени във времето, доказали своята лечебна ефективност през столетията. Методът Аюрведа е известен от около 6 хиляди години (фиг. 1) и е признат официално от Световната здравна организация [3]. Названието произлиза от двете думи: «*ayus*» – живот и «*veda*» – знание или наука. Следователно терминът «аюрведа» означава «наука за живота» или «знание за живота». Това е система на медицинските знания за типове темперамент и здравословен начин на живот. Медицината е професия, която изисква от лекарите да помагат по всеки възможен начин на пациентите си, затова те трябва да са с широк мироглед, в начина си на мислене, постоянно да обогатяват знанията си в лечебните методи и техники без значение от вида или националността им.

Поради своето благотворно въздействие върху здравето на човека Аюрведа е призната като алтернативна медицина в много страни по света, както и от Националния институт по здравето в САЩ.

ИЗЛЕДВАНЕ НА МЕЖДУПРЕДМЕТНИТЕ ВРЪЗКИ НА ХИМИЯ И АНАТОМИЯ В ОБУЧЕНИЕТО ПО МЕДИЦИНА

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ABSTRACT:

Chemistry is one of the fundamental disciplines of human knowledge. Meanwhile, the anatomy is the foundation on which rests the medical knowledge. The study of interaction in the theory and practice of medical education is an important theoretical problem. In this article, the authors reasoned attempt to answer this question. At the same time a systematic analysis of the curricula of these two sciences will contribute to intensification of the learning process, in medicine and improve its quality.

Keywords: chemistry, anatomy, histology, education

Химията е една от фундаменталните учебни дисциплини в човешкото знание. В същото време анатомията е фундаментът, върху който стъпва медицинското знание. Изследването на взаимодействието им в теорията и практиката на медицинското образование е важен теоретичен проблем. С настоящата статия авторите се опитват аргументирано да отговорят на този въпрос. Анатомията е наука за устройството на човешкия организъм. В границите на анатомията са се обособили науки с относителна самостоятелност и свой предмет на изследване. Хистологията и цитологията изучават устройството, функцията и развитието на тъканите и клетките (1)

Цитологията е наука за клетката. В нея са включени всички данни, отнасящи се до строежа, биохимията и физиологията на най-малката елементарна единица на живата материя. В медицинските факултети редица аспекти на цитологията се осветляват от редица други учебни дисциплини: биология, микробиология, биохимия, биофизика и генетика (3). При това определение химията е засегната индиректно. В редица публикации е показана връзката химия – биология (5), химия – биохимия (6), химия – биофизика (7), химия – генетика (2). В лекционния курс в МФ на Тракийски университет са разгледани хисто- и цитохимичните методи в цитологията. Подчертано е, че цитохимията и хистохимията са морфофункционални науки, в които се използват химични и биохимични реакции, адаптирани за доказване на определени вещества в клетките и тъканите. Полученият краен продукт трябва да е цветно вещество (за светлинната микроскопия) и електронноплътно вещество (за електронната микроскопия). Но освен на препаративно ниво химични знания са необходими и за разбирането и осмислянето на цитохимичните понятия и закономерности. Така например при разглеждане на цитоплазма се вижда, че тя е високохетерогенна многофазна колоидна система, която съдържа протеини, нуклеинови киселини, соли и нискомолекулни органични съединения. Цитоплазмата заема около 80% от обема на клетката и се състои от 99% вода, в която се намират соли, органични молекули и ензими. В нея са разположени мембранни и немембранни органели, които представляват малки органоиди, участващи в метаболитните механизми на клетката. В цитоплазмата се откриват

и клетъчни включения, представляващи химически субстанции от запасни хранителни вещества, секреторни продукти и пигментни гранули. Съгласуваната дейност на всички органели осигурява нормалното протичане на химичните реакции, необходими за живота на клетката. Митохондрията е ограничена с двойна мембрана множествен клетъчен органоид. Въз основа на аеробно окисление те доставят енергия на клетката. Съдържат протеини – до 70%, липиди – 25%, РНК – 0.82%, сяра – до 1.16%, желязо – 0.2%, мед – 0.02% и ДНК –

Dynamics of Changes in Central and Peripheral Lymphoid Organs in Rats Treated Intraperitoneally with Lipopolysaccharide of E. Coli

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The arising question is what morphological changes occur in various organs and systems of the human body under the effect of LPDs. The purpose of this study is to identify and record the dynamics of changes in central and peripheral lymphoid organs in rats treated intraperitoneally with lipopolysaccharide of E. Coli. 30 rats were injected intraperitoneally with lipopolysaccharide of E. Coli. The typical changes in the spleen occurred through apoptosis: cytoplasmic eosinophilia, nuclear pyknosis and fragmentation. In the spleen and lymph nodes alike, together with the continued action of LPDs, there is an increased number of lymphocytes.

During the action of LPDs, there is an increase of lymphoid organs -splenomegaly, lymphonodomegaly. LPDs induces apoptosis with the occurrence of apoptosis cells and increase the number of lymphocytes in lymphoid organs.

Key words: Bacterial endotoxin, lipopolysaccharide, apoptosis, E. Coli, lymphoid organs.

Introduction

Bacterial endotoxin lipopolysaccharide (LPS) is a component of the outer surface of the cell membrane in the Gram-negative bacteria. It consists of three elements: O antigen (O polysaccharide), central oligosaccharide и lipid A. LPDs causes changes in metabolism of the cell, its immune status and acid-base balance [1].

Over the past 20 years, some authors describe substances that add to the pathogenic effects of LPDs in the cell – Interleukin 1 (IL-1) [3], Interleukin 6 [6], Prostaglandin E [8].

There are many changes in the normal physiology of the whole organism under the effect of LPDs: erythropenia and leucopenia in the blood [9], subjective complaints – gastrointestinal disorders [2], reduced physical activity [5].

Morphological changes in biologically active Point /BAP/ ST36 after acupuncture in rat

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Biologically active points (BAP) ST 36 is treated with various methods of Chinese medicine. One of the most used is acupuncture. The aim of this study is to clarify the effect of the acupuncture needle on the structure of the BAP ST 36 in rat by the use of classic histological techniques. The impact of the acupuncture needle in the BAT ST36 induces morphological changes in the tissues studied. The methods used allow to explore the construction of acupuncture needle channel and the changes induced by it. The seen defect has a minimal size and the living tissue fast recovers its integrity upon with drawl of the needle.

Key words: biologically active points (BAP), histology, rat, ST 36, Acupuncture needle.

Introduction

Changes that occur in the tissues under the influence of acupuncture needle is not sufficiently investigated [14]. Research efforts are focused on the study of morphological features in acupuncture points [2, 6, 8], the role of connective tissue under the skin of the reflex response [10, 11], the construction of Mechanoreceptors at the cellular level [1]. Special attention is paid to the morphological characteristics [9, 10] and the skin changes that occur in it by mechanical [7] and electrical [13] influences. Some authors seek identity between energy channels in humans and animals [4] and follow the general mechanisms involved in Ayurvedic and Chinese medicine [3].

Aim and objectives

Target of this study is using the classic histological techniques [15] to identify any changes that occur in the tissues under the influence of acupuncture needle.

Materials and Methods

Experiments

Were carried out on five adult normotensive rats, Wistar strain of either sex weighing ranging between 220 and 350 g. and 2 adult spontaneously hypertensive rats, (SHR) of

Normal morphology of biologically active point BAP/ST36 rat.

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Point ST 36 is one of the most important and most commonly used in acupuncture biologically active point (BAP) [3]. The purpose of this study is using the classic histological techniques to visualize normal morphology in the BAP ST 36 in rat. The methods used allow the study of normal anatomic structures in the BAP ST 36 – dermis, subcutis, fascia, muscle, blood vessels and nerves. The observed differences are in the thickness of the dermis and subcutis, loose connective tissue layer, the presence of indentations and differences in the thickness of the epidermis. Larger blood vessels could be found in depth in the underlaying striated muscle tissue, clusters of mast cells in certain areas of the dermis, subcutis, fascia and striated muscle.

Key words: acupuncture, biologically active point (BAP), histology, rat, ST 36.

Introduction

ST36 is one of the most important [2] and the most commonly used acupuncture in BAP [11]. To establish any changes in it after acupuncture its normal morphology should be known.

Aim and objectives

The aim of this study is to establish the normal morphology of BAP ST 36 in rat by using a classic histological techniques [12].

Materials and Methods

Experiments

Were carried out on 14 normotensive rats, Wistar strain of either sex weighing 220-350 g and 7 adult spontaneously hypertensive rats, (SHR) of both sexes, weighing 180 to 320 g. The point ST 36 is localized by determining the ratio of standard anatomical structures [3, 4] and with device KWD-808 to measure the skin resistance.

8. Короленко Т.А., Пушщев А.Б., Музураковская А.В. Исследование внутри-лизосомального катаболизма белка с использованием лизосомотропных препаратов – ингибиторов протеолиза и протенинов. // *Вопр. мед. химии*, – 1987. – Т.33. – №5. – С.93-6.
9. Рывняк В. Механизмы инволюции экспериментального цирроза печени // *Автореф.... доктора мед.наук.* – Москва, 1990.
10. Шараев П.Н. Метод определения свободного и связанного оксипролина в сыворотке крови. // *Лаб.дело*, 1981. – N 5. – С.283-285.

Safe and durable plastination of anatomical preparations

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Abstract

Many years of experience from researchers in plastination of anatomical objects are introduced. The method is particularly relevant now, when there is a shortage of corpse training material for students in medicine, dentistry, and veterinary medicine. The reasons for failures of the plastination are analyzed: reduced duration of the plastination phases, operating temperature, composition of the plastination agent, and external contamination. Anatomical preparations made are absolutely safe for human health.

Key words: Plastination, Biodur, S10 technique, Anatomy, Education,

Безопасность и прочность пластикации анатомических препаратов

Внедряется многолетний опыт работы с исследователями в области пластикации анатомических объектов. Этот метод особенно актуален сейчас, когда не хватает трупов для обучения студентов-медиков, стоматологов и ветеринаров. Причины неудач пластикации проанализированы: сокращенная продолжительность фазы пластикации, рабочая температура, состав агента пластикации и внешние загрязнения. Изготовленные анатомические препараты абсолютно безопасны для здоровья человека.

Ключевые слова: пластикация, Бюдур, техника S10, анатомия, образование.

Timeliness of the topic: The study of morphological features in human and animals on corpse materials is the basis of anatomical education for medical students. Preservation and long-term storage of biological material is a major problem facing anatomists worldwide for centuries. The application of conservation techniques over the millennia was based on the latest physical and chemical factors for that time, but the prepared anatomical preparations have many shortcomings – most notably damage to human health, which is why research in this area continues today. Using plastinated anatomical objects for teaching anatomy is expensive in the short term, but in a long-term strategy, it is financially advantageous, as established morphological preparations are virtually timeless and can be used for decades without any special storage conditions. They are absolutely safe for human health and therefore can be studied by students and trainees in medicine, dentistry, and veterinary, for a long time without using special protective equipment.

Material and methods

In the plastination process, two types of materials are used: organic matter (human and animal corpses or parts from them) and chemical agents (fixatives, dehydrating and impregnating agents, accelerators, colors, and gas-curing agents).

Physical and chemical changes that occur in the tissues after death hinder its preservation and exploration. Their organic ingredients are destroyed irreversibly by the action of microorganisms and the proteolytic enzymes present in cells whose function becomes uncontrollable after death. This resulted in the absence or insufficient protective measures into the decay and death of the tissue, and the destruction of anatomical teaching preparations that were made. Classic preservatives have a deleterious effect on the human body – causing inflammation and allergic reactions of the exposed mucous membranes, the respiratory organs, and airways.

In plastination methods, dehydrating and impregnating agents enter the dead tissue with a constantly changing cycle speed, and fill the tissue at a specific rate based on the tissues type.

ТЕРАПИЯ С МОКСА ПРИ ДЕЦА С ЕНУРЕЗИС НОКТУРНА

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Резюме. Терапията с мокса е дял от традиционната китайска медицина. Прилага се за лечение и за укрепване на здравето чрез изгаряне на билката Артемизия вулгарис и някои други билки на или над кожата върху акупунктурните точки по тялото. Изследването демонстрира ефекта от комбинираното прилагане на тази терапия и психологични утвърждения с визуализации при деца от 2,5- до 8-годишна възраст с енурезис ноктурна (ЕН). Приложеният терапевтичен метод е загаряване на акупунктурни зони с мокса под формата на пури. Пациентите са 33 деца на средна възраст 4,5 г. Проведено е проспективно проучване на клиничен контингент, преминал през кабинета за период от 6 г. Приложена е терапевтична методика с продължителност 10 дни и продължение на процедурите от родителите, които са обучени от терапевта по време на лечението на техните деца. По време на лечебната процедура на децата се дава игра-задача, включваща автогенен тренинг с положителни утвърждения и визуализации. ЕН при 50% от децата изчезна напълно след 1 г. При 30% от децата ЕН се сведе до редки инциденти след 6-месечен срок на домашно лечение. 20% продължаваха да имат нощни напикавания и след 1 г. При 70% от децата се отчете субективно намаляване на тревожността, при 30% не се отчетоха подобрения. Терапията с мокса е неинвазивен метод на лечение и профилактика, подходящ при децата. Съчетаването на тази терапия и положителния автогенен тренинг с визуализации води до много добри резултати с продължителен ефект.

Ключови думи: мокса, деца, нощно напикаване

ГРЕЛИН-ПОЗИТИВНЫЕ КЛЕТКИ В ОРГАНИЗМЕ КРЫС

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Кодзіма та співавтори у 1999-му році виділили грелін з мукози шлунка щура. Після цього багато вчених почали вивчати цей унікальний пептид, який стимулює споживання їжі і призводить до ожиріння у людей. Дослідники повідомляють, що грелін стимулює апетит людини і гризунів, і так само позитивно впливає на серцево-судинну систему і шлунково-кишковий тракт. Грелін стимулює секрецію гормону росту, моторику шлунка і знижує кров'яний тиск, впливає на активність симпатичної нервової системи, зменшує симпатичну відповідь на психічну напругу. Дно шлунка показує найвищий рівень експресії греліну, але гормон присутній у всіх відділах шлунково-кишкового тракту, в сім'яниках, підшлунковій залозі і у деяких інших органах і системах. У слизовій оболонці шлунка грелінопродуковані клітини розташовані у товщі слизової оболонки.

У кровообігу грелін існує у двох основних формах: *N*-октаноїл-модифікований (ацильований) грелін і *DES*-ацил (неацильований) грелін. Вони виявляють протилежні біологічні активності. Неацильований грелін також присутній у чималих кількостях у шлунку і крові. Дійсно, безліч найважливіших питань щодо продукції греліну досі залишаються без відповіді і є об'єктом для майбутніх досліджень.

Грелін, шлунок, нирка, гіпофіз, клітини, пілорус, печінка, щур.

Кодзима и соавторы в 1999-м году извлекли грелин из мукозы желудка крысы. После этого многие ученые изучают этот уникальный пептид, стимулирующий потребление пищи и приводит к ожирению у людей.

Цель исследования – изучить литературные данные о местоположении грелина в тканях и его специфическое значение для организма. Анализируя литературу систематизируем и обобщаем ее чтобы установить уровень исследования до этого момента с целью планирования дальнейших экспериментов.

Физиологическое действие грелина. Nakazato и соавт. (2001) доказывают значение грелина в координации перистальтики отделов желудочно-кишечного тракта, секреции инсулина и интестициальных гормонов. Эти же авторы отмечают значение грелина в клеточной пролиферации и в механизме клеточной смерти.

USING OF P40 TECHNIQUE FOR BRAIN SHEET PLASTINATION

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P40 пластинаційна технологія є специфічною технікою для виготовлення мозкових плит. У оригінальному варіанті обробка мозку відбувається послідовно у декілька етапів: фіксація, дегідратація, нарізка, імпрегнація, ущільнення та шліфування. Для отримання високоякісних анатомічних препаратів за класичною технікою необхідно два місяці. Ми модифікували цю техніку й скоротили процедуру до декількох днів після фіксації. Спочатку ми нарізали мозок і виготовляли пластини завтовшки 4–5 мм, а потім залишали у холодному ацетоні на 2–4 доби. Далі проводили імпрегнацію в P40 мікстурі також 2–3 доби.

Ущільнення проводиться шляхом опромінення джерелом ультрафіолетового світла. За необхідності обробляли поверхні шліфувальною машинкою.

Анатомія, пластинація, P40, мозг, плити, фіксація, дегідратація, імпрегнація.

P40 plastination technology is a specific technique for the tissue preservation and production of brain slices. The original version of the processing has several phases: fixation, dehydration, slicing, impregnation, hardening and grinding. For achieve of high quality anatomical specimens with classic technique requires two months. This needs too much time.

Von Hagens (1994) the first describes P40 technique, but soon his followers develop this method, they discover and apply new materials that have the same application. Three years later Barnet (1997) publicizes his results of P40 plastination of coronal and horizontal brain slices. The best specialists of brain sheet P35 plastination try to produce brain slices by P40 technique and have good results (Henry and Weiglein, 1999). Weiglein and Feigl (1998) compare sheet plastination of brain slices with P35 and P40 procedures. They enhance preferences of P40 plastination method. Sora et al (1999) does a comparison between two different techniques – immersion and impregnation.

Latore et al (2004) try to do a sheet plastination with polyester as an alternative for all tissues. The same author and Henry (2007) describe own results P40 body slices production. They use acetone, methylene chloride and polyester resin in plastination process. The flat chamber, containing the specimen, is filled with mixture P40-A4 (100:2). A 40 watt UVA-light minimum for one hour is hardener.

VARIATIONS OF THE BRACHIAL PLEXUS (A CASE REPORT)

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ABSTRACT

We have described a rare triple variation of the musculocutaneous nerve: atypical and late origin, and the unusual location of the nerve in the upper arm. Musculocutaneous nerve does not derive from the lateral cord of the brachial plexus, but from the median nerve 5-6 cm distally from the point of its formation, then it does not penetrate through coracobrachial muscle, but runs between it and biceps muscle, sending branches for its both heads. Then the nerve runs laterally and distally between biceps muscle and brachial muscle, following its typical movement to the lateral side of the arm. In its course the nerve derives motor branches to the coracobrachial, brachial and biceps muscles. Then the nerve pierces the deep fascia on the tendon of the biceps muscle and continues as the lateral cutaneous nerve of the forearm.

Variations in separation and placement of the branches of the lateral cord of the brachial plexus are frequent and important for clinical practice and must be well known and studied.

Knowledge not only for typical but also for atypical anatomy of the arm would substantially reduce errors in surgery of these areas and possible complications with bad results for patient and society.

In the available literature we did not encounter a description of low origin of musculocutaneous nerve, like our case, although some authors mention a possible variability in the origin of this nerve.

Keywords: *musculocutaneous nerve, variation, lateral cutaneous nerve of the forearm, surgery of the arm*

INTRODUCTION

The ventral branches of the spinal nerves form plexuses in the cervical, lumbar and sacral regions. The brachial plexus is formed by the union of the ventral branches of the C5-Th1. The fifth and sixth rami pass by the medial scalenus muscle and form the upper trunk of the plexus. The anterior branch

of the seventh spinal nerve continues as middle trunk, and the eight cervical and first thoracic form behind posterior scalenus muscle the lower trunk of the brachial plexus. The trunks divide in an anterior and a posterior part. The anterior parts of the upper and middle trunks form the lateral cord, the anterior division of the lower trunk forms the medial cord and all posterior parts unite to posterior cord of the brachial plexus.

The musculocutaneous nerve (MCN) is an infraclavicular branch of the brachial plexus (BP). It derives from the ventral branches of the fifth, sixth and seventh cervical nerves. Usually it arises from the lateral cord of the brachial plexus (Fig. 1) above the lateral root of the median nerve, pierces the coracobrachial muscle and runs between the biceps and the brachial muscles down and laterally. After the reaching the lateral side of the arm the nerve

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Changes in Collagen and Elastic Fibers in Biological Active Point ST₃₆ of Rats after Experimental Acupuncture

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One of the most used methods of Chinese medicine is acupuncture. Point ST₃₆ is one of the most important and most commonly used in acupuncture biologically active points (BAP). The target of this study is, by using the classic histological techniques, to identify any changes that occur in the elastic and collagen fibers under the influence of acupuncture needle. We observe deformation and partial demolition of adjacent elastic and collagen fibers and the fascia. In the needle canal elastic and collagen fibers are destroyed. Particles of loose connective tissue and fascia, collagen and elastic fibers fall into striated muscle, located in the depth of the point. Changes in the structure of elastic and collagen fibers are most clearly differentiated near the channel formed by the acupuncture needle, but also occur in adjacent areas of skin. The defect seen is with a minimum size and the tissue integrity recovers fast after the removal of the needle.

Key words: acupuncture, BAP – biologically active point, histology, rat, ST₃₆, elastic and collagen fibers.

Introduction

The beginning of the traditional Chinese medicine (TCM) dates back to antiquity [1]. One of the most used methods of Chinese medicine is acupuncture [1, 2]. There is a correlation between the location of acupuncture points and channels in humans and animals [2, 8]. Point ST₃₆ is one of the most important and most commonly used [11] in acupuncture biologically active points (BAP). Using the classic histological techniques the aim of this study is to identify changes that occur in the elastic and collagen fibers under the influence of acupuncture needle. For the implementation of the objective we identified the following main tasks: 1) through various coloring methods to visualize the state of the tissues in ST₃₆ before and after acupuncture; 2) with a light microscope to identify changes in the state of collagen and elastic fibers in the area of ST₃₆ after experimental acupuncture.

Free Nerve Endings in Biological Active Point ST₃₆ of Rat

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Point Stomach 36 (ST₃₆) is one of the most important and most commonly used in acupuncture biological active point (BAP). The aim of the study is to determine the presence or absence of free nerve endings in the area of acupuncture point ST₃₆. Free nerve endings are unencapsulated, they are the most common type of nerve ending, and are most frequently found in the skin. Free nerve endings infiltrate the epidermis and surround hair follicles. We observe a large amount of hair follicles in the dermis with sebaceous glands. We observe accumulation of free nerve endings around the hair follicles. The nerve innervations in the hair follicles possibly play a role for the effect of acupuncture at point ST₃₆ in rats.

Key words: acupuncture, BAP – biological active point, histology, rat, ST₃₆, free nerve endings.

Introduction

In the last century, the traditional Chinese medicine has been increasingly used for treatment or improvement of the general state of chronic diseases, as well as an additional physio-therapeutic agent, enhancing the primary therapeutic methods [2]. Point ST₃₆ is one of the most important and most commonly used biological active points (BAP) in acupuncture. Free nerve endings in the skin play an important role in the effects of acupuncture [3]. Receptors and free nerve endings in the skin play an important role in the effects of acupuncture and interpretation of responses to mechanical signals [1, 2, 4]. The aim of the study was to determine the presence or absence of free nerve endings in the area of acupuncture point ST₃₆. For the implementation of the objective we identified the following main tasks: 1) by appropriate specific staining techniques to visualize any free nerve endings in the ST₃₆, 2) by light microscopy to determine the presence or absence of free nerve endings in the area of acupuncture point ST₃₆.

Materials and Methods

We observed 12 adult normotensive rats, Wistar strain of either sex weighing ranging between 220 and 350 g. The area around the BAP was epilated, defined and marked with the method of standard proportion of anatomical structures [5] under the control

*Dimitrov¹ N., Atanasova² D., Sivrev¹ D.***STUDY OF NERVE FIBERS IN POINT ST₃₆ OF THE RAT**

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Biologically active point (BAP) ST₃₆ is one of the most important and most commonly used points in the traditional Chinese medicine (TCM). There is a correlation between the location of acupuncture points and channels in humans and animals. Rat's ST₃₆ is determined according to human ST₃₆ which is located on the stomach meridian, transversely in the middle of the tibialis anterior muscle. The point ST₃₆ was localized by determining the ratio of standard anatomical structures and with the help of device to measure the skin resistance. The target of this study is by using the classic histological techniques to identify the nerve fibers in ST₃₆ point in rat and close to the acupuncture channel. We observed nerve fibers in the deep layer of the muscles in point ST₃₆ and the same close to the acupuncture channel.

Keywords: acupuncture, BAP - biologically active point, histology, rat, ST₃₆, nerve fibers

*Димитров Н., Атанасова Д., Сиврев Д.***ИССЛЕДОВАНИЕ НЕРВНЫХ ВОЛОКОН
В АКУПАНКТУРНОЙ ТОЧКЕ ST₃₆ У КРЫС**

Биологически активная точка (БАТ) ST₃₆ является одним из самых важных и наиболее часто используемых пунктов в традиционной китайской медицине. Существует корреляция между расположением акупунктурных точек и каналов в организме человека и животных. У крыс положение ST₃₆ определяют в соответствии с человеческой ST₃₆, которая расположена на меридиане желудка в поперечном направлении в середине передней большеберцовой мышцы. В работе ST₃₆ была локализована путем определения соотношения стандартных анатомических структур и с помощью устройства для измерения сопротивления кожи. Цель данного исследования заключается в использовании классических гистологических методов для определения нервных волокон в точке ST₃₆ у крыс и вблизи к акупунктурному каналу. Мы наблюдали нервные волокна в глубоких слоях мышц в точке ST₃₆, а также в непосредственной близости от акупунктурного канала.

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STUDY OF MUSCLE SPINDLES IN BIOLOGICALLY ACTIVE POINT ST₃₆ IN RAT

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Biologically active point (BAP) ST₃₆ is one of the most important and most commonly used points in the traditional Chinese medicine (TCM). There is a correlation between the location of acupuncture points and channels in humans and animals. Rats' ST₃₆ is determined according to human ST₃₆ which is located on the stomach meridian, transversely in the middle of the tibialis anterior muscle. The aim of this study is by using the classic histological techniques to identify muscle spindles in ST₃₆ point in rat and close to the acupuncture channel. We observed muscle spindles in the deep layer of the muscles in point ST₃₆ and the same close to the acupuncture channel.

Keywords: acupuncture, BAP - biologically active point, histology, rat, ST₃₆, muscle spindles

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ИССЛЕДОВАНИЕ МЫШЕЧНЫХ ВЕРЕТЕН В БИОЛОГИЧЕСКИ АКТИВНОЙ ТОЧКЕ ST₃₆ У КРЫС

Биологически активная точка ST₃₆ является одной из самых важных и наиболее часто используемых точек в традиционной китайской медицине. Существует взаимосвязь между расположением акупунктурных точек и каналов в организме человека и животных. У крыс ST₃₆ определяется в соответствии с человеческой ST₃₆, которая расположена на меридиане желудка в поперечном направлении в середине передней большеберцовой мышцы. Целью данного исследования является использование классических гистологических методов для определения особенностей мышечных веретен в точке ST₃₆ у крыс вблизи от акупунктурного канала. Мы наблюдали мышечных веретен в глубоком слое мышц в точке ST₃₆, а также вблизи от акупунктурного канала.

Ключевые слова: иглоукалывание, биологически активная точка, гистология, крысы, ST₃₆, мышечные волокна.



HISTOLOGICAL STRUCTURE OF THE HUMAN BIOLOGICALLY ACTIVE POINT (BAP) ST₃₆

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ABSTRACT

Biologically active point (BAP) ST₃₆ is one of the most important and most commonly used points in the traditional Chinese medicine (TCM). A correlation between the location of acupuncture points and channels in humans and animals has been established. In the human ST₃₆ is located on the stomach meridian - 3 cun (1 handbreadth) down and 1 fingerbreadth lateral to the anterior crest of the tibia, on the tibialis anterior muscle. The target of this study is to describe the histological structure of biologically active point (BAP) ST₃₆ in the human by using the classic histological techniques. We observed normal histology structures in ST₃₆ point in the human.

Key words: acupuncture, BAP - biologically active point, histology, human, ST₃₆, traditional Chinese medicine (TCM).

INTRODUCTION

Biologically active point (BAP) ST₃₆ is one of the most important and most commonly used points in the traditional Chinese medicine (TCM) (1). A correlation between the location of acupuncture points and channels in humans and animals has been established (2). In the human ST₃₆ is located on the stomach meridian - 3 cun (1 handbreadth) down and 1 fingerbreadth lateral to the anterior crest of the tibia, on the tibialis anterior muscle (3).

Aim and objectives

The aim of this study is to describe the histological structure of biologically active point (BAP) ST₃₆ at the human by utilizing the classic histological techniques.

METHODS

We took material from the ST₃₆ point of human cadavers. The ST₃₆ point was localized by determining relations between standard anatomical structures and with the help of KWD-808 device for measuring the skin conductivity (4). The material was embedded into paraffin and cut in 5 µm thick sections. Four standard stains were applied: Mallory, H&E, toluidine blue and Bismarck brown.

RESULTS

In the ST₃₆ point in the human normal histology structures were observed: skin, subcutaneous adipose tissue, blood vessels,

nerves, sebaceous and sweat glands, and mast cells. (**Figures 1A, B; 2A-F**). In some areas of the skin indentations and differences in the thickness of the epidermis and the loose connective tissue layers were found, but these differences were not pronounced. In the subcutis of the ST₃₆ point in the human a large number of lymphocytes were demonstrated. The superficial fascia was found to blend with the reticular layer of the dermis. Elastic fibers were found around the glands, the hair follicles, and superficial fascia. In human skin mast cells were visualized around the blood vessels, the sweat glands, the sebaceous glands, and the hair follicles. (**Figures 2C, E, F**).

DISCUSSION

This normal histology structures are confirmed by other authors. (5, 6, 7, 8, 9, 10). No significant differences between the skin structure of acupuncture point ST₃₆ and normal skin outside the said point could be defined, despite such differences were reported by other authors (11, 12).

CONCLUSIONS

In the human ST₃₆ point we observed normal histology structures. Accumulation of mast cells, primarily in the vicinity of blood vessels and around the glands and the hair follicles, was observed.



USING AN ALTERNATIVE LIGHT SOURCE IN CURING POLYESTER P40

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ABSTRACT

Impregnation of brain sections with polyester P40 is a modern method for making brain plates. Use a special glass chamber for imparting a form of preparations. Artificial UV radiation is used for cerebral plates production. There have been successful attempts to use a mercury lamp as a catalyst for the polymerization of polyester. As ultraviolet sources and mercury lamps are expensive source of UV radiation, which increases the value of the resulting anatomical preparations. We use the sun's rays in the early and late in the day for hardening Biodur P40 in the development of brain plates. The basic requirement is the intensity of solar radiation to be not high, as rapid polymerization causes shrinkage and cracking of the protective polyester film. Thus curing brain plates is slower than classic curing, but allows continuous control of the curing process of brain slices. The resulting anatomical preparations are of high quality and can be successfully used for training of medical and veterinary students.

Key words: plastination, Biodur, P40, safety anatomical preparations, UV, mercury lamp

INTRODUCTION

Impregnation of brain sections with polyester P40 is a modern method for making brain plates. This impregnation method is a successor of P35 classic method for brain slices making. According Üzel P35 is used to obtain semitransparent brain slices with excellent gray-white matter distinction (1). There are four steps in P35 plastination procedure: fixation, dehydration, impregnation and light curing stage (2). Water formaldehyde solution 8-10% is usually used for fixation of the brain. *Weiglein* slices the brain on stainless steel saw and put it in +5°C dehydrator (2). *Von Hagens, Weiglein and Weber* (2007) use a special double glass chamber for imparting a form of preparations (2, 3, 4).

The hardeners for Biodur P35 and P40 are UV rays. Curing was started using UVA-light on both sides of the specimen for 3 hours (2). The same author indicates that ventilation is very important during light curing. The ventilation support temperature bellow 35°C in the embedding chamber. *Suriyaprapadilok* and *Withyachumnarnkul* use color injections for achievement of stained sections of the human brain (5).

The history of all plastination methods is described by *Pashaei* (6) in a brief review on the history, methods and applications of

plastination. Plastination is an expensive method in anatomy conservation. Using of electrical UV sources additional raise the cost of final preparations.

AIM AND PURPOSES

The **aim** of this investigation is to compare the quality and price of the P40 brain slices hardened by UV-light lamp and by sunny light.

For achievement of this aim we plan the next **purposes**:

1. Making brain slices using UV-light lamp in curing stage.
2. Making brain slices using sunny light in curing stage.
3. Make comparison between these two curing techniques.

MATERIAL AND METHODS

We used fixated brains got at the time of educational dissections with second medical course. The brain is cut preliminary to slices 4 mm thick. Brain plates was plunged for dehydration in cool (+5°C) acetone. The dehydration time was 3 days since the thickness of brain slices was 4 mm only. We used one dehydration bath and one immersion bath with Biodur P40 mixture for 24 hours. The next step was brain impregnation in double glass chamber that was filled with

5. Неудахин Г.В., Чурсин А.А., Таранцев Т.Е., Ершова М.Ю., В.Л. Радущкевич В.Л. Анализ научно-методического обеспечения и результативности обучения первой медицинской помощи лиц, участвующих в ликвидации последствий ДТП // Скорая медицинская помощь.– 2007.– Т. 8, № 2. - С. 6-10.

6. Особенности диагностики и лечения сочетанной абдоминальной и черепно-мозговой травмы / Лебедев Н.В., Малярчук В.И., Абакумов М.М. // Вестник Российского университета дружбы народов. Серия: Медицина. - 2000. - № 3. - С. 107-110.

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**ВЛИЯНИЕ УЛЬТРАФИОЛЕТОВОГО СВЕТА НА
ЭКСПРЕССИЮ МАТРИЧНЫХ МЕТАЛЛОПРОТЕИНАЗ В
КУЛЬТУРЕ ПЕРВИЧНЫХ КОЖНЫХ ФИБРОБЛАСТОВ**

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Статья опубликована с большими сокращениями

Процессы деградации белков внеклеточного матрикса (ВКМ) обязательны для многих нормальных физиологических процессов. Управление и контроль деградации белков ВКМ осуществляется несколькими группами протеолитических ферментов, включая активатор плазминогена (АПГ).

Sivrev D., Georgieva A., Stoyanov J., Dimitrov N., Atanasova D.

COMPARISON OF S10- AND P40- PLASTINATION TECHNIQUES

Techniques of biological material plastination were first introduced by German professor Gunther von Hagens. In the early nineties of the twentieth century, he opened the first plastination laboratory in Eastern Europe in the Bulgarian town of Stara Zagora. Despite the lack of materials and administrative obstacles it works to this day.

Plastination technique S10 is the most famous, it is used in laboratories all over the world for plastination of soft tissues. Plastination technique P40 was developed later. It is used to make brain slices. The resulting anatomical specimens of two types we use on a daily basis for training of medical students at Thracian University.

Keywords: plastination, plastination technique S10, plastination technique P40, polyester.

Начало пластинационным технологиям положил немецкий профессор Гюнтер фон Хагенс (1979), который первым попробовал использовать термопластические смолы и эластомеры для импрегнации внутренних органов. Позже он развил эту технику и внедрил использование силиконовых компонентов [von Hagens, 1987] чтобы сохранить биологический материал от разложения. В следующие 20 лет многие анатомы [Weiglein, 2002; Ramakrishna, 2002; Miklosova and Miklos, 2004, Rodriguez, 2006] занимались пластинацией, используя S10-технологию. Многие ученые с мировыми именами модифицировали различные этапы пластинационной техники [Henry, 1992; Henry, 1995; Pretorius and Lessing, 1995; Grondin, 1996].

Пластинационная технология S10, однако, пригодна для фиксации не всех типов биоматериала. Например, для изучения мозга обычно используются тонкие пластины с толщиной 4-5 мм. Обработка мозга для получения этих мозговых срезов проходит

Lower Division of the Common Carotid Artery – A Case Report

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Expressed variations in division of the common carotid artery are not rare. Low division (30% of the variations) is usually at the level of the middle part of the larynx. The dividing at the level of the annular cartilage is very rare and we found only one reported case of separation below the annular cartilage – at the base of the neck. The aim of the study was to determine, analyze, document and assess the presence of a rare variation – lower division of common carotid artery discovered during a dissection. Cadaveric dissection material was used. We detected a low separation of the common carotid artery – below the level of the lower edge of the annular cartilage. Knowledge of the variations of the common carotid artery and its branches is required, as in the diagnosis of disease in the neck and head, and in carrying out manipulations in these areas.

Key words: common carotid artery, division, variations, hyoid bone, neck.

Introduction

Expressed variations in the division of the common carotid artery are not rare in Europeans [9] and Africans [1]. Of these, the most common is high separation [3, 6, 16] of the artery – at the level of or above the hyoid bone (70% of variations). Furukawa et al. publish results of an investigation about variation of the carotid artery bifurcation level [5]. Low division (30% of the variations) is usually at the level of the middle of the larynx [8, 12].

Cakirer et al. [4] using MR inform for separate origins of the left internal and external carotid arteries from the aortic arch. Roberts and Gerald use X-ray and find an absence of both common carotid arteries [11]. Vitek et al. discover a thoracic bifurcation of the common carotid artery [17]. Many authors report about anomalous branching patterns of the carotid arteries [7, 10, 13, 15] and high carotid bifurcation but we found only two reported cases of separation below the annular cartilage – at the base of the neck and a thoracic bifurcation. The aim of the study was to determine, analyze, document and assess the presence of a rare variation – lower division of common carotid artery discovered during dissection exercises. For the implementation of the objective identified the following main tasks: 1) by preparation of anatomical objects in the division to determine the presence of vascular deviation from accepted norms; 2) to analyze the case and compare with similar abnormalities.

Много важно в тази лечебно-възстановителна програма е ползването на тейси, ортези и други средства за превенция на контузията.

За пълноценното и бързо възстановяване на спортни травми има важно значение познанията, уменията и практическия опит на рехабилитатора. Той трябва непрекъснато да търси и прилага нови лечебни подходи, което от своя страна улеснява изготвянето на бързи и коректни възстановителни кинезитерапевтични програми.

Литература

1. Владимирова Б. Ортопедия, травматология и ортотика „Знание“ 2000г.
2. Каранешев Г., Соколов Б., Венова Л. и кол. „Теория и методика на лечебната физкултура“. Под ред. доп. Г. Каранешев – София: Медицина и физкултура, 1987
3. Рязкова М. Практическа физиотерапия „Знание“ 1999г
4. Рязкова М., И. Киров Физикална терапия – обща и специална част София 2002г.
5. Попов Николай Кинезитерапия в спортната практика НСА София 2006г.
6. Попов Н. Кинезиология и патокинезиология на опорно-двигателния апарат НСА 2009г.
7. Паскалева Р., „Практическо ръководство по кинезитерапия при социалнозначими заболявания в детска възраст“, Учебно помагало, Издателство ЕКСПРЕС – Габрово 2013,
8. Флонд Р.Т. „Анатомична кинезиология“ Медицина и физкултура София 2008г.

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ACUPRESSURE OF ST₃₆ ACUPOINT (ZUSANLI)

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Abstract

The acupoint ST₃₆ is one of the most commonly used biologically active points of the human body, according to the Traditional Chinese medicine. The aim of the present study is to determine the therapeutic effect of acupressure in ST₃₆ acupoint. We have analyzed the therapeutic results, achieved with 26 patients treated at the Via Vite Centre of Chinese Medicine in Stara Zagora over a 5-years' time.

Immediate results: During acupressure, a slight pain is felt in the point being intervened. Other sensations can be registered too, such as numbness, paresthesias, and heaviness. Following the procedure, a relaxation of the skeletal muscles is observed, along with slight erythema (redness of the skin), and in some patients – a pleasant heating sensation.

Long-term results: The patients report a general feeling of liveliness, as well as increased muscular strength in the legs and the body. Adults and children get generally strengthened. Acupressure can be applied in children with success, since the lack of pain makes it more acceptable, compared with acupuncture. ST₃₆ acupoint can be used for acupressure in a wide spectrum of medical conditions. Intervention in this point increases general tone and causes a feeling of well-being and bodily strength.

Keywords: Acupressure, ST₃₆ acupoint, Zusanli

INTRODUCTION

During the XX century acupressure, which has been used for thousands of years in China and other countries of the Far East, is being extensively applied in modern medicine both as a modality for treatment or general conditioning in chronic disease as well as supplementary physical therapy, in support of the main therapeutic methods. The Traditional Chinese medicine continues to gain more and more popularity in Europe, the USA, and all over the world in the last years (1). The acupoint ST₃₆ is one of the most important and most commonly used for acupressure point of the human body (2,3,4). The classical method to localize biologically active points

MOXIBUSTION IN ST₃₆ ACUPOINT (ZUSANLI)

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Abstract

The acupoint ST₃₆ is one of the most commonly used biologically active points of the human body, according to the Traditional Chinese medicine. The aim of the present study is to determine the therapeutic effect of moxibustion in ST₃₆ acupoint. A total of 45 patients treated at the Via Vite Centre of Chinese Medicine over a 5-years span. All of them underwent moxibustion, in which the burning moxa was held 2-3 cm from the skin surface for 3 to 20 min, depending on the desired effect. Normally, the patients reported a pleasant heating sensation, radiating in a specific direction. Immediate results: Moxibustion results in erythema (redness) and a sensation of a pleasant heating, which can be felt in the point of intervention, but can also be radiated from this point towards deeper parts of the body. Apart from heat, other sensations may arise in the point of intervention – numbness, paresthesias, and heaviness. Long-term results: The immune system is stimulated, which, as reported by the patients, results in less flu-like episodes during winter, their easier resolution, as well as increased subjective well-being. Compared with acupuncture, moxibustion has a milder working mechanism. Heating normally does not cause fear and is generally well accepted by patients, therefore it is also suitable for children. Therefore, moxibustion of ST₃₆ acupoint can be used for treatment and especially for prophylaxis of adults and children.

Key word: moxibustion, acupoint, acupuncture, Zusanli ST₃₆

INTRODUCTION

Traditional Chinese medicine (TCM) is being used with great success and popularity today (1). The acupoint ST₃₆ is one of the most commonly used biologically active points of the human body, according to the Traditional Chinese medicine. Acupuncture points, described in the classical texts, are usually detected with the method of standard proportion of anatomical structures (2, 3). It teaches that this point has one of the widest working spectrums. Among the methods employed by TCM for intervention in such points is moxibustion. It involves the heat of a burning cigar-shaped stick, containing a mix of herbs, predominantly mugwort (moxa), approached to certain points of the body (4). Moxibustion has been applied in treating a great range of diseases. The most common indications of moxibustion therapy are malposition, diarrhea, and colitis; other common indications are urinary incontinence and dysmenorrhea, knee osteoarthritis, temporomandibular joint disturbance syndrome, soft tissue injury, heel pain, asthma, urinary retention, and herpes zoster (8). The functions of moxibustion, expelling cold, promoting the circulation in meridians and collaterals, clearing away heat, detoxification, and so forth, are dependant on the efficacy of moxibustion for circulating qi and blood flow (9). Burning moxa without flame can produce high temperature of about 548–890°C (10,11). The moxibustion has a dual effect of tonification and purgation in TCM theories, which are based on two aspects: the actions of the meridian system and the roles of moxa and fire. Modern research works of the moxibustion mechanism mainly relate to the thermal effects, radiation effects, and pharmacological actions of moxa and its combustion products (12).

AIM AND OBJECTIVES

The aim of the present study is to determine the therapeutic effect of moxibustion in ST₃₆ acupoint.

METHODS

A total of 45 self-reports of patients treated at the Via Vite Centre of Chinese Medicine over a 5-years span were analyzed. All of them underwent moxibustion, in which the burning moxa was held 2-3 cm from the skin surface for 3 to 20 min, depending on the desired effect. We used different ways of moxibustion (Figure 1 A-E)

Distribution of Histamine-Positive Mast Cells in the Vicinity of the Needle Tract Following Acupuncture in “Zusanli” (ST₃₆) Acupoint in Rats

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“Zusanli”(ST₃₆) acupoint is commonly used in acupuncture. The mast cells are important object in experimental acupuncture. Histamine is stored in the granules of rat mast cells. The aim of the present study is to examine the distribution of histamine-positive mast cells in the vicinity of needle tract following acupuncture in ST₃₆ acupoint in rats. Acupuncture in ST₃₆ disrupted the integrity of the epithelium, derma, subcutis, fascia, epimysium and striated muscle tissue. In our research we observed thickening and displacement of the connective tissue in the direction of the needle tract and folding of the fascia. We noticed histamine-positive mast cells in the proximity of needle tract in the tissues of ST₃₆ acupoint in rats. We could not establish considerable differences in the number and distribution of histamine-positive mast cells in the needle tract vicinity. Few histamine-positive mast cells in the proximity of the needle tract showed signs of degranulation.

Key words: mast cells, histamine, acupuncture, needle tract, Zusanli (ST₃₆).

Introduction

During the 20th century Traditional Chinese Medicine (TCM) which has been used for thousands of years in China and other countries of the Far East, is being extensively applied in modern medicine both as a modality for treatment or general conditioning in chronic disease as well as supplementary physical therapy, in support of the main therapeutic methods. The acupuncture is one of the main methods of TCM.

“Zusanli”(ST₃₆) acupoint is one of the most commonly used in acupuncture. Acupuncture points, described in the classical texts, are usually detected with the method of standard proportion of anatomical structures under the control of the apparatus measuring skin resistance [17, 4]. The acupuncture channels and acupuncture points of human and animals (including rats) share certain similarities [3], which allows researchers to

СЕКЦИЯ АНАТОМИИ ЧЕЛОВЕКА

THE MAST CELLS IN ACUPUNCTURE

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Abstract

The acupuncture is one of the methods of the Traditional Chinese Medicine (TCM). To better understand the therapeutic effectiveness of acupuncture, questions about the role of mast cells (MCs) in acupuncture effect need to be addressed. The MCs are associated mainly with their involvement in innate immunity and the mechanisms of defense against parasite infections, immunomodulation of the immune system and tissue repair. Many studies have been devoted to the role of MCs in acupuncture and acupuncture points. Some results revealed that the numbers of the MCs were significantly larger along the meridian lines in comparison with their control areas. Other investigations reported that there were no significant differences in the distribution of MCs between acupuncture and non-acupuncture areas. MCs are a subject for research regarding changes in tissue after acupuncture. Acupuncture is known to cause alterations of MCs in the acupuncture points after acupuncture. It leads to tissue dislocation and mast cell degranulation. Some researchers found evidence for the existence of neuromastocytic junction and its possible involvement in the effects of acupuncture. Since MCs are important subject for research in experimental acupuncture, the possible role of MCs degranulation and neuromastocytic junction should be considered when discussing acupuncture effects.

Key words: acupuncture, acupuncture, mast cells

Background: The acupuncture is one of the methods of the Traditional Chinese Medicine (TCM). During the XX century acupuncture, which has been used for thousands of years in China and other countries of the Far East, is

being extensively applied in modern medicine both as a modality for treatment or general conditioning in chronic disease as well as supplementary physical therapy, in support of the main therapeutic methods. The Traditional Chinese medicine and acupuncture in particular continue to gain more and more popularity in the last years, which is one of the reasons for our struggle to clarify the morphological basis of this ancient healing method. In order to be able to better understand the therapeutic effectiveness of acupuncture, questions regarding the role of mast cells (MCs) in acupuncture effect were raised and need to be addressed. The MCs are associated mainly with their involvement in innate immunity and the mechanisms of defense against parasite infections, immunomodulation of the immune system and tissue repair. The MCs are derived from hematopoietic stem cells and distributed throughout tissues. The MCs are important subject for research in animals and humans. Studies have shown that the mast cells which are located underneath the basal layer of the epidermis in normal skin in rats are involved in wound healing of the skin. Many studies have been devoted to the role of MCs in acupuncture and acupuncture point. The mast cells were proven to be an essential element not only in classical acupuncture with steel needle, but also in laser acupuncture, electro-acupuncture and acu-moxibustion.

The MCs are a very important subject for research of acupuncture points and acupuncture meridian lines. Researchers have explored the distribution of MCs in the tissues of the acupuncture points. Some researchers have found that the mast cells are often in chemotactic migration along the course of acupuncture meridians, in a longitudinal direction. Authors suggest that the distribution of MCs in tissues corresponds to the location of the «meridian». Some researchers have found that the density of MCs in the area of acupuncture point is higher than that of the nearest sham points. Some results revealed that the number of the MCs was greater under the meridian lines in comparison with their control areas and the difference was significant. Other researchers however failed to reproduce this data and did not register significant differences in the distribution of MCs between acupuncture area and the nonacupuncture

CGRP- and VIP-Immunoreactivity in the Rat Carotid Body

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The carotid body (CB), the primary peripheral chemoreceptor in mammals, is a mass of vascular tissue located near the bifurcations of the carotid arteries. It registers changes in the oxygen concentration of arterial blood and helps to control respiratory activity. The most striking anatomical features of the CB are its rich vascularization and dense innervation. At a light microscopical level using immunohistochemistry we identified the localization and distribution of calcitonin gene-related peptide (CGRP) and vasoactive intestinal peptide (VIP)-containing nerve structures in the CB of rats. Both investigated vasoactive neuropeptides were expressed, although in a different manner, in periglomerular and intraglomerular nerve fibers which innervate blood vessels. Moreover, we observed strong VIP-like immunoreactivity not only in nerve fibers but also in the glomus cells. Our data provide immunohistochemical proof that the rat CB uses perivascular neuropeptides, which probably manage chemosensory activity through their actions on the vessels and neuron-like glomus cells.

Key words: carotid body, CGRP, VIP, immunohistochemistry, chemosensitivity.

Introduction

The carotid body (CB) is the main peripheral chemoreceptor responsible for monitoring changes in arterial blood levels of pO₂, pCO₂ and pH, and participates in the ventilatory responses to hypoxia, hypercapnia and acidosis [1, 4]. It is a neural crest-derived ovoid mass of tissue bilaterally located at the bifurcation of the common carotid artery, just before blood chemicals reach the brain, an organ that is quite sensitive to oxygen and glucose deficiency. The CB is composed of clusters of cells, surrounded by a dense meshwork of capillaries and penetrated by bundles of sensory nerve endings of the carotid sinus nerve, a branch of the glossopharyngeal nerve, and by sympathetic post-ganglionic nerve fibers from the superior cervical ganglion [4, 17, 23].

The cell clusters, also known as glomoids or glomeruli, are the essential morpho-functional units of the CB. The glomeruli consist of two juxtaposed cell types, neuron-like oxygen sensitive type I, or glomus cells, incompletely invested by glial-like type II or sustentacular cells [1, 4].

Besides classical neurotransmitters, possible involvement of various neuropeptides such as CGRP and VIP in the chemoreception has been proposed immunohisto-



Case Report

NON-FORMATION OF THE MAIN TRUNK OF THE SCIATIC NERVE AND UNUSUAL RELATIONSHIPS TO THE PIRIFORMIS MUSCLE

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ABSTRACT

Background: The sciatic nerve is the largest branch of the sacral plexus. Variations of its origin, exit from the pelvis, emergence and branching in the posterior region of the thigh, especially in regards to the piriformis muscle, are an object of interest due to the possibility to be involved in the pathogenesis of clinically significant non-discogenic sciatica or piriformis syndrome.

Case report: We present a case of variant anatomy of the sciatic nerve, discovered during routine dissection of the left gluteal region of an adult female cadaver. We observed a non-formation of the main trunk of the nerve; rather, the tibial nerve passed inferiorly to the piriformis muscle, while the common peroneal nerve went through the body of the bifid piriformis muscle, immediately next to its tendon. The two branches continued their course in the thigh without joining and forming a proper sciatic nerve. The medical records of the body donor did not reveal any neurological impairment which could be linked to this anatomical peculiarity. **Conclusion:** The anatomy of the sciatic nerve could be considered to be a factor of clinical significance. The high prevalence of similar anatomical variations should be kept in mind during the diagnostic process of clinical entities involving the sciatic nerve.

Key words: Sciatic nerve, piriformis muscle, variation

INTRODUCTION

The sciatic nerve is the largest nerve in the human body, emerging from the sacral plexus and including nerve fibers from the ventral rami of spinal nerves L4 to S3. In most cases, the main trunk of the sciatic nerve forms just anteriorly to the piriformis muscle, then leaves the pelvis through the infrapiriform foramen and continues in the posterior region of the thigh, where it splits in its two main components – the tibial and the common peroneal nerves (1). As it courses from the pelvis to the posterior femoral region, it comes in close contact with the pelvitrochanteric muscle group, especially with the piriformis muscle. The close relationship of this muscle and the sciatic nerve could be the cause of nerve compression and the so called piriformis syndrome (2, 3). Nerve entrapment could be caused not only by irritation, inflammation or hypertrophy of the piriformis muscle, but also by aberrant anatomy of the sciatic nerve and its course between muscles (4, 5). Data from many case reports suggest this neuromuscular conflict to be at least a contributing factor of

the pathogenesis of very low back and buttock pain (6). Another practical consideration involving the anatomy of the sciatic nerve is the level of its division into tibial and common peroneal nerves. A high division of the nerve could potentially lead to incomplete nerve block when attempting popliteal block anesthesia (7).

MATERIALS AND METHODS

We dissected the left lower limb of a formalin fixed adult female cadaver, age 58, available at the Department of Anatomy, Faculty of Medicine, Trakia University, Stara Zagora, Bulgaria. The gluteal region was carefully cleaned, and after transection of the gluteus maximus muscle, the greater sciatic foramen, and the pelvitrochanteric group of muscles were exposed. The piriformis muscle, the supra- and infrapiriform foramina were demonstrated, and the nerves and vessels passing through the region were carefully followed and prepared.

RESULTS

During our dissection, we observed the piriformis muscle originating from the middle of the greater sciatic notch, and attaching with a single tendon to the greater trochanter. The

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Original Contribution

MODIFIED BISMARCK BROWN STAINING FOR DEMONSTRATION OF SOFT TISSUE MAST CELLS

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ABSTRACT

Bismarck brown staining is a suitable method for demonstration of mast cells in peripheral tissues. However, apart from the intensive color of the mast cell granules, almost no other structures are visible after this staining, which may compromise the results and discourage the investigator. In the present report, we validate the applicability of the Bismarck brown staining of soft tissue and introduce a modification of the method to improve the quality of the histological preparation. Counterstaining with haematoxylin produces specimens with superb contrast and high analytical value. We consider our method involving counterstaining to be superior to the classical Toluidine blue staining, because of the greater contrast of mast cells, which makes evaluation easier, while the preparations are suitable for automated image analysis as well.

Key words: Bismarck brown, Toluidine blue, mast cells, rat

INTRODUCTION

Mast cells are a versatile population of granulocytes, found in virtually all tissues of the body (1, 2). Their involvement in innate immunity, immunomodulation, inflammation, allergic reaction, autoimmunity, and wound healing puts them at the focus of study during evaluation of histological alterations in such conditions (3, 4, 5), both in humans and animal models.

The majority of the histochemical methods for demonstration of mast cells depend on the content of heparin (6) and other glycosaminoglycans in their granules (7). Probably the most commonly employed one is the Toluidine blue staining, which shows the mastocytic granules as metachromatic structures (8), however producing a good amount of background staining of other cellular and extracellular elements (9). Such high signal-to-noise ratio can make evaluation of the resulting histological preparation ambiguous. Furthermore, the contrast of mast cells is often not sufficient for an automated or semi-automated image analysis.

AIM

The aim of the present study is to validate the

applicability of the Bismarck brown staining of soft tissue mast cells by comparing it with the widely accepted Toluidine blue staining method. A modification of the method for improving the results by counterstaining is also proposed.

MATERIALS AND METHODS

We used tissue obtained from six male rats male Wistar normotensive rats, weighing 220-350 g, which were transcidentally perfused with 4% paraformaldehyde (Sigma, Germany) in phosphate-buffered saline as a part of another experiment. All animal handling was done in strict adherence to governmental (Directive 2010/63/EU of the European Parliament and of the Council of September 22, 2010) and institutional animal care regulations.

Following perfusion, tissue pieces containing skin, subcutis and skeletal muscle were excised and immersed in the same fixative at 4 °C overnight. The samples were thereafter dehydrated and embedded in paraffin following a standard protocol. Sectioning was done in 5 µm serial sections. Adjacent sections were mounted on albumen-gelatine covered slides and processed for Bismarck brown or Toluidine blue staining, alternatively. The staining procedure is described in detail below. For the Bismarck brown staining sections were deparaffinised with xylene and rehydrated to 70% ethanol. They were subsequently

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ANCIENT METHODS OF SKIN INTERVENTION – ACUPUNCTURE PREDECESSORS?

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Abstract

It has been proposed, that the very first therapeutic methods involved applying pressure or needling painful spots on the body surface. Ancient antropomorphic figurines and drawings, showing markings on the body, have been found. Those markings could be interpreted as special points, body painting, piercings, scarification, tattoos, or needling spots. In the present study we discuss the possibility that such historical therapeutic methods have given rise to the acupuncture. We study possible methods of skin intervention, we compare ancient tools and juxtapose the spots, in which modern acupuncture intervenes – the biologically active points (BAP). During acupuncture, needles of various materials (stone, bone, wood or metal) are temporarily inserted in specific points of the body. Body piercing and tattooing are contemporary used ancient methods, spread all over the world. We presume, that they could have been used not only ritualistically, but also as a therapeutic modality. Ancient mummies show tattoos in the form of lines, dots, or circles, often placed in BAP. Furthermore, it could be assumed, that they were therapeutically applied, since the tattooed individuals suffered from ailments, coinciding with the placement of tattoos in an attempt of treatment. Many historically used instruments that could be used in body piercing and tattooing, resemble the contemporary tools of acupuncture, points of application of tattoos and needles are also closely associated.

In the present paper we presume, that different healing methods could have existed simultaneously for a long time. We also discuss the probability of acupuncture being a derivative of ancient methods of superficial skin intervention, such as tattooing and body piercing.

Key words: acupuncture; acupoint; tattoo, piercing, needle

Introduction

Humans have shown interest towards their own bodies since ancient times. It has been hypothesized, that the very first therapeutic attempts involved applying pressure, heat, or needling painful spots on the body. Some antropomorphic figurines and drawings with body markings (dots, holes and lines) have been found (Zidarov, 2009; Kalchev, 2010; Soukopova, 2011; Hansen, 2011). Those markings on the surface of the body could be interpreted as special points, body painting,

THE FEMALE G-SPOT: ANATOMICAL FACT OR FANTASY?

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Abstract

Ever since its existence was suggested by Ernst Gräfenberg in the 1940s, the eponymous G-spot remains a controversial topic among anatomists, gynecologists, sexual medicine specialists, and self-proclaimed sexologists. Its assumed localization on the anterior vaginal wall, 50 to 80 mm from the introitus, has been established predominantly relying on self-report, questionnaires, and vaguely reasoned functional tests, all contributing toward the notion that a functionally important for the female orgasm zone indeed exists on the anterior vaginal wall.

Despite those statements are not based on the proven fact of the presence of a discrete anatomical structure, numerous reports have speculated about possible muscular, vascular, and even neural peculiarities of the region, contributing to its functional importance. However, even though the distal anterior wall of the vagina is a highly sensitive area, included in the morphofunctional clitourethrovaginal (CUV) complex, the existence of the G-spot as a separate morphological entity is yet to be proven.

The present report reviews the reports regarding the morphological essence of the G-spot and summarizes the available data on the anatomy of the anterior vaginal wall.

Key words: Gräfenberg spot; G-spot; anterior vaginal wall;

COMPARATIVE CHARACTERIZATION OF PLASTINATION METHODS

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ABSTRACT

Anatomy is the foundation of medicine. Practical anatomy education at Medical Universities is usually performed on cadaveric material. The proper conservation of biological material is important not only for the quality of medical education but also for the health of both students and lecturers. Von Hagens offers plastination – a modern conserving method for long-time preservation of anatomical structures.

The three basic techniques used in plastination are: S10, P40, and E12. In the present work we offer a comparison between them as well as tips from our practice, which can be useful for beginner plastinators.

Keywords: plastination, S10, P35, P40, E12, anatomy

INTRODUCTION

Practical anatomy education at Medical Universities worldwide is usually performed on cadaveric material. This material is not permanently stable, because following death tissues deteriorate and decompose. The influence of microorganisms from the external and internal environment, and the action of enzymes in tissues are the reason for the disintegration of the biological material.

10% aqueous solution of formaldehyde, used in the last 150 years, preserves the biological matter, but it is highly toxic – it causes inflammation of the mucous membranes and triggers allergic reactions that can be fatal. The toxic effect of this conservation mixture is considerable, regarding both students and teachers.

The alteration of the tissue color is yet another problem for the anatomy education. **Formaldehyde-preserved anatomical objects don't have the real morphological appearance of the educational material.**

Due to those reasons, over the last centuries anatomists have looked for a new harmless conservation method to preserve the biological material in stable condition and at the same time be safe for human health.

Many of these problems were solved once Gunther von Hagens started applying the plastination method in his practice (*von Hagens et al.*, 1987). This method caused a revolution in the preservation of anatomical preparations for medical training. Initially, experiments for impregnation of soft biological specimens with thermosetting resins and elastomers were made (*von Hagens*, 1979). They subsequently led to the modern plastination method.

ЭКСПЕРИМЕНТАЛЬНОЕ ОПРЕДЕЛЕНИЕ ТЕМПЕРАМЕНТА КРЫС

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В наше время придется все большее значение исследованию индивидуально — типологических особенностей подопытных животных в эксперименте. Для исследований в различных областях медицины широко используется мелкие лабораторные животные — крысы и мыши. Из литературы изученной нами следует, что после экспериментов проводится математический анализ, затем делят особей по гендерным, возрастным и генетическим группам без учета индивидуально — типологических особенностей, что существенно искажает результаты полученные в процессе эксперимента.

В связи с этим, целью нашего эксперимента было: изучить темперамент у разных видов крыс. Для этого используются известные и популярные методы определения темперамента крыс: методы открытой площадки (Boissier с соавт., 1964), прищипывающего крестообразного лабиринта (Handley, S.L., Mithani S. 1984), Light-Dark box test (J.N. Crawley, F.K. Goodwin, 1980), но нами был выбран самый удобный, информативный, малозатратный, доступный — метод «открытого поля» (C.Hall). На основании данных К.Холла выделяются две группы темпераментов крыс: тип А и тип В. К типу А относятся «не эмоциональные» крысы с низким уровнем дефекации и высокой подвижностью, а к типу В относятся «эмоциональные» крысы с высоким уровнем дефекации и низкой подвижностью.

В данной работе мы использовали собственную модификацию этого метода: ареной для нас была большая квадратная камера 100х100 см, с высотой стенки 40 см. Полом служит лист ватмана, расчерченный на одинаковые квадраты 25х25 см. В эксперименте участвовали 49 животных обоего пола двух видов: беспородные белые и черно-белые декоративные. Каждую крысу по отдельности помещали в угол камеры и наблюдали за ее поведением в течении 5 мин., при этом регистрировались следующие показатели: количество пройденных

квадратов (горизонтальная активность), количество дефекации, количество умываний, количество вертикальных стопок (вертикальная активность), количество пройденных центральных квадратов. Для фиксирования времени использовали секундомер и результаты записывали в журнал учета. Затем интерпретировали результаты следующим образом: если крыса проходит большое количество квадратов как периферических, так и центральных с большой вертикальной активностью, активно умывается и не выраженной дефекацией, мы относим эту крысу к типу А — «не эмоциональные», способные быстро ориентироваться и исследовать новую среду и делали насечку на правое ухо. Если крыса проходит малое количество квадратов или вообще забивается в угол, с низкой вертикальной активностью и с частыми актами дефекации, мы относим такую крысу к типу В — «эмоциональные», неспособные быстро ориентироваться и исследовать новую среду, они пассивны и делали насечку на левое ухо.

В итоге проведенной работы нами были получены результаты: из 54 крыс к типу А относятся 24 крысы, к типу В, соответственно 30, из 29 белых крыс 15 относятся к группе А, 14 к группе В, из 25 черно-белых крыс к группе А относятся 9 крыс, к группе В 16.

Эти данные дают возможность сделать выводы о проведенном эксперименте: во-первых, исследование по методу «открытое поле» дает возможность определить темперамент каждой опытной крысы, во-вторых, темперамент белых беспородных крыс отличается от темперамента черно-белых декоративных крыс. В-третьих, тип А и тип В у белых крыс распределены одинаково в тестируемой популяции. В-четвертых, у черно-белых крыс тип В в 1,5 раза больше типа А.

Таким образом, черно-белые декоративные крысы более «эмоциональные» по сравнению с белыми беспородными крысами.

СОВРЕМЕННЫЕ МЕТОДЫ ИЗУЧЕНИЯ МОРФОЛОГИИ ДЛЯ ИНТЕРАКТИВНОГО ОБУЧЕНИЯ СТУДЕНТОВ НА МЕДИЦИНСКОМ ФАКУЛЬТЕТЕ ТРАКИЙСКОГО УНИВЕРСИТЕТА

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Морфологические науки являются основными фундаментальными дисциплинами, которые стоят в основе обучения студентов медицинского профиля. В отличие от России, в Болгарии все предметы морфологического цикла (анатомия, гистология, цитология) традиционно изучают на одной кафедре, поэтому каждый из преподавателей является морфологом в широком смысле. Классические методы, которые используются в большинстве европейских ВУЗов в целом мире включают теоретические лекции, практические занятия и домашнюю самоподготовку. Во время практических занятий студенты рассматривают микропрепараты на обычном световом микроскопе и описывают их специфические особенности. При этом они опираются на свои знания, которые предварительно приобрели дома в процессе подготовки к занятию.

Неиспользование методов интерактивного обучения делает обучение более легким потому, что студент всегда может обратиться к обширной информации для описания гистологических препаратов. Преподаватель позволяет студенту осуществлять доступ в Интернет и всегда может online контролировать как доступ к информации в базе данных и/или в Интернете, так и самостоятельные действия студента на его микроскопе.

Целью данной работы явилось описание нашего опыта в использовании методов интерактивного обучения в области медицинской науки и, в частности, в изучении анатомии.

Материалы и методы. В процессе обучения мы используем классические цито- и гистологические препараты, изготовленные в лаборатории кафедры. Они соответствуют программам обучения на медицинском факультете и включают следующие темы: цитология (клетка, органеллы, ткани), общую гистологию (строение тканей и их особенности), общую эмбриологию (развитие эмбриона от момента зачатия до начала формирования систем органов), гистологию или микроскопическую анатомию (гистологическое строение органов).

Для всех препаратов у нас есть подробное описание в соответствующих руководствах и в базе данных, которая хранится на кафедре.

В учебных помещениях мы используем микроскопы «Олимпус» (Olympus Eitora SE & CO. KG), которые связаны в единую систему с микроскопом преподавателя. Через компьютер изображение препарата проецируется на большой экран у стены. Преподаватель может вывести на экран изображение со своего микроскопа и с микроскопа любого из студентов. При необходимости он дополнительно демонстрирует все препараты, которые сохраняются в электронной базе данных. В таком случае студенты могут сделать сравне-

ние между своими препаратами и стандартными образцами в базе данных кафедры. Если это необходимо, руководитель может войти в Интернет и разыскать интересные препараты в базах данных многих мировых университетов.

Результаты и обсуждение. В процессе обучения наши студенты имеют возможность использовать самые лучшие препараты кафедры анатомии медицинского факультета Тракийского университета и получить объяснение всех подробностей микроскопического изображения на большом экране. Система позволяет студентам обмениваться данными, получать у преподавателя объяснение всех неясных моментов, сформировать визуальное представление о самых важных гистологических объектах, которые можно увидеть на препарате, дифференцировать важное от маловажного.

В результате широкого использования интерактивных методов обучения изучение морфологических дисциплин стало легче и для преподавателей, и для студентов, а результаты образовательного процесса значительно улучшились.

Интерактивное обучение является современным методом для обучения студентов разных специальностей. Он позволяет использовать электронную базу данных, которая сохраняется на кафедре и доступна для студентов. Этот метод не используется в многих странах мира. Все преподаватели говорят о хороших результатах вследствие перехода на интерактивное обучение.

Данный подход является инновационным методом с важным практическим применением в изучении морфологических дисциплин. При этом студенты приобретают современные и систематические знания, визуальное представление о гистологической структуре клетки, ткани и органа. Одновременно они получают практические умения в использовании изучаемого материала.

Эти результаты были представлены на проведенном «круглом столе в области обучения» в рамках Международной конференции Клинической анатомии в городе Варна – октябрь, 2016.

В наших планах создание двух учебных помещений для проведения интерактивных занятий по морфологии, один из которых уже едет в эксплуатацию. В скором времени мы ожидаем окончания ремонтных работ и установку оборудования во втором помещении.

Выводы.

1. Интерактивное обучение является современным методом для усвоения теоретических и практических знаний.
2. Этот метод применим в области медицины, его эффективно можно использовать в изучении морфологических дисциплин, таких как анато-

логия, общая гистология, общая эмбриология и частная гистология.

3. В результате обучения студенты получают хорошие теоретические и практические познания в изучаемых дисциплинах, что отражается в

результатах семестровых экзаменов.

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ИСПОЛЬЗОВАНИЕ ИНТЕРАКТИВНЫХ МЕТОДОВ ПРИ ИЗУЧЕНИИ МОРФОЛОГИЧЕСКИХ ДИСЦИПЛИН СТУДЕНТАМИ МЕДИЦИНСКОГО КОЛЛЕДЖА

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Применение интерактивного метода при обучении студентов Медицинского факультета показало хорошие результаты, что позволило также использовать его для обучения студентов разных специальностей в Медицинском колледже.

Кафедра анатомии, гистологии и эмбриологии человека является, пожалуй, наиболее перспективной для внедрения этого метода в рамках не только высшего, но и среднего специального медицинского образования. В нашей практике метод интерактивного обучения стал особенно популярен при изучении таких дисциплин как «Гистология» и «Гистологическая техника». Он позволяет студентам не только получить практические умения и навыки, но и сформировать четкое визуальное представление об учебном материале.

В обучении студентов Медицинского колледжа мы использовали базу данных, которая была создана для обучения студентов Медицинского факультета Тракийского университета (Стара Загора, Республика Болгария). Доступ студентов и преподавателей к базе данных возможен либо непосредственно или через доступ в сети Интернет. Обучение осуществляется в специально оборудованном помещении с современными микроскопами и мультимедийной аппаратурой.

Интерактивная форма обучения позволяет студентам принять активное участие в учебном процессе. В результате использования этого инновационного метода обучения среди студентов Медицинского колледжа мы получили гораздо лучшие результаты, чем при организации учебного процесса с использованием классической методики.

Ключевые слова: интерактивное обучение, анатомия, гистология, гистологическая техника, Медицинский колледж

В медицинских высших учебных заведениях традиционное обучение включает лекции и практические занятия по анатомии и гистологии. Эти морфологические дисциплины являются фундаментом медицинской науки и поэтому они отличаются особой важностью в процессе подготовки будущих специалистов.

При этом в изучении гистологии чаще всего используют классические микроскопические препараты, которые студенты изучают под микроскопом и в дальнейшем убеждают на основании своих познаний. Таким образом, основным принципом здесь является следующий: «Кто что видит то, что знает». Интерактивное обучение в процессе убеждения позволяет использовать базу данных, содержащую тысячи гистологических микрофотографий, сформированную на кафедре, которая находится в памяти компьютера руководителя практического занятия.

Целью данной работы явилось сравнение эффективности классического и интерактивного метода обучения при преподавании анатомии и гистологии среди студентов Медицинского колледжа в нашем городе.

Основными задачами данной работы явилось описание метода и сравнение результатов интерактивного и классического обучения.

Материалы и методы. Были изучены успеваемость по изучаемым предметам у студентов Медицинского колледжа при изучении следующих морфологических дисциплин: анатомия человека (первый семестр первого курса); общая и специальная гистология (второй семестр первого курса); гистологическая техника (первый семестр второго курса).

При обучении по классической методике используем стандартные цито- и гистологические

ИЗПОЛЗВАНЕ НА ИНТЕРАКТИВНОТО ОБУЧЕНИЕ В МЕДИЦИНСКИ
ФАКУЛТЕТ И МЕДИЦИНСКИ КОЛЕЖ – СТАРА ЗАГОРА Драчева, Р.², Д.
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Загора

USE OF INTERACTIVE TRAINING IN MEDICAL FACULTY AND MEDICAL
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Abstract

Interactive practices are a modern method in medical education. Students are not just listeners, but they take active part in the educational process and are in constant contact with their Assistant-Professor. Interactive learning gives knowledge as well as it learns the students to think. Each student is individually contacted with the database containing the information that must to be learned. The Assistant Professor is not only a source of knowledge, but also a generator of new ideas as well as a leader of the free learning process. The main principle of interactive learning is the active dialogue between a learner and a trainee while continually maintaining feedback between them. Interactive training can be conducted as a research based education or as a situated learning.

Situational methods of interactive learning are used to imitate a real environment. Discussion methods discuss the observed cases. In terms of morphological training, these are anatomical and histological preparations. Project work builds on students the business qualities that are needed for future researchers.

The high positive results are due to the active participation of the students in the learning process and the feedback that exists in the group of trainees.

Keywords: *interactive training, morphology, feedback, education*

Въведение

Интерактивното обучение е нов за нашата страна метод на преподаване. Това е не само обучителен метод, но и характерна връзка между преподавател и студент, а също и между студентите от обучаваната група. Този метод превръща групата в екип, който работи въз основа на връзката студент-преподавател и студент-студент.

ПОЛОЖИТЕЛНИТЕ КАЧЕСТВА НА ИНТЕРАКТИВНОТО ОБУЧЕНИЕ
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THE POSITIVE CHARACTER OF INTERACTIVE TRAINING

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Abstract

Interactive practices are a modern method in medical education. Students are not just listeners, but they take active part in the educational process and are in constant contact with their Assistant-Professor. Interactive learning gives knowledge as well as learns the students to think. Each student is individually contacted with the database containing the information that must to be learned. The Assistant Professor is not only a source of knowledge, but also a generator of new ideas as well as a leader of the free learning process. The main principle of interactive learning is the active dialogue between a learner and a trainee while continually maintaining feedback between them. Interactive training can be conducted as a research based education or as a situated learning.

Situational methods of interactive learning are used to imitate a real environment. Discussion methods discuss the observed cases. In terms of morphological training, these are anatomical and histological preparations. Project work builds on students the business qualities that are needed for future researchers.

The high positive results are due to the active participation of the students in the learning process and the feedback that exists in the group of trainees.

Keywords: *interactive training, morphology, feedback, education*

Въведение

Интерактивното обучение е сравнително нов за нас обучителен метод, при който студентите са не само слушатели, но те вземат активно участие в образователния процес.

Интерактивното обучение освен че дава на студентите знания по съответната

USE OF 3D IMAGING FOR TEACHING ANATOMY IN MEDICAL EDUCATION AND THE DEVELOPMENT OF THE FIRST BULGARIAN 3D ANATOMY ATLAS

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Abstract

Understanding certain parts of anatomy is often found difficult for students due to the complexity of the material and the lack or insufficiency of practical lessons. Even with real anatomical models and dissections a big portion of the theoretical material cannot be seen in real life. In the century of computer technologies computer generated images can be solve many of the problems in teaching and learning anatomy for both students and lecturers.

The goal of this project is to create interactive 3d software that will ease and simplify the learning process and provide a better and more accurate view over human anatomy. Although many 3D viewers exist we want to create an interactive and flexible imaging source, coordinated with the needs and preferences of students, combined with real-life photos and references.

The software will be created by students under the instructions and monition of the lecturers from the department of anatomy. The environment will be based on Unity, which is a free cross-platform game engine. This will allow us to easily create an application that will run on multiple platforms both desktop and mobile. The 3D models will be created entirely from scratch on a software, called Autodesk 3Ds Max, using real photographical references from the department of anatomy in the Faculty of Medicine of Trakia university. The back-end coding will be realized using C# programming language.

The first realease of the application will contain the human skeletal system with she skeleton as a whole as well as all the bones seperately. Future upgrades will include all other systems of human anatomy as well as topographical features.

Introduction

Understanding anatomy can sometimes be found difficult for students due to the complexity of the material. One of the biggest problems they are facing is understanding the way all the elements in human anatomy correlate to each other. This is because in real life the organs and systems are not isolated. They are all in one place, they are linked, and are in the most difficult topographical relations.

Even with real anatomical models and dissections a big portion of the theoretical material cannot be seen in real life. In the century of computer technologies computer generated

2. Елишева О.Б. Инновационные процессы в образовании / О.Б. Елишева, Д.Ю. Трушников. - Тюмень: ТюмГНГУ, 2010. - 124 с.

Преимущества интерактивного обучения в условиях современного общества

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Анатомия, гистология и другие морфологические дисциплины являются фундаментальными в медицинском образовании и поэтому они отличаются особой важностью в процессе обучения студентов. Классические способы обучения анатомии включают теоретические лекции и практические упражнения в диссекционном зале. В гистологии во время практического занятия мы показываем и объясняем микроскопические препараты, которые студенты наблюдают и обсуждают на основании своих познаний.

Цель этого исследования - представить методы интерактивного обучения, которые мы используем и сравнить с ними классические образовательные методы.

Средства для обследования интерактивных методов финансируемые за счет проекта номера 18/2014 года фонда медицинского факультета – Стара Загора, Болгария.

В исследовании участвовали студенты, докторанты и преподаватели кафедры анатомии медицинского факультета и медицинского колледжа Тракийского университета в городе Стара Загора, Болгария.

Коллектив сформировали на базе проектов:

1. Интерактивное обучение по цитологии, эмбриологии, общей гистологии и органной анатомии для студентов специальностей «Медицина» и «Медицинская лаборатория».

2. Строительство двух светлинных стен для интерактивного обучения цитологии, специальной гистологии и анатомии для студентов специальностей на медицинском факультете.

3. Применение набора мероприятий для улучшения сотрудничества Медицинского колледжа в Тракийском университете - Стара Загора с практическими базами обучения.

Принципы. Основным принципом интерактивного обучения является активный диалог между учащимся и преподавателями, основанный на «обратной связи» между ними. Активная роль студентов в обучении медиков, лаборантов, кинезитерапевтов и других, является основой их обучения. Использование мультимедиа, сотрудничество между студентами и преподавателями и создание



Чудесата на акупунктурата

Николай Димитров

Едно от чудесата на древния свят, достигнало до нас от Китай, е акупунктурата, или излюбождането. Този на пръв поглед прост метод води до чудогейни в очите на повечето хора резултати.

На какъв принцип работи акупунктурата? На определени точки от тялото се поставят тънки игли, а пациентът ги понася сякаш без болка, и не само това, болката,

от която е страдал, чудогейно изчезва. Но дали наистина това е така? Нека разкажем за този използван от хилядолетия метод за лечение, да го разгледаме в светлината на съвременната наука и да отговорим на някои от най-често задаваните от хората въпроси. Как е възникнал този лечебен метод и прилага ли се успешно и в България? Боли или не боли акупунктурата? Може ли да се сравни с убождането от мускулна инжекция или когато ти вземат кръв? Наистина ли има лечебен ефект и ако е така, на какво се дължи той? Кога и как трябва да се прилага акупунктурата?

Названието „акупунктура“ има латински корени, от *Acus* – игла и *Punctum* – което може да се използва с две значения: убождане или точка. Много често се използва и терминът „иглотерапия“ – лечение чрез поставяне на игли. Акупунктурните игли се поставят в определени места по човешкото тяло – акупунктурни точки. Те се от-

крояват по човешкото тяло със специфични морфологични особености и по-ниското електрическо съпротивление, което позволява тяхното откриване със специални апа-

рати, измерващи кожното съпротивление. В класическата китайска медицина още през XI в., когато се изготвя известната бронзова фигура на човек за обучение на лекари по китайска медицина, са обозначени 600 точки. Днес има открити над 1500 такива точки по човешкото тяло. В лечебния процес рядко се използват всички тези точки, в клиничната практика най-често има около 150 точки на въздействие (акупунктурни точки).

Смята се, че акупунктурата произлиза от Китай, като се явява част от традиционната китайска медицина. Акупунктурата е използвана в продължение на хилядолетия от поколения лекари и безброй пациенти. Най-ранният писмен източник по акупунктура (III – I в. пр.Хр.) е „Нейдзин. Трактат за вътрешното“, традиционно приписван на Жълтия император – Хуанди, живял около 2697 – 2597 г. пр.Хр. Текстът е построен под формата на диалози между Хуанди,



**ОЦЕНКА НА ЗДРАВНАТА ГРАМОТНОСТ НА ПАЦИЕНТИТЕ В
РЕВМАТОЛОГИЧНАТА ПРАКТИКА**

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**EVALUATION OF THE HEALTH LITERACY OF PATIENTS IN THE
RHEUMATOLOGICAL PRACTICE**

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Abstract:

Health literacy is the ability to receive, read, understand, and use health information to make appropriate health decisions and follow the treatment guidelines. A survey method and IALSS were used. We found out that 12 patients (17.7%) of all 68 patients included in the study had low health literacy. These people had difficulty with common health issues, including reading medication prescriptions. 29 of 68 patients (42.6%) find it difficult to understand health information published in the media. 60 patients (88.2%) have a third level of IALSS literacy. Low health literacy reduces the success of treatment and increases the risk of medical error.

Keywords: assessment, health literacy, rheumatic patients.

Препоръките на Европейската лига по ревматология (ЕУЛАР) включват в съвременния терапевтичен план нуждата от споделено решение: За да бъде компетентен за това, пациентът с ревматологично заболяване е нужно да има здравна грамотност(3,15,16). Ключов механизъм за подобряване на качеството в здравеопазването е осигуряването на здравни знания(2,7,8). Подобряването на грамотността, свързана със здравните услуги е важен фактор за успешно лечение(1,4).

Цел на изследването: Да се оцени здравната грамотност на пациентите с ревматологични заболявания, лекувани в амбулаторната практика.

Материал и методи:

Изследвани са 68 пациента, от които 55 жени и 13 мъже. Средна възраст 64,2 години. От тях по етнос 8 пациенти се определят като роми и 3 -като турци. 47 пациента живеят в град, а 21- на село. По образование: 2 болни са с начално, 5 са с основно образование, 48 са



НИВО НА ВИТАМИН Д3 ПРИ БОЛНИ С ФИБРОМИАЛГИЯ

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VITAMIN D3 LEVEL IN PATIENTS WITH FIBROMYALGIA

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Abstract:

In patients with fibromyalgia and chronic pain, there is an evidence in the literature for the presence of low levels of vitamin D3. According to some authors, low levels of vitamin D3 may be a result from the disease and not the cause. We examined vitamin D levels in women suffering from fibromyalgia. Results: 36 women from the Stara Zagora region were studied. 12 patients (33.33%) had low vitamin D levels below 30 ng / ml. Of these, 10 (27.8%) were over 50, 2 (5.6%) were under the age of 50. Determining vitamin D 3 deficiency allows for the inclusion of substitution treatment and improvement in symptoms as well as the quality of life of patients with fibromyalgia.

Keywords: Vitamin D3 level, fibromyalgia

Фибромиалгията (fibromyalgia syndrome - FMS) е най-честият болков синдром в клиничната практика, който засяга предимно женската популация (14). В САЩ между 2 и 10% от населението (над шест милиона души) покриват диагностичните критерии за фибромиалгия. Данните от обзор на множество клинични проучвания показваха, че FMS засяга около 6% от популацията в Европа и Северна Америка. (9) Причините не са напълно известни. Наблюдавано е, че много пациенти с фибромиалгия имат появата на симптомите след травматично събитие, инфекция, физически и психически стрес (7,8,12)

Обичайно дефицитът на витамин Д е характерен за старческа възраст, свързан със стареенето на кожата и инволютивните процеси (4,5,10). При пациенти с фибромиалгия и хронична болка има данни в литературата за наличие на ниски нива на витамин Д3 (6,10). Според някои автори, ниските нива на витамин Д3 могат да бъдат резултат от фибромиалгия, а не причина за заболяването (11).

Цел: Изследване на нивото на витамин Д3 при болни с фибромиалгия.

Материал и методи: Изследвани са 36 жени на средна възраст 61.8г. от Старозагорска област, диагностицирани със заболяването фибромиалгия според Ревизираните критерии от 2016г (15).

Резултати:

При 12 пациенти (33,33%) се установиха ниски нива на витамин Д - под 30 ng/ml. (фиг1)