NEUROPHYSIOLOGY OF ACUPUNCTURE

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OBJECTIVES

1. Acupuncture's mechanism of action
2. The meridians and the vegetative/peripheral nervous systems
3. The ontological development of the meridians
4. Acupuncture points
5. The effects of acupuncture

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1. Acupuncture's mechanism of action

- Still today there is not a clear description of the mechanism of action of acupuncture
- 1970 acupuncture was related to the central nervous system
- 1972 acupuncture was related to histamine release and to the vegetative nerve system
- 1973 acupuncture was related to upper nervous centres
- Neurophysiological development nowadays define the mechanism of action of acupuncture to be through neuromodulation of the nervous system

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1. Acupuncture's mechanism of action

- Occidental medicine considers the nervous system as a complex network which activates, regulates, and maintains plenty of vital functions through local and systemic processes
- Traditional Chinese medicine intuitively describes the nervous system when describing the meridians and acupuncture points
- Moreover, the concept of the Jing-Luo meridians (channels and collaterals) resembles the occidental nervous system

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1. Acupuncture's mechanism of action

- In both cases there is a hierarchical organization
- Both have a tremendous network distributed through the body
- Both have nots (acupoints) on which we can work to regulate its function (tonification/dispersion). These not on the nervous system are the synaptic clefts
- Both structures have a strong relationship to the dorsal area of the body:
  - In the nervous system it happens through the dermatome which is realted to the ganglionic dorsal roots
  - In TCM it happens through the dorsal Shu points which are located at the height of the ganglionic dorsal roots

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1. Acupuncture's mechanism of action

- Both nerves and meridians have remote connections
  - The nervous system present vasovagal reactions
  - The acupoint Bl 62 activates the occipital cortex
- The topographic test on cadavers have shown that each acupoint is located over a cutaneous "neurovascular" bunch

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1. Acupuncture's mechanism of action

- The results of a scientific study injecting technetium (Tc) in an acupoint reported:
  - The substance appears on the skin after 2 – 120 mins following the meridian path to which the acupoint belongs. This showed the "ectodromes" or external pathways
  - After 8 – 24h there is major concentration of technetium at the viscera related to the meridian. This shoed the "endodromes" or internal pathways.

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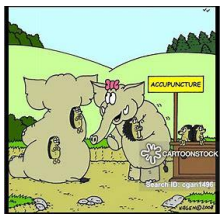

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2. The Meridians

- Histologically
  - They are tubular structures of 30 – 100 micrometers width
  - They are transparent and so thin that are not visible with augmentation microscopes. They are usually confused with fibrine fibers from bleeding tissues during dissection
  - The tubular structures contain an amber liquid with hyaluronic acid, small DNA granules and microcells (1-2 mm diameter) . These microcells contains cromosomatic material reactive to the same material as stem cells which derives from the embrionary sheets

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2. The meridians

The meridians follow a similar distrution as the nervous fibers

Group	Innervation	Myelination	Velocity (m/s)
Aα	Motor to skeletal muscle	myelinated	70 – 120
Aβ	Sensory (touch, pressure, vibration, proprioception)	myelinated	30 – 70
Aγ	Motor to muscle spindles	myelinated	15 – 30
Aδ	Sensory (nociceptors, mechanoreceptors, thermoreceptors)	Thinly myelinated	12 – 30
B	Sympathetic preganglionic	unmyelinated	3 – 15
C	Sensory (Nociceptors, mechanoreceptors, thermoreceptors) Sympathetic postganglionic	unmyelinated	0.5 – 3

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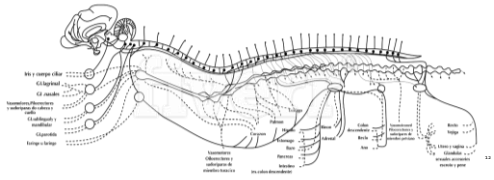
2a. The meridians & the vegetative nervous system

The nerve roots leave the spinal cord to approach the paravertebral ganglionar chain of the simpathetic nerve system



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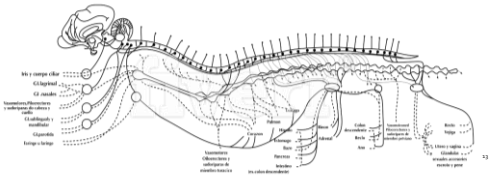
2a. The meridians & the vegetative nervous system

From the paravertebral ganglionar chain the fibers enter the visceral ganglia to innervate the abdominal organs



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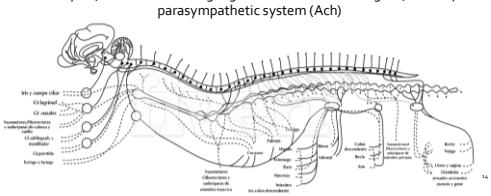
2a. The meridians & the vegetative nervous system

This last part, from the visceral ganglia to the abdominal organs, is led by the parasympathetic system (Ach)



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This way, acupunture on the dorsal Shu points of the bladder meridian are affecting the nerve roots and as a consequence also influencing the abdominal organs

Shu	Localization	Root nerve innervation
Lung 13V	T3	T2 – T3
Pericard 14V	T4	T2 – T4
Heart 15V	T5	T3 – T5
Liver 18V	T10	T8 – T10
Gall Bladder 19V	T11	T9 – T11
Spleen 20V	T12	T10 – T12
Stomach 21V	T13	T11 – T13
Triple Heater 22V	L1	T12 – L1
Kidney 23V	L2	T13 – L2
Large Intestine 25V	L5	L2 – L5
Small Intestine 27V	S1	S1
Bladder 28V	S2	S2

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2b. The meridians & the peripheral nervous system

- The spinal nerve roots connect with the cervical and thoracic sympathetic ganglia when the leave the vertebra. Immediately afterwards they divide and spread to innervate the limbs
- Next, we're going to study the correspondence between medular segments, innervated structures and the meridians related with the fore- and hindlimbs

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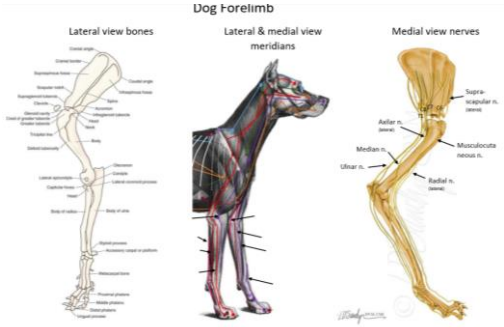

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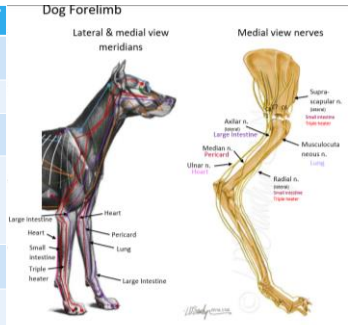
Medular segment	Nerv	Innervation	Muscles innervated	Correspondence with meridian
$C6, C7$	Suprascapular	Lateral escapulohumeral joint	Supraspinosus Infraspinosus Subescapular	Small intestine Triple heater
$C6, C7$	Musculocutaneo	Craniomedial forearm	Biceps braquial Coracobraquial	Lung
$C7, C8$	Axilar	Caudal shoulder joint Craniolateral forearm	Braquiocephalic Deltoid	Large intestine
$C7, C8, T1$	Radial	Lateral Elbow joint Forearm and dorsal paws	Triceps Anconeo Extensors (carporadial, common, long digital, carpoulnar) Supine m. Abductor m.	Small intestine Triple heater
$C8, T1$	Median	Medial Elbow joint Forearm and palmar paws	Flexors (carporadial, superficial, deep digital) Prone m.	Pericard
$C8, T1$	Ulnar	Caudal Elbow joint Forearm and caudolateral paws	Flexor carpoulnar Flexor deep digital	Heart



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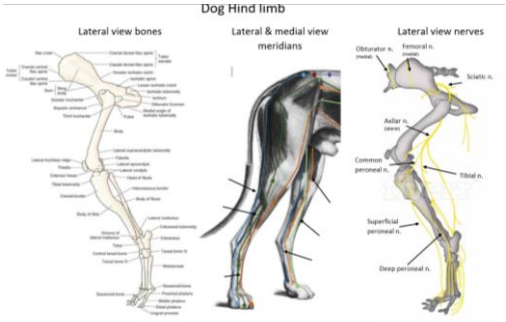

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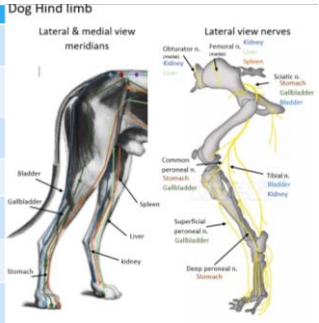
Nerve	Structure innerved	Correspondence with meridian
Obturator (L2 – L4)	Medial thigh Obturator m., Pectineo m., Adductor m. Gracilis m.	Kidney Liver
Femoral (L4 – L6)	Anterior thigh & medial hind leg Psoas m., Pectineo m., Sartorio m. Cuadriceps femoral m.	Spleen Kidney Liver
Sciatic (L4 – S3)	Coxofemoral joint Biceps femoral m. Semitendinosa & semimembranoso m.	Gallbladder Stomach Bladder
Commun Peroneal (sciatic)	Biceps femoral m. Lateral Knee Fibula head	Stomach Gallbladder
Superficial Peroneal (common peroneal)	Lateral hind leg Lateral long and short peroneal m.	Gallbladder
Deep Peroneal (common peroneal)	Cranial hind leg Anterior Tibial m., anterior peroneo m. Long Extensor m.	Stomach
Tibial (sciatic)	Popliteal fossa Gastrocnemio m., Popliteal m. Caudal knee Branches: medial maleolo	Bladder Kidney



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Detailed innervation of the knee

Nerve	Part of the knee innervated	Meridian
Articular posterior	Caudal part	Bladder
Articular medial	caudomedial Anterior Posterior cruciate ligament	Liver, Spleen, Kidney Stomach
Articular lateral	Colateral lateral ligament Lateral articular capsule	Gallbladder Stomach

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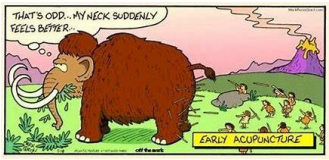

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3. The ontological development of the meridians

The embryo has 3 sheets
- ectoderm
- mesoderm
- endoderm

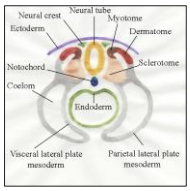
Notochord
induces the formation of the nervous system and the somites.

Nucleus pulposus

Annulus fibrosus

cumulates to the right and to the left of the notochord creating a somite for each vertebra.

Somite
3 parts, **same origin**
- Dermatome → dermis of the skin
- Myotome → skeletal musculature
- Sclerotome → vertebras, ribs, endochondral bone and the skull basis



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grow and migrate and the dermatome and myotome keep the innervation from the original somite
i.e. L1 & testicles
i.e. Stomach & stomach meridian

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3. The ontological development of the meridians

- During the embryologic development, there are areas from the ectoderm and endoderm that are connected

  i.e. **Stomatch & Skin**

- The sheets from ectoderm and endoderm get pulled apart and the relation is maintained through the nervous system following the path of the stomach meridian

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3. The ontological development of the meridians

- Similarly there is an explanation to the communication through the vagal n. between the brain and the intestine and the formation of the enteric nerve system following the migration of nerve cells to the abdomen
- What happens?
  - The intestinal nerv cells are originated at the same germinal sheet as the cells of the brain
  - During the embrionary development, nerv cells from the CNS migrate to the abdomen creating at the intestine a second nerv system; the enteric nerv system
  - The intestine and the brain are separated by they remain communicated through the vagal nerv which corresponds to the X cranial nerv.

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3. The ontological development of the meridians

- The sensitive innervation of the skin has the same origin as the innervation of a determined organ; they come from the same medular segment
- This relationship is essential to understand the way acupunture works; a needle stimulates an area of the skin, which is going to modulate a medular segment. The effect over this medular segment is going to affect in the same way the function of the organ innervated

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3. The ontological development of the meridians

Having this in mind, the following observations have been described in human medicine

- With the presence of renal calculi, pain appears from the sole of the foot to the urethra = Kidney meridian
- With a heart attack, pain appears along the left arm up to the small finger tip (dermatome T1) = Heart meridian
- With digestive disorders, discomfort appears at the parietal area of the head. Acupuncture points such as Gbl 8 or Th 19, both located at the parietal area reduce emesis and therefore the secondary headache (related through the dermatome T9)

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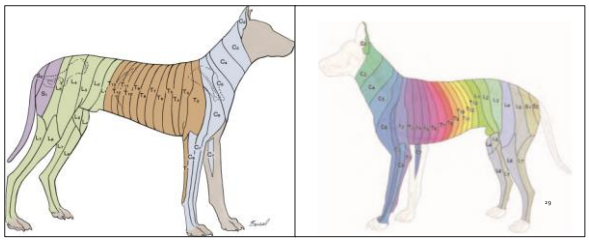
3. The ontological development of the meridians



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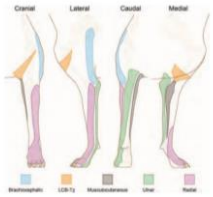
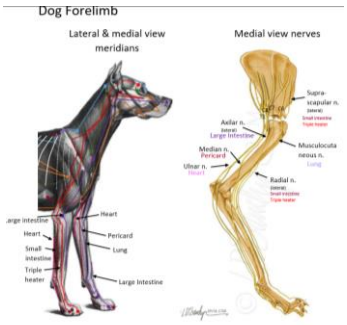
FORELEG

Dermatomes

Nerves

Meridians





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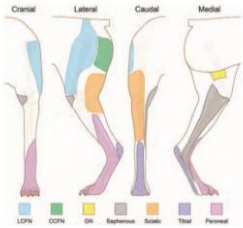
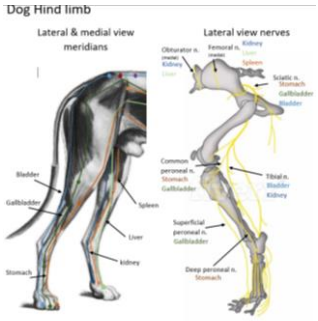
HIND LIMB

Dermatomes

Nerves

Meridians





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4. Acupuncture points

- They are small anatomical depressions of about 1,5 ± 0,5mm located at the epidermis, dermis and muscular fascia
- They are located close to the nerv endings and brunches and to the blood and lymphatic vessels
- Many of them are related to tendinomuscular joints, 70% are trigger points and 80% are related to nerves that crosses a superficial fascia
- Most of the motor points chosen for electromyography are acupuncture points

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4. Acupuncture points – Anatomical characteristics

1. **The size of the nervous trunk.** Most important points are located close to large peripheral nerves. The signal is spread more rapidly through large fibers
2. **The depth where the nerve is located.** Most of the acupoints are located along superficial nerves which are easier to stimulate than deeper located nerves. For instance, there are more acupoints at the forearm and distal hind leg (superficial nerves) which also have wider sensorial areas at the cortex
3. **Deep fascia penetration.** Most acupoint are located where a nerve bunch crosses a deep fascia to reach the surface. The superficial fascia is connected to the skin

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4. Acupuncture points – Anatomical characteristics

4. **The way through bone foramina.** Some acupoints are located over bone foramina where the nerve trunks exits to reach the cutaneous surface. For instance branches of the trigeminal n. are stimulated by St 2 (n. Infraorbital) and Gbl 2 (n. Supraorbital)
5. **Neuromuscular joints.** Some acupoints are located over the nerve trunks which penetrate muscles having a sensitive afferent fiber and a motor sympathetic efferent component (i.e. Sl 11 & Sl 12)
6. **Concomitant blood vessels.** Arteries and veins are distributed parallel to the nerve trunks. An example of acupoint which affects a neurovascular bunch is the Lu 5

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4. Acupuncture points – Anatomical characteristics

7. **Nerve fiber composition**. Relevant acupoints are located close to nerve trunks with afferent, efferent and postganglionic fibers. Less relevant acupoints are close to cutaneous nerves with only afferent and postganglionic fibers
8. **Bifurcation points.** Some acupoints are located where a nerve trunk bifurcates in 2 or more branches
9. **Sensitive ligaments.** Some acupoints are located close to ligaments, tendons, articular bone, thick fascial sheets, articular capsule o collateral sinews
10. **Cranial suture lines.** Some acupoints are close or over cranial suture lines which are highly innervated

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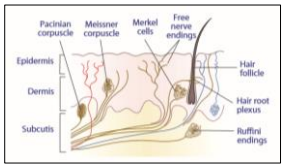
4a. Receptors related to acupuncture points

Histologically, all acupoints are formed by afferent receptors which transduce innocuous sensitive information into an electrical sign. Those receptors are:



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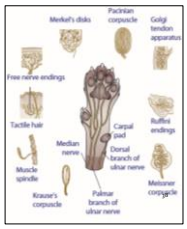
4a. Receptors related to acupuncture points

- **Meissner Corpuscle**
  - Located at the dermis
  - Sensitive to soft touch
  - Fibers Aα, Aβ
  - They get activated very fast (mainly by vibrations <50Hz) and end up been unnoticed (i.e we don't realice we're wearing clothers)



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4a. Receptors related to acupuncture points

- **Pacinian corpuscle**
  - Skin mecanoreceptors
  - Sensitive to fast vibrations & mechanical pression
  - Fibers Aα, Aβ

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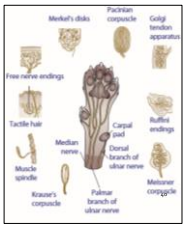
4a. Receptors related to acupuncture points

- **Merkel's Disks**
  - Located at skin and mucose membranes
  - Pression & vibration mecanorreceptors (5 – 15Hz)
  - fibers Aα, Aβ
  - Slow adaptation (responds over 30 min)



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4a. Receptors related to acupuncture points

- **Ruffini endings**
  - Located at the deep dermis
  - Information about skin stretching
  - Fibers Aα, Aβ

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4a. Receptors related to acupuncture points

- **Golgi tendon apparatus**
  - Located close to the muscletendinous joint
  - Propioceptive receptor that transduces information about the tension degree of the tendons from the squeletal muscles
  - Fibers Aα

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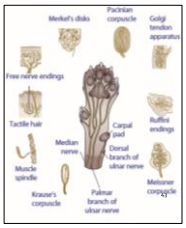
4a. Receptors related to acupuncture points

- **Muscle spindle**
  - Inside the muscle
  - Information about length and stretching of the muscle
  - Fibers Aα, Aβ



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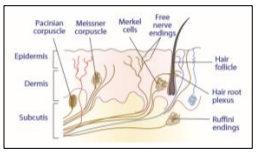
4a. Receptors related to acupuncture points

- Those receptors are mostly located around the acupuncture point
- The acupoints are areas with very high electrical conductivity. This is due to the gap links which facilitate the cellular communication
- The "acupuncture point detector" is based on this property



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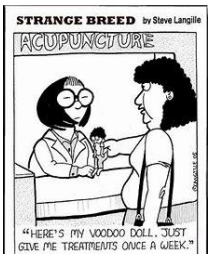

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4b. Acupuncture points classification (Tissue – Nerve)

There are 4 types of acupuncture points based on the location and distribution of the related nerves

- **Type I points (motor):** These are the most common. They are located where the nerves penetrate the muscles
- **Type II points:** They are located at the nerve intersection between the dorsal and the ventral midline of the body
- **Type III points:** They are located over the superficial nerve brunches
- **Type IV points:** They are located where the nerves penetrate the tendons (*Golgi tendon apparatus*)

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4c. What happens with the activation of the acupuncture points?

- The whole homeostasis of the body is affected by the different surfaces where the acupuncture points are located
- These points were firstly described based on try-error science when the ancestors where looking for meaningful neurovascular structures
- The acupuncture points where aligned (origin of meridians) following partial relationships; i.e. a group following main nervous pathways, dermatomes or axonal anatomical sequences
- The metaphysical descriptions allowed to define a group of acupuncture points based on the observed effects rather than following any anatomical homology

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4c. Which structures are affected by the activation of acupuncture points?

The activation of acupuncture points modifies the homeostasis of the following surrounding structures:

a. **Cutaneous structures**
b. **Channels**
c. **Spinal structures**
d. **Central structures**

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a. Cutaneous structures

- Histological studies have shown that acupoints integrate free nerve endings, encapsulated cutaneous receptors and musculotendinous sensitive receptors (Golgi tendon apparatus & muscle spindle)
- Even though there have been plenty of studies to define "the Qi" concept, it could only be demonstrated the presence of fascial tissue
- The acupuncture points are located in very well innervated areas with nerve brunches which come out of a foramina, a muscle o a fascia to create a nerve bundle or to bifurcate distally. Those nerves send information through Aα, Aβ, Aδ y C fibers been more prevalent the transmission through Aβ, Aδ. [49]

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a. Cutaneous structures

- Most studies have been done to understand what happens with the high threshold fibers (which detect pain)
- However, acupuncture doesn't lead to stimulation of fibers which transmit painful information but information about heat, cold, pressure and tickling. These last sensations are triggered by stimulation of low threshold mechanoreceptors located at the skin
- This explains the primary mechanism of acupuncture; it is through neuromodulation or afferent nerve fibers stimulation
- Another hint is related to local anaesthetics and the missing effect of acupuncture following their infiltration [50]

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a. Cutaneous structures

- The use of acupuncture or electroacupuncture stimulates Aα, Aβ, Aδ y C fibers. Each impulse is send with a different frequency and produces a different sensation:
  - Aδ, Aβ: numbness, heaviness and distension
  - Aδ y C: aching, soreness, and warmth of needling sensation

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a. Cutaneous structures

- Different acupuncture points have different characteristics:
  - **Distal points** (i.e. Old Shus) have a major homeostatic effect by regulating immune system, visceral functions and sympathetic/parasympathetic balance. This is mainly due to the higher amount of autonomic fibers in the distal limbs. Those autonomic fibers are mainly sympathetic monoaminergic which are the pillar of neurologic and inmune processes
  - **Proximal points** have a major musculoskeletal effect with the exception of paravertebral points which have a neuromodulatory function. These points are deeper approaching the nerves and fascia that penetrate muscles i.e. M. longisimus dorsi or m. iliocostal

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a. Cutaneous structures

- The distal skin of the toes and fingers don't have hair or these hairs have another quality/function. This skin codify complex information about touch (position, shape and type of stimulus) creating a major sympathetic modulation than at hairy areas which are mostly parasympathetical
- The skin of hairy areas is less discriminative to stimuli but is extremely important for emotional issues as it calms superior centers

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a. Cutaneous structures

- The acupuncture points are defined based on the physiology and their relationship with somatic and autonomic components of the *neural acupuncture units (NAU)*. The *cutaneous NAU* can be defined as a triage of nerve endings and associated mastocytes, fascia and capillaries (sympathetic and lymphatic)
- Purines and histamine are the principal components involved in the local response and the systemic diffusion with its homeostatic effect

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a. Cutaneous structures

- Fascia are made of fiberblasts and can be found in all tissues and the intimate layer of all organs
- The fascia cooperate on different functions such as immunomodulation, fluid movement among tissues, muscleskeletal and propioceptive as well as in oncological processes
- Moreover, it has been histologically shown that acupuncture has as direct effect on the fascia demonstrating this was the mechanical relation between the puncture and the nerve system

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a. Cutaneous structures

- Insertion and rotation acupuncture techniques trigger friction at the collagen fibers producing a mechanical stretching which liberates purines from fibroblasts and mastocytes
- This mechanical stretching remodelates the cellular structure within 10 minutes. After 90 minutes there is an increase in mecanotransducction and in the gene production related to the cellular homeostasis
- The main difference between massage/stretching and acupuncture is that the needle produces a collagen spiral in the connective tissue whose tension lasts during hours or days

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b. Channels

- **Fascias, lymphatic structures and axonal reflexes** are considered channels because they connect peripheral points with the rest of the body
- The lymphatic system is distributed through the connective tissue of the limbs. Any change in the connective tissue is going to affect the movement of the fluids and the immune system
- The local effect of acupuncture produces a chain reaction based on neurochemical changes reaching remote structures

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b. Channels

- The fascia are active components of the movement; they coordinate and protect the joints from being overwhelmed and allow communication between muscles (i.e. m. quadriceps & m. gastrocnemius)
- Acupuncture on the fascia has different effects depending on the location; in the periphery, it affects the microcirculation and in the core the function is rather to promote motoric and nervous communication while allowing substances to move to the extravascular space
- Moreover, acupuncture stimulates the neuronal axons which triggers an autocrine reaction (through sensitive afferent fibers) from mastocytes, sweat glands and blood vessels. It is possible that this phenomena is the feeling of "energy moving through the meridians"

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b. Channels

- Acupuncture on the fascia also has a local effect on the motor units. Physiotherapists take advantage of this effect when they perform dry needling o trigger points treatment
- This is the *muscular acupuncture neural unit (ANU).* The feeling is similar to a muscle cramp and it is transmitted by Aγ y Aδ fibers. In acupuncture the Ah Shi points produce a similar sensation
- The aim of acupuncture when treating trigger points is to liberate muscles with reduced perfusion and high concentrations of inflammatory substances and even modify the reflex arch to modulate the muscle contraction

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b. Channels

- The *tendinous acupuncture neural unit (ANU)* is related to tendinous musculoskeletal structures which have been damaged, are painful or shortened
- Acupuncture in these areas stimulate the myotendinous relaxation reflex reducing immediately the sensation of pain and the long term development of wind-up
- The deep insertion of the needle has two effects; a cutaneous and a fascial one and it is a fact on either an acupuncture point or over an aleatory point of the body
- The answer is amplified and refined on acupuncture points but an effect is also seen on other points of the body limiting this way the ability to show the effect of acupuncture on clinical studies

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c. Spinal structures

- At the dorsal horn there are different mechanisms to modify the signal and to avoid the synapsis of a painful stimuli to reach higher centers
- The modulation of the signal produces changes in GABA receptors, serotonin, norepinephrine, calcitonin, P substance, endorphins and cannabinoids . All of them can be modified with acupuncture
- Acupuncture affects the inhibitory descendent pathways reducing the amplification of the painful sensation

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c. Spinal structures

- There is an extremely important component at the dorsal horn and the hematoencephalic barrier; the **glia**
- The glia surrounds every single synapsis and has an structural and anti-inflammatory function at the CNS
- The glia interferes in sleep, mood, amplification or suppression of pain, tolerance and addiction
- Acupuncture has an influence over the glia activity; it reverses the negative effects of the glia stimulants (i.e. Opioids) and reduces the long-term central neuro-inflammation secondary to pain or to treatment with opioids

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c. Spinal structures

- Acupuncture can balance the sympathetic and parasympathetic nervous system
- This effect is not only due to its effect on the vagal n. There are certain points which stimulate the sympathetic and parasympathetic nervous system due to its close location to
  - to the cervicothoracic or lumbosacral ganglia (sympathetic n.s)
  - to the cranial cervical or thoracolumbar ganglia (parasympathetic n.s.)

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d. Central structures

- Experimental studies from the last decades have shown the effect of acupuncture on central neurotransmitters, mostly on endogenous opioids
- Diagnostic imaging studies have shown that acupuncture has an effect on the periaqueductal substance and at the ventrolateral medulla. However, the meaning of this findings is still unclear

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4.d Acupuncture field

A clinical study in human medicine (70 Doctors >200hs training/ 2years experience) showed a wide variation in the location of acupuncture points. Based on the results, it was suggested the term "acupuncture field" rather than "acupuncture point".

Acupuncture points with clear anatomic landmarks i.e Pc6 were located within a variation of 3cm² while i.e. Sp6 the variation was of 10 cm² or St36 of 20 cm²

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4.e Dynamic pathophysiological entities

- The acupuncture points are considered dynamic entities as they vary their consistency on palpation according to their homeostatic status
- Most acupoints are not sensitive when their homeostasis is intact. A sensitive acupuncture point has a reduced or altered homeostasis. The worst the homeostasis of the body, the most sensitive points can be found
- The dynamic phases of the acupuncture points by Dr. H.C. Dung:
  - Latent: no sensitive
  - Pasive: sentive by the individum is unaware
  - Active: sensitive or painful

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5. The effects of acupuncture

"-and how did the acupuncturing go?"

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5.a General effect

Effect on the medulla, the encephalic trunk and the hypothalamic-hypophysis axis

- Acupuncture stimulates the myelinic Aδ and Aβ fibers at the skin and muscle
- The "Qi" sensation has been described in terms of
  - numbness, fullness, heaviness, fatigue
  - When the sensation is described it is considered that the right fibers have been stimulated

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5.b Local effect

- Following needling, there is release of local neuropeptides with inhibitory or stimulating effect
- Stimulating mediators: cytokines, prostaglandins, bradykinin, pro-inflammatory factors. They facilitate the polarization of afferent fibers
- Inhibitory mediators: norepinephrin, acetilcholine, GABA, β- endorfins, somatostatin, nitric oxide (NO), ATP, adenosin. They inhibit the polarization of afferent fibers
- Moreover, there is a release of vasodilatory neuropeptides which produces an increase in the local blood flow and improves regeneration

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5.c Peripheric effect

At areas of inflammation, acupuncture increases the concentration of β-endorphins and endogenous opioids while inhibiting the COX-2 and reducing this way the prostaglandins levels

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5.d Segmentary effect

- The segmentary effect is reached by placing several needles around the painful joint or at 1 or 2 remote points along the limb
- It is defined as segmentary effect because the stimulation happens at the level of the same spinal segment
- Most segments are related to a dermatome (skin area), a myotome (a muscular region), an sclerotome (area at the periost) or a viscerotome (visceral region)

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5.d Segmentary effect

- An important use of this effect is to produce segmental analgesia. It is done by needling a different area from the problematic one which is innervated by the same spinal nerve
- Example, a dog with knee pain secondary to cox-arthrosis:
  - The patient will benefit from needles over the tibial cranial m. (L4-L5) and the sartorius m. (L4-L6) because both get to stimulate the appropriate segments
  - Therefore, acupuncture points such as St36 and Sp10 would be convenient. A needle close to the painful area will additionally have a local effect to the segmental analgesia
- By adding more distal/proximal needles there is an increase of the segmental stimulation producing pain relief. When the area to be treated is very painful, the mirror technique should be used needling the contralateral side which will stimulate the same segment

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5.e Visceral effect

- The organs are not accessible and therefore they need to be treated indirectly. However, musculoskeletal processes benefit con the local and segmentary effect of acupuncture
- The medullar dorsal horns get the afferent information from the organs (i.e. the intestines) and from somatic structures (i.e. skin and abdominal wall muscles)
- Both afferents pathways end up in a common one at the dorsal horn and upper centers receiving only one type of signal indepently of the origin. Therefore, abdominal pain with a visceral origin will be perceived as pain from the abdominal wall from the same innervated segment
- This kind of pain can be treated with acupuncture using the knowledge of the dorsal horn innervation area and needling in the same segment

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5.e Visceral effect

- Each segment is related to a "dorsal Shu" point and a "Mu". This is the reason why those points are used for diagnostic or treatment of visceral issues
- Moreover, there is a somatic and visceral relationship; the somato-visceral and viscero-somatic reflexes
- Therefore, the way to treat visceral problems is by identifying the dorsal segment which represents the viscera (viscerotome) and further on to identify the innervated muscle by the same segment (myotome) in order to puncture a chosen point in the path (dermatome)

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5.e Visceral effect

It is a clear statement that the main effects of acupuncture are related to the segmental relation which can be reached by direct or indirect stimulation and an intact nervous system is neccesary to reach an effect

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5.f Fascial effect

- The fascia are 60-70% connective tissue and 30-40% elastic fibers
- The collagen fibers follow an oblique pathway to the muscle. They are barely elastic and can be found mostly at the tendons
- The blood vessels are also recovered by fascia with reticular fibers
- The fascia are also related to the immune system and the inflammatory processes as they host macrophages and mastocytes
- The fascia connect the whole body as the cover muscles and bones including holes to allow vessels and nerve to penetrate

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5.f Fascial effect

- The characteristics of the fascia
  1. The fascia is not a static structure just responsible for structural support to the body. It is rather a continuous sheath of tissue that moves and connects the organs, blood vessels, nerves, lymph vessels, muscles and bones. I.e, it controls movement and allows muscles to function
  2. The fascia allows the exchange of information throughout the body
  3. The fascia is a sensory organ that moves and reacts to stimulation (e.g. acupuncture needle)

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5.f Fascial effect

- The characteristics of the fascia
  4. The fascia plays a role in nutrition and metabolism at the cellular level
  5. The fascia plays an important role in the circulation of blood and lymph
  6. The fascia is the first line of defence in immune function
  7. There is a strong connection between fascia and disease or dysfunction

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5.f Fascial effect

- The myofascial chains is a group of fascia with the same function. These are the most important myofascial chains that can be treated:
  - Superficial and deep back
  - Superficial and deep ventral
  - Spiral line
  - Forelimb extensor chain
  - Forelimb flexor chain
  - Hindlimb extensor chain
  - Hindlimb flexor chain

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5.f Fascial effect

- The myofascial chains can be treated through the following meridians:

Myofascial chain	Main meridians
Superficial and deep back	Bladder and Governor Vessel
Superficial and deep ventral	Stomach and Conception Vessel
Spiral line	Gall Bladder
Forelimb extensor chain	Triple heater, Small intestine
Forelimb flexor chain	Pericard, Lung
Hindlimb extensor chain	Stomach
Hindlimb flexor chain	Blader

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5.f Fascial effect

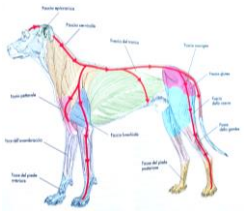

Image: Francesco Longo & Giorgia Mastrangelo. Book Manuale Di Tecnica Fasciale Integrata.

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5.f Fascial effect

- All fascia have strengthen areas where cushioning happens. Those are points with major tension and are going to present fibers in different directions
- All fascia can be altered by
  - trauma, lesions, scars
  - Inflammation, biomechanical dysfunctions,
  - visceral problems
  - stress

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Questions?

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QUESTIONS

1. Which proprioceptive fibers are the main ones transferring acupuncture information?
   a) Aα
   b) Aβ
   c) Aγ
   d) Aδ
   e) C

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QUESTIONS

1. Which proprioceptive fibers are the main ones transferring acupuncture information?
   a) Aα
   b) Aβ
   c) Aγ
   d) Aδ
   e) C

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QUESTIONS

2. Which % of acupuncture points are trigger points?
   a) 10%
   b) 30%
   c) 50%
   d) 70%
   e) 100%

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QUESTIONS

2. Which % of acupuncture points are trigger points?
   a) 10%
   b) 30%
   c) 50%
   d) 70%
   e) 100%

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QUESTIONS

3. Which kind of information is carried by afferent nociceptive fibers?
   a) Temperature
   b) Position
   c) Relaxation/Contraction
   d) Pain
   e) Touch

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QUESTIONS

3. Which kind of information is carried by afferent nociceptive fibers?
   a) Temperature
   b) Position
   c) Relaxation/Contraction
   d) Pain
   e) Touch

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QUESTIONS

4. Which nerve is stimulated by the acupuncture point Gbl 34?
   a) N. Musculocutaneous
   b) N. Median
   c) N. Safeno
   d) N. Femoral
   e) N. Peroneal

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QUESTIONS

4. Which nerve is stimulated by the acupuncture point Gbl 34?
   a) N. Musculocutaneous
   b) N. Median
   c) N. Safeno
   d) N. Femoral
   e) N. Peroneal

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QUESTIONS

5. Which 2 fibers transfer motoric information?
   a) Aα and Aγ
   b) Aβ and C
   c) Aγ and C
   d) Aδ and Aβ
   e) C and Aα

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QUESTIONS

5. Which 2 fibers transfer motoric information?
   - **a) Aα and Aγ**
   - b) Aβ and C
   - c) Aγ and C
   - d) Aδ and Aβ
   - e) C and Aα

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QUESTIONS

6. Which nerve fiber is not recovered by Myelin (amyelinic)?
   - a) Aα
   - b) Aβ
   - c) Aγ
   - d) Aδ
   - e) C

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QUESTIONS

6. Which nerve fiber is not recovered by Myelin (amyelinic)?
   - a) Aα
   - b) Aβ
   - c) Aγ
   - d) Aδ
   - **e) C**

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QUESTIONS

7. The stomach dorsal Shu is the Bl21. Which spinal nerves affect its innervation?
   a) T8 – T11
   b) T11 – T13
   c) T13 – L2
   d) L1 – L2
   e) T11- L1

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QUESTIONS

7. The stomach dorsal Shu is the Bl21. Which spinal nerves affect its innervation?
   a) T8 – T11
   b) T11 – T13
   c) T13 – L2
   d) L1 – L2
   e) T11- L1

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QUESTIONS

8. Which is the main meridian affected in a bicipital tendinitis and which is the associated nerve?
   a) Lung – m. Musculocutaneous
   b) Small intestine – m. Radial
   c) Triple heater – m. Median
   d) Heart – m. Cubital
   e) Large intestine – m. Axillar

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QUESTIONS

8. Which is the main meridian affected in a bicipital tendinitis and which is the associated nerve?
   a) **Lung – m. Musculocutaneous**
   b) Small intestine – m. Radial
   c) Triple heater – m. Median
   d) Heart – m. Cubital
   e) Large intestine – m. Axillar

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QUESTIONS

9. Which meridian is the most relevant for the Sartorius m.?
   a) Bladder
   b) Gallbladder
   c) Spleen
   d) Liver
   e) Kidney

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QUESTIONS

9. Which meridian is the most relevant for the Sartorius m.?
   a) Bladder
   b) Gallbladder
   c) **Spleen**
   d) Liver
   e) Kidney

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QUESTIONS

10. Which structures do the meridians run along with?
    a) Nerves
    b) Blood vessels
    c) Lymphatic vessels
    d) Fascias
    e) All afore mentioned

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QUESTIONS

10. Which structures do the meridians run along with?
    a) Nerves
    b) Blood vessels
    c) Lymphatic vessels
    d) Fascias
    e) All afore mentioned

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QUESTIONS

11. Which structures does acupuncture activate?
    a) Depends on the individual
    b) Cutaneous structures
    c) Channels
    d) Spinal and central structures
    e) B, C and D are correct

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QUESTIONS

11. Which structures does acupuncture activate?
    a) Depends on the individual
    b) Cutaneous structures
    c) Channels
    d) Spinal and central structures
    e) B, C and D are correct

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QUESTIONS

12. At which level does acupuncture have affect?
    a) Generally
    b) Locally
    c) Peripherally and segmentary
    d) Viscerally
    e) All options are right

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QUESTIONS

12. At which level does acupuncture have affect?
    a) Generally
    b) Locally
    c) Peripherally and segmentary
    d) Viscerally
    e) All options are right

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Challenges of biological models in acupuncture research

- Ground rules for good research
  1. Purpose
  2. Relevance
  3. Resources
  4. Originality
  5. Accuracy
  6. Accountability
  7. Generalizations
  8. Objetivity
  9. Ethics
  10. Proof

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Challenges of biological models in acupuncture research

1. **The practice of acupuncture is not homogenous**
   - Different styles, orientations, theories, methods of treatment, point selections, needling methods…
2. **The distribution of acupuncture points**
   - The distribution of acupuncture points is (somewhat) different from the distribution of nerves, blood vessels, lymphatic vessels or connective tissue planes.
   - For example, the ear (ear acupuncture) has no important connections to main nerves, blood vessels, lymphatics or connective tissue planes. Nevertheless, the auricle has many clinically relevant Acupuncture points.

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Challenges of biological models in acupuncture research

3. **Acupuncture affects many bodily systems**
   - The effects of Acupuncture cannot be explained by a single mechanism. One needle insertions may affect multiple systems: e.g. nervous system, circulatory system, immune system, endocrine-hormonal system, etc.
   - A therapy form which affects multiple systems is difficult to research.
4. **Multiple and diverse effects of acupuncture points**
   - Current biological models of acupuncture offer poor explanation in regards to the multiple and diverse effects of certain acupuncture points. (e.g. P 6: cardiac function, calming effect, vomiting, chest pain, etc.)

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Challenges of biological models in acupuncture research

5. **The non-specific activation of acupuncture points**
   - Many methods of stimulation affect therapeutically the acupuncture points: needling, injection of non-specific chemicals, temperature variation, laser, etc. No conventional nerve stimulation technique has such diverse modalities of stimulation.

"Non-noxious stimuli such as non-thermal low intensity laser irradiation, which does not cause local nerve excitation or collagen fiber reorganization at Acupuncture points, can cause extensive systemic effects and stimulate local cellular calcium oscillation cell proliferation, release of basic fibroblast growth factor, interleukins as well as other growth control effects. This suggests that another system other than nervous system mediates the initial signal transduction in acupuncture (Shang, 2007)."

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Challenges of biological models in acupuncture research

6. **Long-term or lasting effects of acupuncture**
   - Many clinical studies support the evidence that acupuncture stimulation can promote long-term or lasting effects. Such effects may not be explainable through peripheral nerve stimulation and endorphin release.
7. **Expectations and placebo**
8. **Types of research**
   - Experimental
   - Clinical

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Acupuncture & vet Anaesthesia

- The use of acupuncture can be of advantage at all different anaesthesia phases in order to reduce the amount of anaesthetic and analgesic drugs

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Acupuncture & vet Anaesthesia

Effects of dexmedetomidine administered at acupuncture point GV20 compared to intramuscular route in dogs.

Pons A[1], Cantalapiedra S[2], Benito J[3], Cediel-Algovia B[2], Gómez de Segura IA[2]

Author information

Abstract

OBJECTIVE: To compare the sedative effects produced by dexmedetomidine in dogs, administered either intramuscularly or into the Governing Vessel 20 acupuncture point.

MATERIALS AND METHODS: Six dogs were sedated with 125 μg/m^2 dexmedetomidine injected either intramuscularly in the gluteal muscles or subcutaneously into the acupuncture point and in random order. Sedation and analgesia were assessed blindly before and after treatments at regular intervals for 90 minutes or until the dogs fully recovered. Duration and quality of sedation were assessed with a numerical sedation rating scale and a dynamic and interactive visual analogue scale. Analgesia was also assessed with a numerical rating scale. Heart and respiratory rates and rectal temperatures were recorded.

RESULTS: Sedative and analgesic scores were significantly increased when dexmedetomidine was administered at the Governing Vessel 20 acupuncture point compared with the routine intramuscular route. Duration of sedation was longer in the acupuncture site injection group compared to the intramuscular group (93 ± 38 and 41 ± 16 minutes). Bradycardia was significantly more pronounced in the acupuncture site group than the intramuscular group, whereas respiratory rates and rectal temperatures did not differ between administration routes.

CLINICAL SIGNIFICANCE: Administration at the Governing Vessel 20 acupuncture point increased the duration and degree of sedation and analgesic effects of dexmedetomidine compared with the intramuscular route.

The sedative effect of farmacopuncture has been studied in dogs.

Dexmedetomidin at the GV20 produces a deeper sedation than IM

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Acupuncture & vet Anaesthesia

Sedative and clinical effects of the pharmacopuncture with xylazine in dogs.

Cerny RN[1], Weichert A[2], Canoe JT[3], Martins PS[4]

Author information

Abstract

PURPOSE: To investigate the sedative and clinical effects of the pharmacopuncture with xylazine, compared to the conventional dose of a intramuscular injection in dogs.

METHODS: Twelve dogs were randomly distributed in two groups of six animals and treated as follows: control group (X-IM): 1mg.kg(-1) of xylazine given intramuscularly (IM); pharmacopuncture group (X-Yintang): 0.1mg.kg(-1) of xylazine diluted to 0.5 mL of saline injected into the Yin Tang acupoint. Heart rate, cardiac rhythm (ECG), systolic arterial blood pressure (SABP), respiratory rate (RR), rectal temperature (RT), blood glucose concentration, degree of sedation and adverse effects were evaluated.

RESULTS: Sedative effect was observed in both groups. The degree of sedation was greater in X-IM only at 15 min when compared with X-Yintang group. Cardiovascular established was observed in X-Yintang group, while marked reduction in the HR and increased incidence of ECG abnormalities were detected in X-IM. In both treatment groups, minimal changes were observed in relation to SABP, HR, RT and blood glucose. High incidence (66%) of vomiting was observed in X-IM, while this adverse effect was absent in X-Yintang.

CONCLUSION: Pharmacopuncture with xylazine induced clinically relevant sedative effects in dogs, with the advantage of reduction of undesirable side effects associated with α2-agonists, including bradycardia, cardiac arrhythmias, and emesis.

Xylazine at Yintang 1/10 dosage compared to IM produces sedation and less side effects

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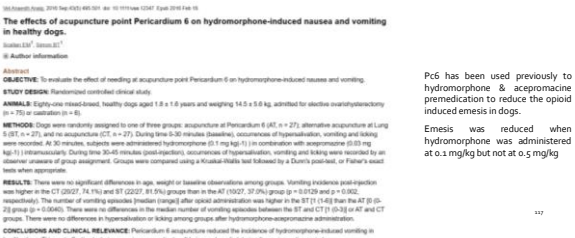
Acupuncture & vet Anaesthesia



The effects of acupuncture point Pericardium 6 on hydromorphone-induced nausea and vomiting in healthy dogs.

Author information

Abstract

OBJECTIVE: To evaluate the effect of needling at acupuncture point Pericardium 6 on hydromorphone-induced nausea and vomiting.

STUDY DESIGN: Randomized controlled clinical study.

ANIMALS: Eighty-one mixed-breed, healthy dogs aged 1.8 ± 1.6 years and weighing 14.5 ± 5.6 kg, admitted for elective ovariohysterectomy (n = 75) or castration (n = 6).

METHODS: Dogs were randomly assigned to one of three groups: acupuncture at Pericardium 6 (AT, n = 27), alternative acupuncture at Lung 5 (ST, n = 27), and no acupuncture (CT, n = 27). During time 0–30 minutes (baseline), occurrences of hypersalivation, vomiting and licking were recorded. At 30 minutes, subjects were administered hydromorphone (0.1 mg kg(-1)) in combination with acepromazine (0.03 mg kg(-1)) intramuscularly. During time 30–45 minutes (post-injection), occurrences of hypersalivation, vomiting and licking were recorded by an observer unaware of group assignment. Groups were compared using a Kruskal–Wallis test followed by a Dunn's post-test, or Fisher's exact tests when appropriate.

RESULTS: There were no significant differences in age, weight or baseline observations among groups. Vomiting incidence post-injection was higher in the CT (20/27, 74.1%) and ST (22/27, 81.5%) groups than in the AT (10/27, 37.0%) group (p = 0.0129 and p = 0.002, respectively). The number of vomiting episodes [median (range)] after opioid administration was higher in the ST [1 (1-6)] than the AT [0 (0-2)] group (p = 0.0040). There were no differences in the median number of vomiting episodes between the ST and CT [1 (0-3)] or AT and CT groups. There were no differences in hypersalivation or licking among groups after hydromorphone-acepromazine administration.

CONCLUSIONS AND CLINICAL RELEVANCE: Pericardium 6 acupuncture reduced the incidence of hydromorphone-induced vomiting in healthy dogs. This cost-effective technique can improve patient well-being and comfort during the perioperative period.

Pc6 has been used previously to hydromorphone & acepromacine premedication to reduce the opioid induced emesis in dogs.

Emesis was reduced when hydromorphone was administered at 0.1 mg/kg but not at 0.5 mg/kg

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Acupuncture & vet Anaesthesia

Vet Anaesth Analg. 2019 May;46(3):308-314. doi: 10.1016/j.vaa.2019.01.004. Epub 2019 Jan 29.

The effect of aquapuncture at Pericardium 6 (PC-6) on dexmedetomidine-induced nausea and vomiting in cats.

Hansen KM[1], Fraser LF[2], Campbell MF[3]

Author information

Abstract

OBJECTIVE: To determine the effect of aquapuncture at acupuncture point Pericardium 6 (PC-6) on the incidence of dexmedetomidine-induced vomiting and nausea in cats.

STUDY DESIGN: Randomized, prospective, crossover study.

ANIMALS: A group of 22 cats, 14 females and eight males, aged 1-12 years and weighing 3.8-5.9 kg.

METHODS: Each cat was administered treatments in random order at ≥1 week intervals. For treatment (DEX-A), cats were administered PC-6 stimulation by aquapuncture (0.25 mL/250 µg vitamin B12 injection subcutaneously at PC-6). After 30 minutes, dexmedetomidine (10 µg kg^{-1}) was administered intramuscularly (IM). For control treatment (DEX), cats were administered only dexmedetomidine (10 µg kg^{-1}) IM. Incidence of vomiting, number of vomiting episodes and time to first vomiting were recorded by an observer unaware of treatment allocation. At 30 minutes after dexmedetomidine administration, alfaxalone (1 mg kg^{-1}) was injected IM. Behavior was video recorded and later scored by two observers for clinical signs of nausea. A regression model (analysis of covariance) was used to detect the influence of aquapuncture on vomiting and nausea. Significance was set at $p < 0.05$.

RESULTS: Of 21 cats, 18 (85%) and 16 cats (76%) vomited in DEX-A and DEX, respectively. There was no significant difference in the incidence of vomiting ($p = 0.55$), number of vomiting episodes ($p = 0.55$), mean time to vomit ($p = 0.88$) or nausea score ($p = 0.51$) between DEX-A and DEX.

CONCLUSIONS AND CLINICAL RELEVANCE: PC-6 aquapuncture did not reduce the incidence of dexmedetomidine-induced vomiting or severity of nausea in cats.

Aquanpuncture with VitB12 on Pc6 has been used previously to dexmedetomidine premedication to reduce emesis in cats.

Emesis was not affected by aquapuncture

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Acupuncture & vet Anaesthesia

- Electroacupuncture can reduce the amount of anaesthetics and analgesics intra & post-operatively in dogs
- Laser on acupuncture points during the preoperative period can provide better postoperative analgesia

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Acupuncture & Anaesthesia

In human medicine, acupuncture has been used related to anaesthesia to

- Reduce preoperative anxiety
- Reduce opioid amount intra and post-operatively
- Reduce the amount of anaesthetic agents
- Reduce or even abolish postoperative emesis and vomiting

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Acupuncture & Pain

Curr Rev Musculoskelet Med. 2019 Nov 26. doi: 10.1007/s12178-019-09593-z. [Epub ahead of print]

Update of Risk Factors, Diagnosis, and Management of Patellofemoral Pain.

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Abstract

PURPOSE OF REVIEW: Patellofemoral pain is the most common cause of anterior knee pain. The purpose of this review is to examine the latest research on risk factors, physical examination, and treatment of patellofemoral pain to improve accuracy of diagnosis and increase use of efficacious treatment modalities.

RECENT FINDINGS: The latest research suggests patellofemoral pain pathophysiology is a combination of biomechanical, behavioral, and psychological factors. Research into targeted exercise therapy and other conservative therapy modalities have shown efficacy especially when used in combination. New techniques such as blood flow restriction therapy, gait retraining, and acupuncture show promise but require further well-designed studies. Patellofemoral pain is most commonly attributed to altered stress to the patellofemoral joint from intrinsic knee factors, alterations in the kinetic chain, or errors in training. Diagnosis can be made with a thorough assessment of clinical history and risk factors, and a comprehensive physical examination. The ideal treatment is a combination of conservative treatment modalities ideally individualized to the risk factors identified in each patient. Ongoing research should continue to identify biomechanical risk factors and new treatments as well as look for more efficient ways to identify patients who are amenable to treatments.

Management of patellofemoral pain

Acupuncture included as part of the treatment

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Acupuncture & Pain

Evid Based Complement Alternat Med. 2019 Oct 20;2019:6704735. doi: 10.1155/2019/6704735. eCollection 2019

Electroacupuncture Relieves CCI-Induced Neuropathic Pain Involving Excitatory and Inhibitory Neurotransmitters.

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Abstract

Neuropathic pain caused by peripheral tissue injuries to the higher brain regions still has no satisfactory therapy. Disruption of the balance of excitatory and inhibitory neurotransmitters is one of the underlying mechanisms that results in chronic neuropathic pain. Targeting neurotransmitters and related receptors may constitute a novel approach for treating neuropathic pain. We investigated the effects of electroacupuncture (EA) on chronic constriction injury- (CCI-) induced neuropathic pain. The mechanical allodynia and thermal hyperalgesia pain behaviors were relieved by 15 Hz EA but not by 2 and 50 Hz. These phenomena were associated with increasing γ-amino-butyric acid (GABA) receptors in the hippocampus and periaqueductal gray (PAG) but not N-methyl-D-aspartate receptors. Furthermore, excitatory neurotransmitter glutamate was decreased in the hippocampus and inhibitory neurotransmitter GABA was increased in the PAG under treatment with EA. These data provide novel evidence that EA modulates neurotransmitters and related receptors to reduce neuropathic pain in the higher brain regions. This suggests that EA may be a useful therapy option for treating neuropathic pain.

EA used in neuropathic pain caused by chronic compression

GABA receptors augmented in PAG but not at NMDA

EA reduces glutamate (+) at the hippocampus & increases GABA (-) at the PAG

EA doesn't affect upper centres

EA is useful to treat neuropathic pain

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Acupuncture & Pain

Chin J Integr Med. 2019 Nov 9. doi: 10.1007/s11655-019-3174-8. [Epub ahead of print]

Efficacy of Acupuncture Combined with Local Anesthesia in Ischemic Stroke Patients with Carotid Artery Stenting: A Prospective Randomized Trial.

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Abstract

OBJECTIVE: To evaluate the efficacy of electro-acupuncture (EA) or transcutaneous electrical acupoint stimulation (TEAS) on perioperative cerebral blood flow (CBF) and neurological function in ischemic stroke (IS) patients undergoing carotid artery stenting (CAS).

METHODS: In total, 124 consecutive IS patients were randomly allocated to the EA, TEAS, and sham groups (groups A, T, and S; 41, 42, and 41 cases, respectively) by software-derived random-number sequence. Groups A and T received EA and TEAS, respectively, at the Shuigou (GV 26) and Baihui (GV 20), Hegu (LI 4) and Weiguan (TE 5) acupoints. Group S received sham EA. The stimulation was started from 30 min before surgery until the end of the operation. The primary outcome was the CBF at 30 min after surgery, which was measured by transcranial Doppler sonography. The secondary outcomes included hyperperfusion incidence and neurological function. National Institutes of Health Stroke Scale (NIHSS) and General Evaluation Scale (GES) scores were recorded at 1 week, 1 month, and 3 months postoperatively.

RESULTS: Mean CBF velocity at 30 min after surgery in groups A and T was much lower than that in Group S ($P < 0.05$); the incidence of hyperperfusion in Groups A and T was also lower than that in group S ($P < 0.05$). Acupuncture was an independent factor associated with reduced incidence of hyperperfusion (OR=0.042, 95% CI: 0.002-0.785, =0.034). NIHSS and GES scores improved significantly at 1 week postoperatively in Groups A and T than in Group S ($P < 0.05$). Relative to Group S, groups A and T exhibited significantly lower incidences of moderate pain, as well as higher incidences of satisfaction with anesthesia, at 1 day postoperatively ($P < 0.05$).

CONCLUSIONS: EA or TEAS administered in combination with local anesthesia during CAS can inhibit transient increases in CBF, reduce the incidence of postoperative hyperperfusion, and improve neurological function. (Registration No. ChiCTR-IOR-15007447).

EA + local anaesthesia in patients with ischemic stroke during carotid stenting

EA:26VG, 20VG, 4IG, 5(TE, Waiguan?). 30 min preop until the end

EA + local anaesthesia inhibits the transitory CBF, reduces hyper perfusion and improves neurological function

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Acupuncture & Pain

The best from East and West? Acupuncture and medical training therapy as monotherapies or in combination for adult patients with episodic and chronic tension-type headache: study protocol for a randomized controlled trial.

Acupuncture for the treatment of headache caused by hypertension

Ac may help

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Acupuncture & Pain

Does Electroacupuncture Have Different Effects on Peripheral and Central Sensitization in Humans: A Randomized Controlled Study.

Effect of EA in peripheral and central sensitization

Study performed with mechanical hyperalgesia and heat/capsaicin hyperalgesia

EA with mechanical hyperalgesia: consistent results

EA with heat/capsaicin hyperalgesia diverse results: ac useful depending on the type of pain and individual response

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Acupuncture & Pain

Acupuncture for Breathlessness in Advanced Diseases: A Systematic Review and Meta-analysis.

Ac in COPD (chronic obstructive pulmonary disease)

Ac improves exercise tolerance, quality of life and breathing ability

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Acupuncture & Pain

[Clinical trials of acupuncture treatment of post-stroke shoulder pain].

[Article in Chinese]

Ac/Auriculopunture in upper back pain after cerebrovascular stroke

Ac: 15IG, Extras, 14,15 (TE?), 4IG

Auriculopunture reduces pain due to β-endorphins, encephalins and dynorphins release

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Acupuncture & Pain

Effects of moxibustion on pain behaviors in patients with rheumatoid arthritis: A meta-analysis.

Moxibustion & pain in rheumatoid arthritis

The addition of moxa to occidental treatment improves pain relieved

Anti-inflammatory effect couldn't be shown

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Acupuncture & Pain

The effectiveness and safety of acupuncture for knee osteoarthritis: An overview of systematic reviews.

Ac in knee osteoarthritis

Ac improves the outcome but the information is not complete and there are biases

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Acupuncture & Pain – Experimental studies

Electroacupuncture Regulates Disorders of Gut-Brain Interaction by Decreasing Corticotropin-Releasing Factor in a Rat Model of IBS.

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Author information

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Abstract

OBJECTIVE: Acupuncture is effective for irritable bowel syndrome (IBS); however, the mechanisms of action are not fully understood. We aim to explore the mechanism of electroacupuncture (EA) in the dual regulation of disorders of gut-brain interaction.

METHODS: A rat model of IBS was generated by chronic unpredictable mild stress (CUMS). Eight of 32 rats were assigned to the blank control group. The remaining 24 rats received CUMS for 14 days. Then, the rats surviving and successfully modelled were randomly divided into the CUMS group, the CUMS+EA group, and the CUMS+PB (pinaverium bromide) group. In the next 14 days of treatment, rats in the CUMS+EA group were acupunctured at ST25 (Tianshu), ST36 (Zusanli), SP6 (Sanyinjiao), and LR3 (Taichong) for 15 min every day. Rats in the CUMS+PB group were treated by the administration of gavage with 2.7 mg/mL pinaverium every day. Visceral pain threshold, the percentage of time spent in open arms (OTA) in the elevated plus maze test (EPMT), and the sucrose preference (SP%) in the sucrose preference test (SPT) were measured at baseline, day 15, and day 30. The expression of zonula occludens-1 (ZO-1), the morphology of the connective structures of intestinal epithelium, the CRF and CRF-R1 mRNA expression in the hypothalamus, and the double staining of intestinal mucosal mast cells (IMMC) and CRF-R1 were measured at the end of the experiment.

RESULTS: Compared with the blank control group, visceral pain threshold pressure, the expression of ZO-1, OTA, SP%, CRF, and CRF-R1 mRNA expression in the hypothalamus, and double staining of IMMC and CRF-R1 were decreased significantly in the CUMS group. Meanwhile, the morphology of the connective structure in the CUMS group was initiated. Compared with the CUMS group, SP% was significantly increased in the CUMS+EA group, but there was no significant difference for it in the CUMS+PB group. The morphology of the connective structure in the two treatment groups was clear and sensible. And the expression of other parameters mentioned above was apparently increased in the two treatment groups. Compared with the CUMS+PB group, the expression of ZO-1 in the CUMS+EA group was significantly enhanced. And no obvious difference for other parameters was found between the two treatment groups.

CONCLUSIONS: EA treatment can decrease the expression of hypothalamic CRF and CRF-R1, relieve anxiety and depression, meanwhile reduce the expression of CRF-R1 in the gastrointestinal mucosa, increase ZO-1 expression, and adjust tight junctions (TJs) to repair the intestinal mucosal barrier. The above roles suggest that EA may play a dual role in alleviating the gastrointestinal and psychological symptoms of IBS, supporting a potentially dual therapeutic role for EA in regulating disorders of gut-brain interaction in IBS rats.

EA regulates disorders of gut-brain by decreasing the corticotropin-releasing factor in bowel disease in rats

EA: St36, St25, Sp6, 3(LR? Taichong) 15 mins/day during 14 days

EA reduces anxiety and depresion & increases factors which repair the intestinal mucosal barrier

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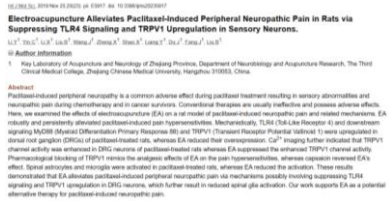
Acupuncture & Pain – Experimental studies



Electroacupuncture Alleviates Paclitaxel-Induced Peripheral Neuropathic Pain in Rats via Suppressing TLR4 Signaling and TRPV1 Upregulation in Sensory Neurons.

Li Y[1], Yin C[1], Liu B[1], Nie J[1], Zhang J[1], Shao X[1], Liang Z[1], Hu J[1], Fang J[1], Liu B[1]

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Abstract

Paclitaxel-induced peripheral neuropathy is a common adverse effect during paclitaxel treatment resulting in sensory abnormalities and neuropathic pain during chemotherapy and in cancer survivors. Conventional therapies are usually ineffective and possess adverse effects. Here, we examined the effects of electroacupuncture (EA) on a rat model of paclitaxel-induced neuropathic pain and related mechanisms. EA robustly and persistently alleviated paclitaxel-induced pain hypersensitivities. Mechanistically, TLR4 (Toll-Like Receptor 4) and downstream signaling MyD88 (Myeloid Differentiation Primary Response 88) and TRPV1 (Transient Receptor Potential Vallinoid 1) were upregulated in dorsal root ganglion (DRGs) of paclitaxel-treated rats, whereas EA reduced their overexpression. Ca^{2+} imaging further indicated that TRPV1 channel activity was enhanced in DRG neurons of paclitaxel-treated rats whereas EA suppressed the enhanced TRPV1 channel activity. Pharmacological blocking of TRPV1 mimics the analgesic effects of EA on the pain hypersensitivities, whereas capsazin reversed EA's effect. Spinal astrocytes and microglia were activated in paclitaxel-treated rats, whereas EA reduced the activation. These results demonstrated that EA alleviates paclitaxel-induced peripheral neuropathic pain via mechanisms possibly involving suppressing TLR4 signaling and TRPV1 upregulation in DRG neurons, which further result in reduced spinal glia activation. Our work supports EA as a potential alternative therapy for paclitaxel-induced neuropathic pain.

EA alleviates neuropathic pain in rats by:

supressing the Toll-like receptor 4 activity (involved in pathological pain)

upregulating the activity of the vanilloid receptor (an excitatory ion channel involved in pain & hypersensitization)

and reducing the glia activation

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Acupuncture & Pain – Experimental studies

Electroacupuncture Delays Cartilage Degeneration by Modulating Nuclear Factor-κB Signaling Pathway.

Author information

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Abstract

OBJECTIVE: To illustrate the molecular mechanisms underlying the therapeutic effects of electroacupuncture (EA) on knee osteoarthritis (OA).

METHODS: Twenty-seven six-month-old New Zealand white rabbits were allocated into three groups in accordance with a random number table: normal group (no surgery-induced OA, without treatment), model group (surgery-induced OA, without treatment) and EA group (surgery-induced OA, received treatment with EA at acupoints Dubi (ST 35) and Neixiyan (EX-LE 5), 30 min twice a day). After eight consecutive weeks of treatment, the histopathological alterations in cartilage were observed using optical microscopy and transmission electron microscopy; cartilage degeneration was evaluated by modified Mankin's score principles, the synovial fluid concentration of interleukin-1β (IL-1β), interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α) and matrix metalloproteinase-3 (MMP-3) were evaluated by enzyme-linked immunosorbent assay, and the protein expression levels of IL-1β, IL-6, TNF-α, MMP-3, IκB kinase-β (IKK-β), nuclear factor of κ light polypeptide gene enhancer in B-cells inhibitor α (IκBα) and nuclear factor-κB (NF-κB) p65 were quantified by Western blot analysis.

RESULTS: EA treatment significantly improved cartilage structure arrangement and reduced cellular degeneration. The IL-1β, IL-6, TNF-α and MMP-3 of synovial fluid in the EA-treated group were significantly decreased compared with the model group (all $P<0.01$). Compared with the model group, the IL-1β, IL-6, TNF-α, MMP-3, IKK-β and NF-κB p65 protein expressions in cartilage of EA-treated group were significantly decreased (all $P<0.01$), whereas IκBα expression was significantly up-regulated ($P<0.01$).

CONCLUSION: EA treatment may delay cartilage degeneration by down-regulating inflammatory factors through NF-κB signaling pathway, which may, in part, explain its clinical efficacy in the treatment of knee OA.

EA delays cartilage degeneration in rabbits

EA reduces the production of necrosis inflammatory factors explaining thus having a clinical efficiency in knee osteoarthritis

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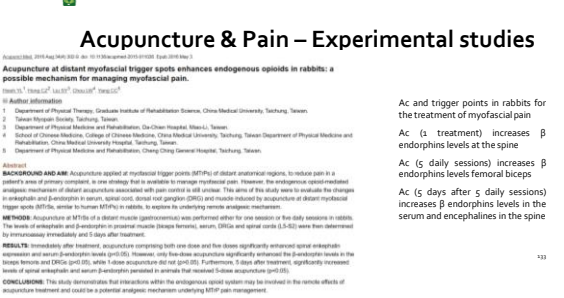
Acupuncture & Pain – Experimental studies



Acupuncture at distant myofascial trigger spots enhances endogenous opioids in rabbits: a possible mechanism for managing myofascial pain.

Ac and trigger points in rabbits for the treatment of myofascial pain

Ac (1 treatment) increases β endorphins levels at the spine

Ac (5 daily sessions) increases β endorphins levels femoral biceps

Ac (5 days after 5 daily sessions) increases β endorphins levels in the serum and encephalines in the spine

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Acupuncture & Pain – Experimental studies

Effects of electroacupuncture on recovery of the electrophysiological properties of the rabbit gastrocnemius after contusion: an in vivo animal study.

EA and recovery after gastrocnemius m. contusion

EA at St36 & at Ashi points in gastrocnemius m.

EA

promotes muscle and nervous fiber regeneration

Accelerates the reconstruction of the neuromuscular union by regulation the expression of Ach at the motor plate

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Acupuncture & Pain – Experimental studies

[Effect of electroacupuncture stimulation of "Huantiao" (GB 30) on walking ability and touch sensation in rabbits with lumbar intervertebral disc protrusion].

EA at Gbl30 in rabbits with intervertebral protrusion to evaluate the ability to walk and the touch sensation

Increases the ability to walk and the touch sensation in comparison with EA at a non acupuncture point

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Acupuncture & Pain – Experimental studies

Electroacupuncture-induced cannabinoid receptor expression in repair of abducens nerve.

Author information

Abstract

Objective: Through the development of beagle abducens nerve-injury model, taking electroacupuncture as the core and microglia as the starting point, the author investigated whether electroacupuncture can promote the repair of injured abducens nerve by cannabinoid receptor-mediated regulation of microglia activation. **Methods**: Healthy beagle dogs were randomly divided into five groups: sham operation group (A), injury group (B), electroacupuncture pretreatment group (C), antagonist group (D) and solvent group (E). After stimulation with electroacupuncture, the expression of cannabinoid 1 receptor (CB1R) and cannabinoid 2 receptor (CB2R) in A, B and C microglia cells was detected by Western Bolt analysis, and further the expression of CB2R in five groups was further analyzed by immunofluorescence, thereby statistical differences were analyzed. **Results**. Among group A, group B and group C, Western Blot analysis showed that there were no significant changes in the expression of CB1R protein after electroacupuncture [F (2, 12)=1.75, p=0.215]. After electroacupuncture preconditioning for 15 min for 2 weeks, group C was compared with group A and group B, which showed CB2 was affected. The expression of CB2R protein was significantly increased among groups A, B and C [F (2, 12)=5188.57, p<0.001], but there was no significant difference in the expression of CB2R protein between group A and group B (p > 0.05). The results of immunofluorescence showed that Arginase/CD11b was significantly increased in group C comparing to group A (*p < 0.001), while there was a significant increase in group E comparing to group A about Arginase/CD11b [F (4, 20)=4345.44, p<0.001]. **Conclusions**: The CB2R in the cannabinoid receptor is mainly involved in the electro-acupuncture-induced neuroprotection. Electroacupuncture can promote the repair of injured abducens nerve by CB2R-mediated activation of microglia.

EA and the induction of cannabinoid receptors during the abductor n. repair in beagles

EA stimulates mainly the CB2 receptor which induces neuroprotection by activating the microglia

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Acupuncture & Pain – Veterinary studies

Pressuring of Acupoints as a Complement to the Diagnosis of Stifle Diseases in Horses.

Author information

Abstract

Diseases of the stifle joint remain a challenge for veterinarians. The objective of this study was to achieve a valuable acupuncture suggestive diagnosis to be considered for stifle joint diseases in horses. Thirty-nine nonlame horses involved in different activities were assessed. Acupuncture was independently performed by two evaluators. Reactions of the animal when pressurizing the point suggestive of stifle disease (PSSD), Bladder-20 and/or Bladder-21, were considered as the inclusion criteria for inclusion in the stifle group (SG, n = 31), and the animals with no reactions were assigned to the control group (n = 8). Radiographic and ultrasonographic examinations were performed and evaluated by two independent professionals blinded to the group allocation. Thermographic examination of the PSSD and stifles was also performed, after acclimatization. The ultrasound scores and radiographic findings were higher in the SG than in the control group. Thermography evidenced increased temperature in the PSSD and stifles in the SG. The minimum acupuncture diagnostic criteria for stifle joint disease had a sensitivity of 87.5% and a specificity of 57.0%, and the addition of the acupoints Gallbladder-dorsal tuber coxae, Gallbladder-27, and Spleen-13 to the minimum diagnostic criteria improved sensitivity and specificity. In conclusion, assessing the reaction at the demonstrated acupoints can facilitate a diagnosis of a potential stifle lesion.

The use of acupuncture points to co-diagnose stifle disease in horses

Ac: Bl 20 & Bl21

87% sensitivity (the ability of a test to correctly identify those with the disease (true positive rate))

57% specificity (the ability of the test to correctly identify those without the disease (true negative rate))

Ac: GbI dorsal to coxial tuberosity, GbI27, Sp13

Increases sensitivity & specificity

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Acupuncture & Pain – Veterinary studies

Bumblefoot: a comparison of clinical presentation and treatment of pododermatitis in rabbits, rodents, and birds.

Author information

Abstract

Pododermatitis, also known as bumblefoot, is a common condition encountered in birds, rabbits, and rodents in clinical practice. This article compares the anatomy and physiology of the foot and the predisposing factors for pododermatitis in each of the species discussed. Clinical presentation, diagnostics, and treatment options, including medical and surgical therapies, are provided. In addition, alternative therapies, including natural remedies, therapeutic laser, and acupuncture, are explored. This article is intended to encourage practitioners to use a multimodal approach for successful management of this disease in all species.

Ac y laser in bumblefoot in exotic pets should be included in the multimodal approach to increase the successful rate

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Acupuncture & Pain – Veterinary studies

PLoS One. 2019 Dec 5;14(12):e0226985. doi: 10.1371/journal.pone.0226985. eCollection 2019

Effects of acupuncture at Pericardium-6 and Stomach-36 on nausea, sedation and gastrointestinal motility in healthy dogs administered intravenous lidocaine infusions.

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Abstract
The objectives of this study were to assess gastrointestinal transit times, sedation, and signs of nausea associated with intravenous lidocaine infusions in dogs following targeted acupuncture at Pericardium-6 (PC6) and Stomach-36 (ST36). In a randomized, blind crossover design, 6 healthy, adult Beagles were fed thirty 1.5 mm barium-impregnated polyethylene spheres (BIPS), then were subject to 30 minutes of: 1) no acupuncture, 2) bilateral targeted acupuncture at PC6 and ST36, or 3) bilateral non-target acupuncture at Lung-5 (LU5) and Bladder-55 (BL55). Lidocaine was immediately administered at 1 mg/kg intravenously followed by 50 μg/kg/min. BIPS were tracked radiographically; sedation and nausea were scored at baseline (Time 0) and for 11 hours during lidocaine infusions. Transit times and sedation and nausea scores were analyzed with a linear mixed-effects model; the number of BIPS at defined time points was analyzed with a piecewise linear mixed-effects model. All P values were two-sided and P < 0.05 was considered significant. Sedation and nausea scores did not differ between treatments at any time point (all P > 0.05). However, nausea scores in all groups were significantly greater at Times 5 through 7 and at Time 11 compared to Time 0 whereas sedation scores in all groups were significantly greater at Times 2 through 11 compared to Time 0 (all P < 0.05). The number of BIPs found out of the stomach, the number found in the large intestine, gastric emptying and gastrointestinal transit times did not differ between treatments (all P > 0.05). Acupuncture at PC6 and ST36 did not alleviate nausea and sedation associated with lidocaine infusions in clinically normal animals or affect gastric emptying and gastrointestinal transit.

AC in Pc6 & St36 to assess the degree of sedation, emesis and intestinal motility in healthy dogs with Lidocaine CRI when fed with Barium

Compared to no Ac or Ac at Lu5 & Bl55

No effect in any group

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Acupuncture & Pain – Veterinary studies

Res Vet Sci. 2019 Apr;123:247-251. doi: 10.1016/j.rvsc.2019.01.011. Epub 2019 Jan 12.

Combination of stem cells from deciduous teeth and electroacupuncture for therapy in dogs with chronic spinal cord injury: A pilot study.

Prada I[1], Fraiz P[2], de Sá Schiavo Matias G[3], Boscardin SB[4], Monteiro J[5], Dos Santos CJ Jr[6], Joazeiro JGP[7], Giglio JR[8], Fonseca FS[9], Sakata SR[10], Miglino MA[11]

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Abstract
Spinal cord injury (SCI) is a serious condition that causes profound economic and emotional impact in human patients and companion animal owners. It has been shown that the neurogenic effects of the stem cells are enhanced when combined with electroacupuncture (EA) in rodent models of SCI. To determine the safety and feasibility of combining transplantation of allogenic stem cells derived from canine exfoliated deciduous teeth (SCED) and EA in dogs with chronic spinal cord injury a canine pilot clinical study was conducted. A total of 16 individuals ranging from 5 to 11 years at 3 to 18 months of injury were investigated and randomly assigned to 4 experimental groups (SCED, EA, SCED + EA, control). Mild neurological and functional improvements were seen in all 4 groups. There was no clinical progression or mortality of the cases occurred in a follow up of 7 months after procedure. The study shows that SCED transplantation and electroacupuncture were feasible, safe and potentially beneficial. However Long-term patient monitoring is necessary to rule out any delayed side effects and assess any further improvements.

EA & stem cells from teeth for therapy in chronic spinal cord injury damaged dogs

The combination is possible, safe and potentially beneficial but more studies are needed to evaluate the long-term effect (> 7months)

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Acupuncture & Pain – Veterinary studies

J Am Vet Med Assoc. 2018 Nov 1;249(9):1031-1039

Owner assessment of chronic pain intensity and results of gait analysis of dogs with hip dysplasia treated with acupuncture.

Teixeira LR, Luna SP, Matsubara LM, Cápua ML, Santos BP, Mesquita LR, Faria LG, Agostinho FS, Holm-Bjorkman A

Abstract
OBJECTIVE To evaluate pain intensity and kinetic variables in dogs with hip dysplasia (HD) treated with acupuncture, carprofen, or a placebo. DESIGN Randomized, controlled clinical study. ANIMALS 54 HD-affected dogs and 16 healthy dogs. PROCEDURES Seven HD-affected dogs were removed from the study. Dogs with HD were treated in a blinded manner for 30 days with acupuncture (once weekly for 5 sessions; n = 15), carprofen (4.4 mg/kg [2.0 mg/lb], PO, q 24 h; n = 16), or placebo capsules containing lactose (1 mg/kg [0.45 mg/lb], PO, q 24 h; n = 16). Dogs were evaluated 2 weeks and immediately before (baseline) and 2, 4, and 6 weeks after the onset of treatment. Owners evaluated the dogs' pain intensity with 2 validated questionnaires and a visual analogue scale (VAS) for pain and evaluated degree of lameness with a VAS for locomotion. Kinetics of the hind limbs were also evaluated. Sixteen HD-free dogs were used to assess the evaluation protocol. RESULTS Owners' assessments revealed that outcomes of the 3 treatments did not differ significantly. The Canine Brief Pain Inventory and VAS pain intensity assessments were decreased from baseline at weeks 4 and 6, respectively, but only in acupuncture-treated dogs. The locomotion VAS values were decreased at week 4 in acupuncture-treated and carprofen-treated dogs. Kinetic evaluation findings did not differ among the groups or over time. CONCLUSIONS AND CLINICAL RELEVANCE Neither acupuncture nor carprofen was significantly different from placebo. Acupuncture and carprofen reduced the degree of subjectively evaluated lameness, and acupuncture was associated with a decrease in validated chronic pain scores.

Ac in dogs with hip dysplasia and the owners assessment on chronic pain intensity and the gait analysis

Ac, carprofen & placebo didn't differ in the kinetic evaluation

Ac & carprofen reduced the subjective degree of lameness (VAS)

Ac reduced chronic pain in the Canine Brief Pain Inventory validated score

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Acupuncture & Pain – Veterinary studies

Effectiveness of combined acupuncture and manual therapy relative to no treatment for canine musculoskeletal pain.

Lane DM[1], Hill SA[1]

Author information

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Abstract in English, French

Despite the rise in popularity of both acupuncture and manual therapy in veterinary medicine, and the increasing number of Canadian veterinarians practising these techniques, there is little research demonstrating their effectiveness. In this repeated measures, therapeutic trial, 47 client-owned dogs with naturally occurring lameness were assessed for clinical response to treatment. Owners were blinded to the treatment schedule and completed questionnaires to assess their dogs' comfort and mobility. Comparison between pre- and post-treatment results demonstrated that combined acupuncture and manual therapy provides immediate short-term improvement in comfort and mobility, as demonstrated by owner observed changes in play behavior (P < 0.015), walking (P < 0.001), trotting (P = 0.002), jumping (P < 0.001), descending stairs (P = 0.003), rising from a lying position (P < 0.001), and reduced stiffness after rest (P < 0.001) or following exercise (P < 0.001). Mood and attitude also improved, but did not attain statistical significance.

The combination of acupuncture and manual therapy to no treatment for canine musculoskeletal pain

The combination increases short-term the comfort and mobility of the dog

It subjectively improves mood and attitude but it is not statistically significant

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Acupuncture & Pain – Veterinary studies

Acupuncture and pharmacopuncture are as effective as morphine or carprofen for postoperative analgesia in bitches undergoing ovariohysterectomy.

Luna SP[1], Martins EJ[2], Lorena SE[3], Cassu RN[4], Lima AV[5], Santos AP[6], Brondani JT[7], Viscon G[8]

TABLE 1 - Number and time of analgesic rescues in the postoperative period of bitches undergoing ovariohysterectomy previously treated with acupuncture (A; n=7), carprofen (C; n=7), morphine (M; n=7), pharmacopuncture with carprofen (AC; n=7) or pharmacopuncture with morphine (AM; n=7).

Group	1h	2h	4h	Number of animals treated with rescue analgesia
A	2			2
C	3			3
M		2		2
AC	1	2		3
AM	1		1	2

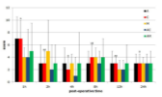

FIGURE 1 - Medians and semi-amplitudes of the University of Melbourne pain scale in bitches undergoing ovariohysterectomy. Acupuncture (A; n=7), carprofen (C; n=7), morphine (M; n=7), pharmacopuncture with carprofen (AC; n=7) and pharmacopuncture with morphine (AM; n=7). Capital letters expresses differences in time in the animals treated with carprofen, being A>B; maximum possible value of the scale =27

Pain relief effect in bitches undergoing OHE

Ac (20 mins): GB34, Sp6, St36 & Li3

Ac = Ac + 0.05 mg/kg morphin =Ac + 0.4 mg/kg carprofen = 0.5 mg/kg morphin SC= 0.4 mg/kg carprofen SC (following sedation with ACP)

No differences during the 1st hour

No differences in rescue analgesia (0.5 mg/kg IM) over 24h

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Acupuncture & Pain – Veterinary studies

Electrical neuromodulation at acupoint ST36 normalizes impaired colonic motility induced by rectal distension in dogs.

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Author information

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5. Veterans Research and Education Foundation, Veterans Affairs Medical Center, Oklahoma City, Oklahoma; Division of Gastroenterology and Hepatology, Johns Hopkins Center for Neurogastroenterology, Baltimore, Maryland.jyin12@hmi.edu.

Abstract

Electroacupuncture (EA) has been shown to improve impaired gastric motility and slow waves in both humans and animals. However, its effects on colonic motility have rarely been investigated. The aim of this study was to investigate the effects and underlying mechanisms of EA on impaired colonic motility induced by rectal distension (RD) in dogs. Colon contractions and transit were measured in various sessions with and without EA in hound dogs chronically placed with a colonic cannula. Colonic contractile activity was assessed by motility index (MI). Autonomic functions were determined by the spectral analysis of the heart rate variability derived from the electrocardiogram. It was found 1) RD suppressed colonic motility by 40.5% (10.8 ± 0.9 with RD vs. 6.4 ± 0.8 at baseline, P < 0.002). EA at ST36 normalized colonic contractions suppressed by RD (12.9 ± 2.8, P < 0.002 vs. RD and P > 0.1 vs. control). 2) Administration of atropine blocked the ameliorating effect of EA on colon motility. 3) RD also delayed colonic transit (65.0 ± 2.0% with RD vs. 86.0 ± 1.9% without RD, P < 0.001) that was restored with EA (84.0 ± 1.9%, P = 0.178 vs. control). 4) EA increased vagal activity suppressed by RD (0.37 ± 0.07 with RD + EA vs. 0.09 ± 0.03 with RD without EA, P < 0.001). In conclusion, RD inhibits colonic contractions and delays colonic transit in dogs. EA at ST36 restores the RD-induced impairment in both colonic contraction and transit by enhancing vagal activity and mediated via the cholinergic pathway.

EA at St36 normalizes impaired colonic motility induced by rectal distension in dogs

Rectal distention inhibits the colon contractions delaying the transit.

EA increases vagal activity through the cholinergic pathway establishing the colon contractions and transit

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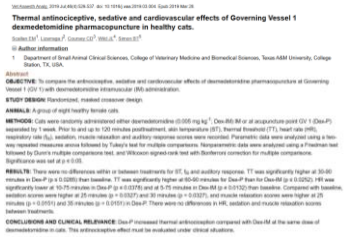
Acupuncture & Pain – Veterinary studies



Thermal antinociceptive, sedative and cardiovascular effects of Governing Vessel 1 dexmedetomidine pharmacopuncture in healthy cats.

Author information

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Abstract

OBJECTIVE: To compare the antinociceptive, sedative and cardiovascular effects of dexmedetomidine pharmacopuncture at Governing Vessel 1 (GV 1) with dexmedetomidine intramuscular (IM) administration.

STUDY DESIGN: Randomized, masked crossover design.

ANIMALS: A group of eight healthy female cats.

METHODS: Cats were randomly administered either dexmedetomidine (0.005 mg kg^{-1}, Dex-IM) IM or at acupuncture point GV 1 (Dex-P) separated by 1 week. Prior to and up to 120 minutes postreatment, skin temperature (ST), thermal threshold (TT), heart rate (HR), respiratory rate (f_R), sedation, muscle relaxation and auditory response scores were recorded. Parametric data were analyzed using a two-way repeated measures anova followed by Tukey's test for multiple comparisons. Nonparametric data were analyzed using a Friedman test followed by Dunn's multiple comparisons test, and Wilcoxon signed-rank test with Bonferroni correction for multiple comparisons. Significance was set at $p \leq 0.05$.

RESULTS: There were no differences within or between treatments for ST, f_R and auditory response. TT was significantly higher at 30-90 minutes in Dex-P ($p \leq 0.026$) than baseline. TT was significantly higher at 60-90 minutes for Dex-P than for Dex-IM ($p \leq 0.0252$). HR was significantly lower at 10-75 minutes in Dex-P ($p \leq 0.0376$) and at 5-75 minutes in Dex-IM ($p \leq 0.0132$) than baseline. Compared with baseline, sedation scores were higher at 25 minutes ($p = 0.0327$) and 30 minutes ($p = 0.0327$), and muscle relaxation scores were higher at 25 minutes ($p = 0.0151$) and 30 minutes ($p = 0.0151$) in Dex-P. There were no differences in HR, sedation and muscle relaxation scores between treatments.

CONCLUSIONS AND CLINICAL RELEVANCE: Dex-P increased thermal antinociception compared with Dex-IM at the same dose of dexmedetomidine in cats. This antinociceptive effect must be evaluated under clinical situations.

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Ac + 5 mcg/kg dexmedetomidine at GV1 in cats

The combination increases the thermal antinociceptive threshold in comparison to only dexmedetomidine

It needs clinical validation

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Acupuncture & Pain – Veterinary studies

Analgesic efficacy of laser acupuncture and electroacupuncture in cats undergoing ovariohysterectomy.

Author information

1 Department of Veterinary Surgery and Anesteslology, Faculty of Veterinary Medicine, Universidade do Oeste Paulista, Unoeste, 19067-175, Presidente Prudente, Brazil.

Abstract

The aim of this study was to compare the effects of laser acupuncture and electroacupuncture on postoperative pain and analgesic requirements in cats. In a prospective, randomized and blinded clinical study, thirty cats undergoing ovariohysterectomy were sedated with intramuscular (IM) ketamine (5 mg/kg), midazolam (0.5 mg/kg), and tramadol (2 mg/ kg). Before the induction of anesthesia, the animals were randomly distributed into three groups of ten cats each: LA: bilateral Stomach 36 (ST-36) and Spleen 6 (SP-6) acupoints were stimulated with an infrared laser; EA: bilateral ST-36 and SP-6 acupoints were stimulated with an electrical stimulus; Control: no acupuncture was applied. Postoperative analgesia was evaluated in the first 24 hr post-extubation using the Interactive Visual Analogue Scale and UNESP-Botucatu Multidimensional Composite Pain Scale. Rescue analgesia was provided with IM tramadol (2 mg/kg), and the pain scores were reassessed 30 min after the rescue intervention. If the analgesia remained insufficient, meloxicam (0.2 mg/kg IM, single dose) was administered. Data were analyzed using t-tests, the Mann-Whitney U test, and Friedman test. P<0.05 was considered significant. The pain scores did not significantly differ between the treatment groups at any time point (P>0.05). The prevalence of rescue analgesia was significantly higher in the Control group than in the LA and EA groups (P=0.033). Preoperative laser and electroacupuncture reduced the need for rescue analgesia during the first 24 hr after ovariohysterectomy.

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Analgesia with Laser or EA in cats undergoing OHE

Sedation: ketamine, midazolam, tramadol. Rescue postop: tramadol

Laser/EA bilateral: St36, Sp6

No difference on pain scales between protocols

Major need for rescue in control group (but not significant)

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Acupuncture & Pain – Veterinary studies

Yamamoto New Scalp Acupuncture for postoperative pain management in cats undergoing ovariohysterectomy.

Author information

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Abstract

OBJECTIVE: To evaluate the analgesic efficacy of Yamamoto New Scalp Acupuncture (YNSA) as an adjuvant for postoperative pain management in cats.

STUDY DESIGN: Prospective, randomized, blinded, clinical study.

ANIMALS: Twenty cats aged (mean ± standard deviation) 25 ± 9 months and weighing 2.7 ± 0.6 kg undergoing ovariohysterectomy.

METHODS: The cats were sedated with intramuscular (IM) ketamine (5 mg kg^{-1}), midazolam (0.5 mg kg^{-1}) and tramadol (2 mg kg^{-1}). The cats were randomly distributed before induction of anesthesia into two groups of 10 cats each: group YNSA, in which bilateral basic D points were stimulated with a dry needle from 20 minutes prior to anesthetic induction to the end of the surgery; group Control, in which no acupuncture was applied. Postoperative analgesia was assessed at 1, 2, 4, 8, 12, 18 and 24 hours postextubation using an Interactive Visual Analog Scale and Universidade Estadual Paulista-Botucatu Multidimensional Composite Pain Scale (UNESP-Botucatu MCPS). Rescue analgesia was provided with IM tramadol (2 mg kg^{-1}), and the pain scores were reassessed 30 minutes after rescue intervention. If the analgesia remained insufficient, meloxicam (0.2 mg kg^{-1} as a single dose) was administered IM. Data were analyzed using Student t-test, Fisher exact test, Mann-Whitney U test and Friedman test ($p < 0.05$).

RESULTS: Significantly lower pain scores were observed in YNSA when compared with Control at 1-4 hours based on the UNESP-Botucatu MCPS scores. Although significant differences were not identified between groups requiring rescue analgesia, additional postoperative analgesia was administered to four of 10 cats in Control and no cats in YNSA.

CONCLUSION AND CLINICAL RELEVANCE: Preoperative YNSA resulted in decreased pain scores and a reduction in postoperative requirement for rescue analgesia in cats. This method should be considered a viable option as an adjuvant analgesic therapy for cats undergoing ovariohysterectomy.

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Yamamoto skull ac for postop pain in cats OHE

Sedation: ketamine, midazolam, tramadol. Rescue postop: tramadol/metacam

Yamamoto reduces pain scale and the need for rescue analgesia (but not significant)

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Acupuncture & Pain – Veterinary studies

Evid Based Complement Alternat Med. 2015;2015:653270. doi: 10.1155/2015/653270. Epub 2015 Jun 11

Laser Acupuncture for Postoperative Pain Management in Cats.

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Author information

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Abstract

The aim of this study was to evaluate laser acupuncture as an adjuvant for postoperative pain management in cats. Twenty cats, undergoing ovariohysterectomy, were sedated with intramuscular (IM) ketamine (5 mg·kg(-1)), midazolam (0.5 mg·kg(-1)), and tramadol (2 mg·kg(-1)). Prior to induction of anaesthesia, the subjects were randomly distributed into two groups of 10 cats: Laser: bilateral stomach 36 and spleen 6 acupoints were stimulated with infrared laser;

CONTROL: no acupuncture was applied. Anaesthesia was induced using intravenous propofol (4 mg·kg(-1)) and maintained with isoflurane. Postoperative analgesia was evaluated by a blinded assessor for 24 h following extubation using the Dynamic Interactive Visual Analogue Scale and Multidimensional Composite Pain Scale. Rescue analgesia was provided with IM tramadol (2 mg·kg(-1)), and the pain scores were reassessed 30 min after the rescue intervention. If the analgesia remained insufficient, meloxicam (0.2 mg·kg(-1) IM, single dose) was administered. Data were analyzed using t-tests, the Mann-Whitney test, and the Friedman test ($P < 0.05$). The pain scores did not differ between groups. However, postoperative supplemental analgesia was required by significantly more cats in the CONTROL (5/10) compared with the Laser group (1/10) ($P = 0.038$). Laser acupuncture reduced postoperative analgesic requirements in cats undergoing ovariohysterectomy.

LaserAc for postop pain in cats OHE

Sedation: ketamine, midazolam, tramadol.

Rescue postop: tramadol

Laser/EA bilateral: St36, Sp6

LaserAc reduces the need for postop analgesia

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Acupuncture & Pain – Veterinary studies

J Acupunct Meridian Stud. 2019 Oct 10(5):169-171. doi: 10.1016/j.jams.2019.07.001. Epub 2019 Jul 24.

Stimulation of Bladder Acupoints by Cloprostenol for Treating Back Soreness in Athletic Horses.

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Author information

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Abstract

Twenty-five Thoroughbred jumper geldings suffered back soreness with poor performance, and 5 control horses were assessed by archived computer data, clinical examination, and laboratory analyses of complete blood picture, serum enzymes, and cortisol level, before and after cloprostenol-pharmacopuncture. The 25 diseased horses before therapy showed significant increases in aspartate aminotransferase and creatine phosphokinase with clinical pains scored mild in 15 horses, moderate in 9 horses, and severe in one horse, without changes in the hormonal and hematological data. After therapy, they responded by an increase of heart rate (57.8 ± 4.3 bpm), body temperature (38.5 ± 0.7°C), respiration rate (26.3 ± 2.1 bpm), and capillary refilling time (CRT) (1.0 ± 0.0). On the 2nd day, a significant decrease in the mean levels of aspartate aminotransferase and creatine phosphokinase ($P < 0.001$) was detected, while on the 4th day, they mirrored the level of the 5 controls, and on the 6th day, they showed a significant decrease ($P < 0.05$). The serum cortisol level showed a significant increase on the 6th day of treatment ($P < 0.01$). The blood picture showed significant increases in red blood cells, mean corpuscular volume, platelets, white blood cells, hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, mean platelet volume, platelet distribution width, lymphocytes, plateletcrit, and large platelet concentration ratio ($P < 0.05$) and nonsignificant changes in hematocrit, granulocytes, and mid-cytes. The improved blood parameters, enzymes, hormones, and performance progress after cloprostenol-pharmacopuncture proved its effectiveness in treating back soreness in athletic horses.

Ac with Cloprostenol in bladder meridian points for back pain in athletic horses

Improves haematology enzymes, hormones & performance

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Acupuncture & Pain – Veterinary studies

Iran J Vet Res. 2019 Winter;20(1):9-12.

Comparison of first and second acupuncture treatments in horses with chronic laminitis.

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Author information

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Abstract

BACKGROUND: Laminitis is a common but critical disease that causes severe pain and disability in horses. The etiology and pathogenesis of laminitis remain inconclusive and a multimodal therapeutic approach is generally indicated. Acupuncture has been used as a treatment option; however, the required number of treatments is still controversial due to the lack of objective scientific evidence.

AIMS: The objective of this study was to determine if the response to a second acupuncture treatment differed from the response to the first acupuncture treatment in horses with chronic laminitis.

METHODS: Fourteen horses with chronic laminitis were identified. Acupuncture points were determined based on the results of a diagnostic acupuncture palpation examination. The second acupuncture treatment and lameness examination were conducted one week after the first treatment. Ten minutes after each acupuncture treatment, a lameness examination was performed and included an objective examination using a body-mounted inertial sensor system called "Lameness Locator" and a routine lameness examination following the "American Association of Equine Practitioners" (AAEP) lameness scale. The level of lameness was statistically analyzed using paired t-test and Wilcoxon signed rank test with p-values <0.05 considered significant.

RESULTS: Both objective ($P=0.042$) and routine lameness examinations ($P=0.027$) showed that the level of lameness significantly decreased after the second acupuncture treatment compared to the response to the first treatment.

CONCLUSION: The results of this study suggest that continued acupuncture treatments will result in increasing levels of pain relief, showing the advantage of performing more than one acupuncture treatment in horses with chronic laminitis.

Comparison of 1st & 2nd Ac session in horses with chronic laminitis

Continues Ac treatments alleviates pain by reducing the lameness degree

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Acupuncture & Pain – Veterinary studies

Acupuncture Treatment of Pain along the Gall Bladder Meridian in 15 Horses.

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Abstract
This study reports on clinically significant relief of pain along the gall bladder meridian in 15 sport horses. Both local and distant points were needled in this study. Pain relief was marked not only locally but also in remote areas along the gall bladder meridian. Clinical improvement was observed in all 15 horses within 30 seconds to 2 minutes after the treatment had started. Twelve horses and three horses were rated as "cured" and "improved", respectively, when they were re-examined 1-8 days after the treatment. The relief of somatic pain was often associated with improved riding performance of the horses. These data are relevant in terms of equine clinical pain relief, as well as in terms of meridian therapy and the scientific theory of acupuncture.

Ac to treat pain along the Gall Baldder meridian in horses

Local and distal points were used with improvement within 2 mins. 12/15 horses showed pain relief associated with imrpoved riding performance

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Acupuncture & Pain – Veterinary studies

Analgesic and physiological effect of electroacupuncture combined with epidural lidocaine in goats.

Author information
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3 College of Veterinary Medicine, Huazhong Agricultural University, Wuhan, Hubei, P.R. China. Electronic address: dmx@mail.hzau.edu.cn.

Abstract
OBJECTIVE: To investigate physiological and antinociceptive effects of electroacupuncture (EA) with lidocaine epidural nerve block in goats.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Forty-eight hybrid male goats weighing 27 ± 2 kg.

METHODS: The goats were randomly assigned to six groups. L2.2, epidural lidocaine (2.2 mg·kg^{-1}); L4.4, epidural lidocaine (4.4 mg·kg^{-1}); EA, EA-L1.1, EA with epidural lidocaine (1.1 mg·kg^{-1}); EA-L2.2, EA with epidural lidocaine (2.2 mg·kg^{-1}); and EA-L4.4, EA with epidural lidocaine (4.4 mg·kg^{-1}). EA was administered for 120 minutes. Epidural lidocaine was administered 25 minutes after EA started. Nociceptive thresholds of flank and thigh regions, abdominal muscle tone, mean arterial pressure (MAP), heart rate (HR), respiratory frequency (f_R) and rectal temperature were recorded at 30, 60, 90, 120, 150 and 180 minutes.

RESULTS: Lidocaine dose-dependently increased nociceptive thresholds. There were no differences in nociceptive thresholds between L4.4 and EA from 30 to 120 minutes. The threshold in EA-L2.2 was lower than in EA-L4.4 from 30 to 120 minutes, but higher than in EA-L1.1 from 30 to 150 minutes or in L4.4 from 30 to 180 minutes. The abdominal muscle tone in EA-L2.2 was higher at 30 minutes, but lower at 90 and 120 minutes than at 0 minutes. There were no differences in muscle tone between L4.4 and L2.2 or EA-L4.4, and between any two of the three EA-lidocaine groups from 0 to 180 minutes. The f_R and HR decreased in L4.4 at 90 and 90 minutes compared with 0 minutes. No differences in f_R, HR, MAP and temperature among the groups occurred from 30 to 180 minutes.

CONCLUSIONS AND CLINICAL RELEVANCE: EA combined with 2.2 mg·kg^{-1} epidural lidocaine provides better antinociceptive effect than 4.4 mg·kg^{-1} epidural lidocaine alone in goats. EA provided antinociception and allowed a decrease in epidural lidocaine dose.

EA combined with lidocaine epidural in goats

EA (36Hz, 1.5v, 120min): Tian ping (middle T13-L1) + An Shen (middle L3-L4)

EA + 2.2mg/kg lidocaine epidural provides better analgesia than 4.4 mg/kg lidocaine epidural alone

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Acupuncture & Pain – Veterinary studies

Physiologic effects of electroacupuncture combined with intramuscular administration of xylazine to provide analgesia in goats.

Author information
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Abstract
OBJECTIVE: To investigate physiologic effects of electroacupuncture (EA) combined with xylazine administration in goats.

ANIMALS: 48 healthy crossbred goats.

PROCEDURES: Goats were randomly allotted to 8 groups of 3 (nonpregnant and nonlactating) female goats and 3 male goats each. The 8 treatment groups were as follows: 1 EA group, 3 xylazine (0.1, 0.2, and 0.4 mg/kg, IM) groups, 3 EA-plus xylazine (0.1, 0.2, and 0.4 mg/kg, IM) groups, and 1 control group. Electroacupuncture was performed for 90 minutes. Xylazine was administered 20 minutes after EA was performed. Pain threshold, heart rate, mean arterial pressure (MAP), respiration rate, and rectal temperature were observed at 0, 5, 25, 45, 65, and 85 minutes after xylazine administration.

RESULTS: Xylazine administered at 0.4 mg/kg increased the pain threshold and reduced MAP. Xylazine administered at 0.1, 0.2, or 0.4 mg/kg reduced heart rate, respiration rate, and temperature. Electroacupuncture increased the pain threshold but had no effect on heart rate, MAP, respiratory rate, or rectal temperature. Pain threshold in goats that underwent EA plus xylazine administration was higher than in goats that received EA or xylazine alone. Electroacupuncture combined with xylazine at 0.1 mg/kg did not affect heart rate, MAP, respiratory rate, or rectal temperature. Pain threshold in goats that underwent EA plus xylazine administration at 0.1 mg/kg was higher than in goats given xylazine at 0.4 mg/kg alone.

CONCLUSIONS AND CLINICAL RELEVANCE: Electroacupuncture combined with xylazine, even at 0.1 mg/kg, provided analgesia without significantly affecting cardiorespiratory parameters or rectal temperature in goats.

EA + IM xylazine analgesic effect in goats

EA (36Hz): Bai hui (hundred meetings), San tai (3 platforms), Erh gen (ear base), and San yan luo (3 Yang communication)

EA + 0.1 mg/kg xylazine provide analgesia without significant changes in HR, RR and temperature

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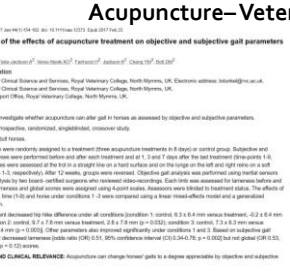
Acupuncture–Veterinary studies



A pilot study of the effects of acupuncture treatment on objective and subjective gait parameters in horses.

Effect of Ac in subjective/objective gait parameters

Ac changes the way horses walk in a subjective & objective way

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Acupuncture – Veterinary studies

International Survey Regarding the Use of Rehabilitation Modalities in Horses.

Survey regarding different rehabilitation modalities in horses

305 surveys (60% USA, 26% Europe)

70% uses Ac.

Very interesting all therapy possibilities

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Acupuncture – Veterinary studies

Effects of acupuncture on the heart rate variability, cortisol levels and behavioural response induced by thunder sound in beagles.

AC effect on the Heart rate variability, cortisol levels & behavioural response induced by thunder sound in beagles

Ac prior to the sound reduces the cardiac autonomic and behavioural response without cortisol changes in beagles

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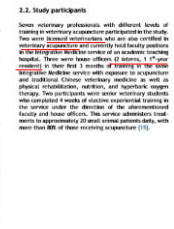
Acupuncture – Veterinary studies

Comparison of Point Placement by Veterinary Professionals with Different Levels of Acupuncture Training in a Canine Cadaver Model



2.2. Study participants

Seven veterinary professionals with different levels of training in veterinary acupuncture participated in the study. Two were licensed veterinarians who are also certified in veterinary acupuncture and currently held faculty positions at the Integrative Medicine service of an academic teaching hospital. Three were house officers (2 interns, 1 1st-year resident) in their first 3 months of training in the same Integrative Medicine service with exposure to acupuncture and traditional Chinese veterinary medicine as well as physical rehabilitation, nutrition, and hyperbaric oxygen therapy. Two participants were senior veterinary students who completed 4 weeks of elective experiential training in the service under the direction of the aforementioned faculty and house officers. This service administers treatments to approximately 20 small animal patients daily, with more than 80% of these receiving acupuncture [15].

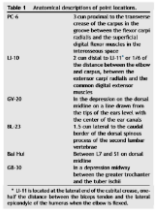


Table 1 Anatomical descriptions of point locations.

PC-6	3 cun proximal to the transverse crease of the carpus in the groove between the flexor carpi radialis and the superficial digital flexor muscles in the interosseous space
LI-10	2 cun distal to LI-11 or 1/6 of the distance between the elbow and carpus, between the extensor carpi radialis and the common digital extensor muscles
GV-20	In the depression on the dorsal midline on a line drawn from the tips of the ears level with the center of the ear canals
BL-23	1.5 cun lateral to the caudal border of the dorsal spinous process of the second lumbar vertebrae
Bai Hui	Between L7 and S1 on dorsal midline
GB-30	In a depression midway between the greater trochanter and the tuber ischii

* LI-11 is located at the lateral end of the cubital crease, one-half the distance between the biceps tendon and the lateral epicondyle of the humerus when the elbow is flexed.

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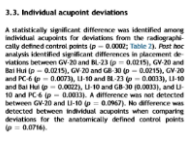
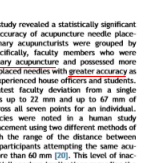


3.3. Individual acupoint deviations

A statistically significant difference was identified among individual acupoints for deviations from the radiographically defined control points ($p = 0.0002$; Table 2). Post hoc analysis identified significant differences in placement deviations between GV-20 and BL-23 ($p = 0.0215$), GV-20 and Bai Hui ($p = 0.0215$), GV-20 and GB-30 ($p = 0.0215$), GV-20 and PC-6 ($p = 0.0073$), LI-10 and BL-23 ($p = 0.0033$), LI-10 and Bai Hui ($p = 0.0022$), LI-10 and GB-30 (0.0033), and LI-10 and PC-6 ($p = 0.0033$). A difference was not detected between GV-20 and LI-10 ($p = 0.0967$). No difference was detected between individual acupoints when comparing deviations for the anatomically defined control points ($p = 0.0716$).



4. Discussion

The results of this study revealed a statistically significant difference in the accuracy of acupuncture needle placement when veterinary acupuncturists were grouped by training level. Specifically, faculty members who were certified in veterinary acupuncture and possessed more clinical experience placed needles with greater accuracy as compared to less-experienced house officers and students. However, the greatest faculty deviation from a single accepted point was up to 22 mm and up to 67 mm of combined error across all seven points for an individual. Similar inconsistencies were noted in a human study assessing needle placement using two different methods of point location, with the range of the distance between markings made by participants attempting the same acupoint measuring more than 60 mm [20]. This level of inac-

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