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IS ACUPUNCTURE AN USEFUL TOOL FOR PAIN-TREATMENT IN OPHTHALMOLOGY ?

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ABSTRACT:

Pain that does not responde to conventional treatment procedures makes it necessary to look for alternative methods. Acupuncture is an ancient procedure with empirical effects on pain. Previous studies established the increased output of messangers at neuronal junctions in spinal cord and hypothalamic locations , especially of endorphins which inhibit the perception of pain. We treated several painful symptoms with acupuncture and evaluated the outcome of the treatment. Patients with various kinds of therapy-refractory pain and patients in whom conventional treatment methods could not be applied were included in the study. The diagnoses included glaucoma, Tolosa-Hunt-Syndrome, ophthalmic migraine, blepharospasm, and dry eyes. In one case acupuncture was used for analgesia during surgery.
Acupuncture was performed with sterile disposable needles, at points known to have an empirical analgesic effect. The stimulation was adapted to the patient's individual needs. VAS assessments before and after acupuncture were compared. The t-test was used for statistical evaluation. Acupuncture had no side effects, but reduced pain to a variable extent. Especially in cases of severe pain and in surgery, very effective pain reduction was achieved. In general, pain was significantly reduced in all patients by the use of acupuncture. A statistically signifivant effect was noted ($p < 0.05$). Further studies should be conducted to demonstrate the specific effect in larger patient populations. Monitoring neurotransmitter activitay will possibly help to illustrate the effect.

KEYWORD: Orbital pain; Therapy-resistance; Visual analog scale; Acupuncture.

INTRODUCTION

Pain is a warning symptom that causes the body's functions to become relatively dormant. The condition is treated with various chemical agents and physical measures (Tab.1 [1, 2]).

Table 1: **About the pathway of pain** [2]
1) Sensitize of the nociceptors
2) ectopic impulse activation (afferent neuron)
3) Sensitize of central neurones
4) central signal transduction (thalamic pain)
5) feedback to α/γ-neurons , inducing muscular tension
6) feedback to efferent sympathetic neurons (cause sympathetic reflex dystrophia)
7) central pain induction (psychic, functional)

Certain features distinguish pain in ophthalmology from that in other locations . The eye is the most sensitive organ in the body and pain in the eye impairs visual perception. [3]. It is also associated with psychic problems, fear of blindness and social disability [4]. In order to treat eye pain effectively, it is necessary to establish the cause. (Tab.2, [5,6])

Table 2: **Differential diagnosis of pain in the eye** [6]
Asthenopia:
Accommodative, Muscular, Nervous, Asthenopia due to glare
Headache and other symptoms with diseases of the Eye or its adnexa:
Ciliary neuralgia, Conjunctivitis, Diseases of the lids, Corneal diseases, (Epi)scleritis, Iridocyclitis, Diseases of the interior of the eye. (Chorio)Retinitis, Lens-diseases. Optic neuritis, retrobulbar neuritis, temporal arteriitis, glaucoma, orbital diseases , Diseases of the lacrimal system and of the bony orbit.
Headache with ocular pain independent of the eye:
Vasomotor headache
Sinusitis, Temporal arteritis, Trigeminal neuralgia,
Intracranial pathologic processes and increased intracranial pressure

Acupuncture has been used since ancient times in china for pain reduction. However , its purpose was mainly symptomatic relief. The treatment was focused on reducing psychic and emotional problems. In Western medicine the pain-reducing effect of acupuncture has been extensively discussed and proved [7, 8]. The effect is a result of reflectory inhibition of neuronal conduction of the pain-signals, after irritation of very sensitive points in the skin. The reflectory signal ascends up to the midbrain, where neurotransmitters, especially endorphins, are produced. The effect can be immediately arrested naloxon, an antogonist of the opioids [9]. Thus, acupuncture serves as an effective complementary mode of achieving pain relief. Ophthalmology offers a few indications for the application of acupuncture [10, 11]. Therefore acupuncture was used in selected patients in the present study

MATERIAL AND METHODS

Based on a set of patients who were treated with acupuncture for various reasons, the therapeutic modality is presented and discussed in the follwing.

1) Pain in glaucoma [12]: A 56years old woman had mild but therapy refractory pain and was referred for acupuncture. The patient had open-angle glaucoma longer than 1 year and her intraocular pressure less than 21 mmHg. Arcuata skotoma was found in the upper visual field. The treatment consisted of betablockers (Timolol 0,5%, twice dayly). The patient had drawing and compressing pain in the orbital cavity , with no signs of double image or strabism. The pain radiated into the frontal region and was more pronounced on the left than on the right side. The treatment consists of nonsteroidal antiphlogistics; opioids were never prescribed. The neurologist's report was unremarkable. Acupuncture was applied solely for the purpose of reducing pain. Observation parameters included visual analog scale (VAS) [13], subjective wellbeing, nature of pain and accumulation of pain. These parameters were monitored before and after every acupuncture session. Furthermore ocular pressure was measured at every session.

2) Painful strabism, a Tolosa-Hunt-Syndrome (THS)
A 72year-old woman, had been suffering from the Tolosa-Hunt-syndrome since one year. She had painful paresis of the abducent and oculomotor nerves and extrem pain in the orbital cavitiy ascending frontally to the occiput. The symptoms were caused by a granulomatous inflammation of the cavernous sinus [14]. The disease might have started as an asymptomatic borellia. Treatments with antibiotics and steroids entirely eliminated the symptoms of paresis. However, pain was resistent to every analgesic therapy even on opiods. The patient had attacks of pain nearly every day , which reduced her quality of life, while the monotony of pain also induced depression.
Dry eyes, which accompanied the syndrome, were treated with artificial tears. However, the treatment influenced, neither the severity nor the frequency of the pain-attacks. The question arose as to whether acupuncture would help in the treatment of extremely intense and therapy-refractory pain in the presence of disease that has not been described in Chinese literature

3) Ophthalmic migraine. [15,16]
A 53-years old woman had been suffering from migraine ophthalmic since several years. She had pain within the orbital cavitiy that radiated temporally. The intensity of pain was mild to severe and the character was subject to change every day. The patient's eyes were normal in terms of visual acuity and visual field and she had no neurological symptoms. Pain may have been aggravated by stress. The symptoms were unrelated to menstruation. [17]. Nonsteroidal analgesics had no effect. Acupuncture was started within in the intervals of attacks and pain was measured with the VAS.

4) Acupuncture analgesia was used in a 64-year-old woman who suffered from acute purulent dacryocystitis. She had highly intensive burning and throbbing pain, that remained monotonously unchanged. The patient had no ophthalmic symptom other than the visual dysfunction secondary to pain. An incision had to be performed for pressure reduction and cleaning. General anesthesia was contraindicated because of cardiac and pulmonary dysfunction. and local anesthesia could not be used. The incision was performed without any analgesic drugs (oral analgetics were ineffective). Surgery was described as being extremly painful, especially the cleaning procedure. Two days later the abscess was filled in spite of local and systemic treatment with antibiotics. A second surgery had to be performed , and now analgesia was administered by means of acupuncture which appeared to be the final solution. Stimulation was administered with needles; Manipulation was started 10 minutes prior to surgery and continued for entire duration of the operation. The manipulation was performed carefully, without causing pain at the insertion points. Points

reported to have an analegesic effect were used: LI4 Hegu, KS6 Neiguan, 3E5 Weiguan [18].

5) Blepharospasm [19,20] The indication for acupuncture treatment in Blepharospasm is pain during spasm, not responding to botulinum toxin A or analgesics.

A 63-year-old man had been suffering from spasm since several years especially when confronted with tension or physical effort. Tension caused spasm, followed by pain and visual impairment, which in turn reinforced spasm.
Acupuncture reduce muscular-spasm [21,22,23]

As no accurate tool for measuring spasm exists, we again used the VAS, and the Elston Skore [24]. The latter is a 6-point scale to describes social and mental handicap secondary to visual dysfunction: 6 denotes mild dyscomfort, and 1 stands for functional blindness. Acupuncture treatment was performed with single disposable needles, at points that are reported to influence muscles according to the traditional chinese medicine TCM : (SI3 houxi, SI4 wangu , GB4 hanyang , Li3 taichong, GB14 yangbai, Le13zhangmen, UB 18 ganshu) [25].

6) Pain and dry eyes: [26, 27] Patients with dry eyes suffer from paresthesia which may be painful. We used acupuncture to treat pain in patients with conjunctivitis sicca.

The first patient was a 61-year-old postmenopausal woman, with serum-estrogen levels lower than 10 pg/ml , who was undergoing treatment with systemic estrogens. She also suffered from dry eyes that have been sticky, crusty, and painful since more than one year. Pain occured espescially during visual strain.

Schirmer's test revealed values less than 5mm /5 min in both eyes and break up time was also reduced. (2 and 3 seconds). Artificial tears were not sufficiently effective. We measured Schirmer values, break up time (BUT) and the frequency of using artificial tears (UAT) before and after acupuncture treatment. Pain and paresthesia were determined by the patient on the VAS.

The second patient was a 38-years-old woman (BM), who had suffered several incidents in life such as divorce, a disrupted career, and social problems. Dry eyes and the use of artificial tear was similar as in the first patient.

The thrid patient was a 51-year-old woman with Sjögren's Syndrom (SS). The rheumatoid factor (WaalerRose) and antinuclear antibodies were positive, the same applied to specific antibodies like Ro and La. All mucous tissues were dry, and no treatment was effective. The patient had pain in the eyes and the joints. Pain was measured by the patients on the VAS. Before and after acupuncture all patients were subjected to Schirmer's test (modified by Henderson and Brough[28]), BUT was measured and the use of artificial tears was monitored.[29]. Normal values were as follows: : Schirmer's test > 5 mm / 5 minutes, BUT >10 seconds. And the lipid layer was normal, if red coloured lines were seen within the maximal >1/2 closed lid. (LIT)lipid interference thickness

A slit lamp investigation was performed to dedect irregularities on the surface, the lid and the conjunctiva. The corneal surface was investigated by fluorescein staining. Pain was determined by the visual analog scale (VAS) 0-10. 0 signified no pain, 10 stood for maximum conceivable pain [30]

		1 Gl	2 THS	3 Mig	4 AA	5 Blsp	6 Ho	7 Psy	8 SS
Head	Yin Tang	N	N	N	n	T	N	T	N
	Tay Yang		N	N			N		
	UB 2 Zhan Zhu		N						
	GB 1 Tongziliao						N	N	N
	SI 18 QuanLiao		N						
	St 2 Sibai	N							
	GB 20 FengChi	N	N			N	S		
Upper limbs	SI 3 Houxi			N					
	SI 4 Wangu					N			
	LI 4 Hegu	N	N		S(*)				
	TH 5 WaiGuan		N	N	S(*)				N
	PC 6 NeiGuan		N	N	S(*)				
	Lu 7 LieQue	N							
Lower limbs	Li 2 XingYian							N	
	Li 3 TaiChong	T		N					
	Kd 3 TaiXi	N						N	
	Sp 4 Gongsun	N							
	Sp 6 SanYinJiao						N		
	GB 41 Linqui								N
	St 36 Zusanli							T	
Ear-points	Eye 8	N	N	N					
	Eye 24 a						N		
	Sun 35		N					N	
	Trigeminus		N						
	Liver	N	N	N					N
	Spasmus					N			
	Point de Jerome							N	

Table 3: Acupuncture points of each patient

Ad Table 3:

1 Gl: Glaucoma; 2 THS: TolosaHuntSyndrome; 3 Mig: Migraine; 4 AA Analgesia; 5 Blsp Blepharospasm; 6 Ho: Hormonal caused dry eyes; 7 Ps: Psychic caused dry eyes; 8 SS: Sjogrens Syndrome

N: Neutral stimulation T: Tonifying stimulation S Sedative Stimulation

(*) continuous stimulation

Acupuncture was performed with sterile disposable needles and the points were selected according to the vienna group headed by Kubiena et al, as well as according to local projection of pain, radiating pain, and the empirical rules of traditional chinese medicine (8 principals, 5 elements) and by modality influencing points. (Kubinena [31,32], Table 3).

A total of 10 acupuncture sessions were performed (once a week , each session had a duration of 30 minutes); the only exception was analgesic treatment during operation.

RESULTS

8 Patients with specific indications were selected for the investigation. Pain on VAS was reduced on average from 7.2 to 3.4. (Fig1)

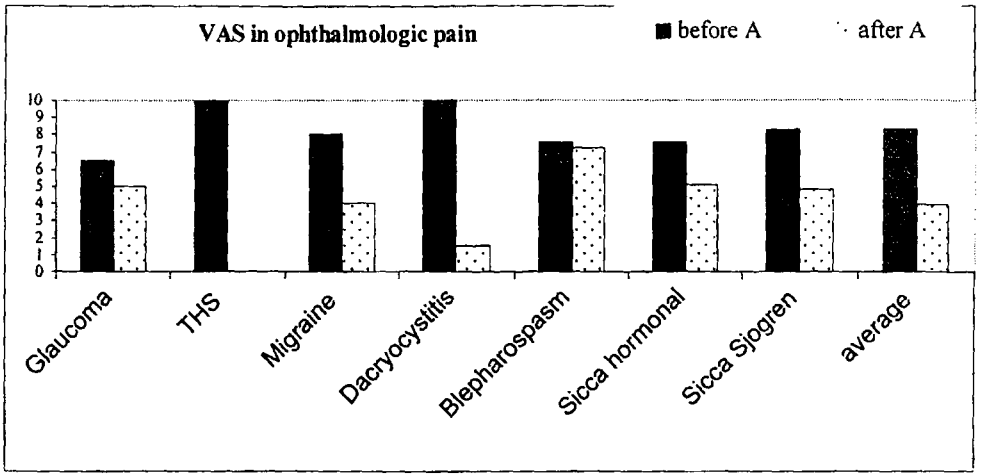

Fig.1 VAS in ophthalmologic pain before and after Acupuncture

No patient reported increased or unaltered pain. Individual pain values varied between 0 and 9. No patient had serios adverse events secondary to acupuncture.
In **glaucoma** there was no measurable difference in tension values or the visual field, between the first and last observation. Tension was always beyond lower than 21mmHg. Pain was reduced from 6.5 to 3.0, and was finally 5

In the **Tolosa-Hunt Syndrome (THS)**, a slight reduction of extreme pain was achieved after the 3rd session; the overall pain reduction was approximatly 40% . Than the reduction was from 10 to 4 after the last session. [33] After an interruption of three years the patient reported pain reduction to 0 and had no further pain any more.

During acupuncture and 6 month thereafter the patient with **ophthalmic migraine** had no attacks of pain. Pain had reduced from 8.0 to 4.0 and she had intervals with no pain (VAS 0). Pain recurred after 6 month but was less intense.

In the case of **dacryocystitis** no analgesics were used. At initial surgery the VAS score was 10, i.e. maximum pain. Following the second surgery procedure the patient's VAS was 2.0 at the beginning, and maximum 5,0 at the end, when the wound was cleaned. No attacks of pain occured during surgery. After first operation the patients had pain decreasing (to 2) for about 24 hours, after the second operation the pain score was 1.5 at the end of operation.

In the case of **blepharospasm** pain was reduced from a VAS score 7.8 to 2.6 after acupuncture. The reduction was not continuous. However the maximum pain score was 7.4

and was never worse than the initial score. Elston's grade increased from 3 to 5. Nearly every acupuncture session was effective, but the effect only lasted for a few days.

In **dry eyes** the effect of acupuncture on pain was quite different.
In cases of menopausal symptoms pain was slightly reduced, VAS decreased from 7.6 to 5.7. There was a remarkable improvement on Schirmers's test, the break up time of the tear film and the use of artificial tears were also reduced. In patients with dry eyes and psychological problems nervousness was reduced , and pain diminished.
In Sjögren's syndrome –an immunologic disease, pain was reduced from VAS 8.3 to 3.1. Schirmer's test remained unaltered (0 before and after acupunture), BUT was slightly improved (1 to 4) and the use of artificial tears decreased from hourly to 4 times a day.

DISCUSSION

The treatment of pain with acupuncture has been described for several indications, such as headache, orthopedic pain and neuralgia [34].

Pain is a cortical recognition of irritation due to several reasons but may also occur in the absence of an irritant. [35]. Pain arises in the cortex, and is modulated by the thalamus and the posterior horn of funiculus the spinal cord. It is caused by alterated function or pathological changes in nocireceptors [36,37]

The fact that existing methods of pain treatment have been inadequate has prompted a search for new and more effective procedures.

The capability of Acupuncture to reduces pain has been proofed. [38]. Irritations of specific sensitive points in the skin stimulate neural reflexes that inhibit neural signals of pain within the spinal cord [8]. A further mode of action is that acupuncture stimulates neurotransmitters within the reticuloendothelial system of the thalamus and hypothalamus. [9]. Central stimulation may have a general calming effect [39]. However pain reduction achieved by acupuncture cannot be equated with that of analgesics, as concomitant perceptions such as discrimination and perception of warmth remain unchanged when acupuncture is used. [40]. The high risk of acupuncture therefore is, to cover symptoms and to get complications (e.g. erosion or acute glaucoma) [41].

Pain is not really measurable . Several factors influence the quality of pain such as the patients's threshold, and tolerance level and psychological situation[42].
We quantified pain on a visual analogue scale, which is an acceptable tool for this purpose. It demonstrates the relationship between existing pain and maximum imaginable conceivable pain.

Pain may occur in chronic glaucoma. Patients with glaucoma may have specific psychological disorders[43]. Acupuncture possibly has a general soothing effects in this settings. Additionally, it may reduce aquous flow in the anterior chamber[44]. However it is necessary to monitor pain and intraocular pressure (IOP) in this cases. Based on the present study, no conclusive statement regarding the effect of acupuncture on IOP can be made. Pain reduction was achievied.

Tolosa Hunt Syndrome is a seldom inflammation of the orbital sinus. [45] It was observed in our department in conjunction with intractable pain, which has not been previously reported in the literature . It is not known, wether such intolerable pain is a frequent or uncommon

symptom. Inflammation was treated with corticosteroids, whereas the pain was resistant to any treatment, including opiods like tramadol. The effect of acupuncture had a late onset , but the treatment modality was surprisingly effective. Maybe there would have been a spontanous decrease of pain after the successful therapy with corticosteroids, too, we are not able to compare.

Ophthalmic migraine is a- vascular disorder associated with projecting pain into the eye and visual dysfunction. Attacks of pain affect the life quality. Retinal and visual disorders need to be regularly monitored by ophthalmic investigatons. Measurements of vessels would have been helpful (e.g.with the Heidelberger flowmeter) but such procedures were not available. The effect of acupuncture on blood flow may be inferred on the basis of thermographic and doppler-studies. [46,47,48]. No further attacks of pain occured.

The analgetic effects of acupuncture are known since long time [17]. The indication for acupuncture in place of analgetics is limited either by intact discrimation [40] and the effort and expenditure involved in using the method: needles have to be mildly stimulated slightly all the time. Acupuncture may be useful in mandatory operations when the patient display explicit intolerance of any analgesic medication or anesthesia.

Blepharospasm is a symptom that arises from a reaction caused by injury of the ocular surface, as well as by psychological tension, nervousness, and other sensation disorders. Pain in this setting is caused by contraction of muscles and photophobia. The best treatment is infiltration of botulinum toxin within the facial muscles, in order to inhibite the transmission of acetylcholine by blocking the cholin-esterase.[49]

Acupuncture possibly reduces pain by central stimulation of neurotransmitters, especially endorphins [50]. Besides, acupuncture reduces the tonus of muscle, which was shown in previous trials. Involuntary closure of the lid causes disability in social life [51] which is assessed by Elston's score [24]. Owing to the insufficient effect of botulinum it was necessary to use other means of achieving relaxation. [52]. After acupuncture our patient's Elston score increased and the VAS improved, but the effect was short – it lasted no more than a few days.

Dry eyes are related to sensation disorders such as burning, itching and pain . Pain is a strong stimulus caused by chronic irritation. Dry eyes become painful due to pressure of the lid on the ocular surface, this caused by poor gliding [53] secondary to inflammation [54]. A further cause of pain in dry eyes is dystrophy [55]. Besides, protective mechanisms such as lid-spasm and photophobia as well as psychic excitement reduce the threshold for pain. [56]

Three patients with dry eyes of-different pathogenesis (hormonal, psychic and immunologic) were investigated. The different effect of acupuncture on dry eyes [57] as well as the reduction of nervousness by acupuncture have been reported elsewhere. [27] Acupuncture was also shown to influence the dry mouth [58]

The markedly varying description of pain- is remarkable and does not appear to be related to changes in parameters of dryness, such as Schirmer's test or break up time.
The elevated threshold of pain is surprising high in Sjogrens syndrome and low in the hormonal setting as well as in dryness due to psychic causes.
Psychic factors appear to be an important determinant of the threshold of pain; such factors are less prevalent in patients with Sjogrens syndrome than in the others.

The general VAS score of all patients was reduced from the first measuremtent before acupuncture to the second measurement; statistical significance was noted in the Students t-test ($p<0,05$)

SUMMARY

We conclude that various kinds of ophthalmologic pain can be treated with acupuncture. It may also be used for the purpose of analgesia during surgery and may serve as a valuable aid in reducing tension in the nervous and psychic system. It serves to fill an important gap in the treatment of pain.

Thus, acupuncture is an useful adjunct especially in pain- that does not responde to treatment and in pain induced by psychic tension and nervousness.

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REFERENCES

1 Jänig W. Biologie u Pathobiologie der Schmerzmechanismen: Lehrbuch der Schmerztherapie, Editor: M Zenz, I. Jurna,WissVerlagsGesellschaft, Stuttgart 15-17, 1993.

2 Jänig W. Das nozizeptive System unter pathobiologischen Bedingungen. Lehrbuch der Schmerztherapie, Hrsg: M Zenz, I. Jurna, WVG, Stuttgart; 22-33, 1993.

3 Draeger J. Corneal Sensitivity Springer Wien, New York 1984.

4 Schulzt Zehden W, F.Bischof. Reaktion d Patienten auf Augenkrankheiten UrbanSchwarzenberg München; in: Psychosomatische Medizin. Ed: Adler R, Uexküll T; 3.Aufl; 1065-66, 1990.

5 Zimmermann M. Physiologische Grundlagen des Schmerzes und der Schmerztherapie . in: Lehrbuch der Schmerztherapie I.Jurna, WissenschaftlicheVerlagsGesellschaft, Stuttgart ed: M.Zenz. 3-14, 1993

6 Pau H. Differential Diagnosis of Eye Diseases. Ed: F.C.Blodi, C.F. Blodi Thieme Stuttgart, NewYork 79-89, 1988.

7 Riederer P., Tenk H., Werner H., Bischko J., Rett H., Krisper H., Manipulation of Neurotransmitters by Acupuncture. Journal Neural Transmission 37, 81.94, 1975.

8 Melzack R, Wall PD: Psychophysiology of pain, Intern Anesthes Clinic 8: 3-34, 1970.

9 Pomeranz BH,Chiu D. Naloxone blockade of acupuncture analgesia: endorphin implimcated. Life Science 19: 1757-1762, 1976

10 Franzini S., A et J Poletti. Ophtalmologie en medecine chinoise. Maloine, Paris 1986.

11 Qing-Guang-Yan. Glaukom. In: Therapie mit Akupunktur III. Ed: C.C Schnorrenberger. Hippokrates Stuttgart, 111-115, 1992.

12 Potter DE Y Luo, TC Chu. Electroacupuncture inhibitory effect in aqueous humor

dynamics. ARVO, Investigative Ophthalmol. Vision Research IOVIS 41,4; 252, 1324. 2000.

13 Anton F., Schmerzmessung Lehrbuch d Schmerztherapie. Ed: M Zenz, I. Jurna, WissenschaftlicheVerlagsGesellschaft, Stuttgart 35-44, 1993.

14 Tolosa EJ, Periarteritic lesion of the carotid siphon. Journal of Neurology, Neurosurgery and Psychiatry, 17, 300, 1947.

15 Bischko J: Indikationen für Akupunktur, Zephalgien. In: Einführung in die Akupunktur ed: Bischko J. Haug Heidelberg; 51-74, 1970.

16 Anonymus, Headache. Essentials of Chinese Acupuncture. Ed. Beijing-, Shanghai, Nanjing –College of Traditional Chinese Medicine Foreign language press, Beijing. 336-341, 1980

17 Pauser G., Reichmann Ch.,Baum M.,Benzer H.,Haider M.,Thoma H. Beeinflussung der Schmerzempfindung, des Schmerzgefühls und der vegetativen Lage des Organismus unter Akupunkturanalgesie. Wiener Klinische Wochenschrift 87; 25-28, 1975.

18 Trauschke W. Die Wirkung der Akupunkturanalgesie in: Akupunkturanalgesie. Haug Vlg, Heidelberg . ed. J. Bischko; 17-19, 1982.

19 Sold Darseff J., Leydhecker W: Akupunktur bei Schmerzen im Kopfbereich sowie bei Blepharospasmus ohne organische Ursache. Klinische Monatsblätter Augenheilkunde, 167- 169, 1986.

20 Nepp J. T.Wenzel, Kuchar A., Steinkogler FJ. Blepharospasmen und Akupunktur – erste Ergebnisse eines Behandlungsversuches. Wiener Medizinische Wochenschrift 19, 457-458, 1998

21 Bergsmann O., Akupunktur und thorako-pulmonale Funktion. Praxis u Klinik d Pneumonologie, 33, Suppl 1695-700, 1979.

22 Bergsmann O., Projektionssyndrome 3) Bergsmann O. Über muskuläre Resonanz und Dämpfungsphänomene bei Akupunktur. Deutsche Zeitschrift Akupunktur; 28: 59-69, 1985.

23 Bergsmann O. Aktionssysteme des Bewegungsapparates. Schalt und Leitsystem der Sensomotorik. In: Bioelektrische Phänomene und Regulation in der Komplementärmedizin. Ed: O.Bergsmann. Fakultas Wien, 167, 177-184, 1994.

24 Elston JS, Botulinum toxin A in a clinical Medicine. Blepharospasmus grading. Journal of Physiology, 84: 285-289, 1990.

25 Kuang P., Huang H. Tourette Syndrom. In: Akupunkturbehandlung bei neurologischen Erkrankungen. Wühr, Kötzting 119-122, 1990.

26 Nepp J., Wedrich A., Akramian J., Derbolav A., Mudrich C, Ries E, Schauersberger J: Dry eyes treatment with acupuncture, a double blind study. In Advances in Experimental medicine and Biology. Ed: Sullivan. Plenum press NewYork, 1011-1016, 1998.

27 Takeheuchi K, K.Ikemoto, et al. The effect of acupuncture stimulation on tear secretion. Folia ophthalmologica Japan., 47; 1185-88, 1996

28 Henderson JW, Prough WA. Influenca de la edad y el sexo en el flujo lacrimal. Archieves Ophthalmology. 43: 224, 1950.

29 Norn M.S.: Diagnostische Methoden. In: Das trockene Auge in Klinik und Praxis. Ed: R Marquart, M.A.Lemp, Springer, Berlin, 133-187, 1990.

30 Huskisson EC, Measurement of pain. Lancet 9,1127-1131, 1974.

31 Bischko J. Technik der Akupunktur. In: Einführung in die Akupunktur. Ed: Bischko J, Haug Heidelberg; 39-50, 1972.

32 Kubiena T, A. Meng, Petricek E, Petricek U. Wiener Schule der Akupunktur, Handbuch für Akupunktur Orac, Wien 293-296, 1990.

33 Nepp J, Graeser L.S, Harrer S., Spacek A, Mudrich C, Stockenhuber D, Wedrich A. Tolosa-Hunt-Syndrome – Intractable Pain treatment with acupuncture? Acupuncture & Electro- Therapeutics Research. The international Journal. Vol 25, No.3&4, 155-164, 2000.

34 Weinschütz T. Schmerztherapeutische Basis und Konzepte in der Akupunktur. In: Akupunktur in der Neurologie. Ed: Pothmann R. Hippokrates, Stuttgart; 59-73, 1994.

35 Wall PD, Melzak R The textbook of pain. Ed: Churchill Livingston , Edingburgh London, NewYork, 4th edition, 1999.

36 Handwerker O. An electrophysiological investigation on cutaneous sensory nerve. Journal of Physiology 95, 1-28, 1939.

37 Hsieh JC, Tu-CH, Chen FP, Chen MC, Yeh TC, Wu YT, Liu RS , Ho LT. Activation of the hypothalamus characterizes the acupuncture stimulation at the analgesic point in human: A positron emission tomography study. Neuroscience letter. 307(2): 105-108, 2000.

38 Research group of Acup Anesthesia, Peking Medical College. Effect of acupuncture on pain threshold of human skin. Chinese Medicine Journal 3, 151-157, 1973.

39 Nepp J., K.Jandrasits, L. Linzmaier, J. Grünberger, G.Schild, J.Schauersberger, A. Wedrich, Psychovegetative Spannung bei KCS und Beeinflussung mittels Akupunktur Spektrum Augenheilkunde, 14/5: 244-248, 2000.

40 Trauschke W. Die Wirkung der Akupunkturanalgesie in: Akupunkturanalgesie. Ed: J. Bischko. Haug, Heidelberg ; 17-19, 1982.

41 Bischko J. Symptomverdeckung durch Akupunktur, pers. Mitteilung. 1991

42 Anton F. Schmerzmessung. Lehrbuch der Schmerztherapie, Ed: M Zenz, I. Jurna, WissenschaftlicheVerlagsGesellschaft, Stuttgart; 35-44, 1993.

43 Erb C, Batra A, Bromer A., Bayer AU, Müller Schaaf B,Thiel H-J. Psychiatrische Auffälligkeiten bei Patienten mit primärem Offenwinkelglaukom. Ophthalmologe 90: 635-639, 1993.

44 Potter D.E., Y Luo, T.C. Chu. Electroacupuncture inhibitory effect in Aqueous humor Dynamics. Investigative Ophthalmol. Vision Research, Vol 41,4 , 1324 B699, 252 2000.

45 Tolosa EJ, Periarteritic lesion of the carotid siphon Journal of Neurology, Neurosurgery and Psychiatry, 17, 300, 1947.

46 Trnavsky G. Rheographische Überprüfung der Durchblutungsänderung an der unteren Extremität nach perkutaner elektrischer Reizung von Akupunkturpunkten.

Wiener medizinische Wochenschrift. 15; 127(21): 659-62, 1977.

47 Ammer K, Schartelmüller T, Cao G, Kitzinger E; Melnizky P. Thermometrische Evaluierung unterschiedlicher Nadelungstechniken der Akupunktur. Deutsche Zeitschrift für Akupunktur.; 38(2): 33-36, 1995.

48 Litscher G; Schwarz G; Sandner-Kiesling A. Computerkontrollierte Akupunktur. Akupunktur. 26(3): 133-142, 1998

49 Moyer E.D., Setler P.E.. Pharmacology of Botulinum Toxin. In: Handbook of Dystonia. ed: J. King,C.Tsui, Decker, New York, 367-390, 1995.

50 Pomeranz B.. Wissenschaftliche Grundlagen der Akupunktur. in: Akupunktur. Springer Berlin Ed: G. Stux, N Stiller, B Pomeranz. 3-49, 1985.

51 Calne S., McConnel B., Purves B., Rammage L., Shaw C. Supportive Services and treatment. In: Handbook of Dystonia. Ed: J. King , C.Tsui. Decker, New York; 447- 461, 1995.

52 Hoffmann S.O., Eagle U.T. Psychodynamische Konzepte bei psychogenen und psychosomatischen Schmerzzuständen. In: Psychologische Schmerztherapie. Ed: H.D. Basler, Springer Berlin 141-159, 1996.

53 Murube J.: Geschichte und Entdeckung Ursachen d Syndroms. In: Das trockene Auge in Klinik und Praxis. Ed: R. Marqart, Lemp. Springer Berlin, 11, 1991.

54 Lemp M A, Wolfley D E: The lacrimal aparatus. In: Adler's Physiology of the eye. Ed: William Hart, Mosby, St. Louis, 18-27, 1992.

55 Lepore F E.: The Neuro–Ophthalmologic Case History: Elucidating the Symptoms In: Ophthalmology. Ed: Duane, CD-version 1989

56 Zimmermann M: Physiologie von Nozizeption und Schmerz. In: Psychologische Schmerztherapie. Ed Basler HD, C.Franz, B.KrönerHerwig, HP Rehfisch, H Seemann Springer Berlin; 59-104, 1996.

57 Nepp J; Derbolav A, Haslinger A.J, Mudrich C, Schauersberger J, Wedrich A., Akupunktureffekt bei Keratoconjunctivitis sicca. Klinische Monatsblätter Augenheilkunde; 215(4): 228-32, 1999.

58 Blom M; Lundeberg T, Dawidson I, Angmar Mansson B. Effects on local blood flux of acupuncture stimulation used to treat xerostomia in patients suffering from Sjogren's syndrome. Journal of oral rehabilitation 20(5): 541-8, 1993.