

# Laser Therapy and Laser Acupuncture in Wound Healing Disturbances in Common Wounds and Post Operative Complications

Dr. med. vet. Uwe Petermann (DVM)  
Schmale Strasse 20, 49326 Melle, Deutschland, Germany  
drUwePetermannMelle@t-online.de

## Summary

In this lecture the effect of laser therapy and laser acupuncture in therapy of common wounds and prevention of post operative complications is explained and demonstrated by a lot of cases. The findings of a long-standing own experience in this field are reported.

**Key-words:** Laser acupuncture, veterinary-medicine, wound healing disturbance

## Introduction

In common wounds and in post operative fields often complications take place in primary infected wounds following injuries and by pre and intra operative hospital infection. In many cases these infections prevent operation success and even worsen the pre operative state of the patient. Laser acupuncture is introduced as a helpful treatment to avoid and to treat wound complications.

## Advantage of laser acupuncture

Laser -acupuncture is a very effective combination of two treatments which are very effective each on its own especially in wound healing. Laser radiation as a proper method to accelerate wound healing was first described by Mester in early 1969 and will be explained as a local treatment in the further lecture (Petermann U. 1998). Acupuncture is setting the cybernetic regulation in motion again not only for the local affected area but also for the whole body by regulating Chi- flow that is mostly stagnated or disturbed in wounds coming from accidents or operation, because of interruption of tissue. Or in western sight it restores disturbed vegetative regulation, what is the reason for long standing pain, inflammation, poor blood circulation and muscle contraction. So we understand that low level laser treatment (LLLT) as a local treatment of wound healing and the cybernetic effect of acupuncture seems a very effective way to support optimal wound healing and avoid and treat wound healing disturbances.

As we know by the studies from Warncke, Popp and Karu, absorbed laser photons are transformed directly into cellular energy. Phosphorylation from ADP to ATP increases. This is particularly beneficial for unhealthy cells and cells in tissue modified by illness and cells working in wound repair. These cells have a particularly high energy requirement to perform their functions. The laser may play a decisive role by providing the necessary energy. Equally, an intense energy pulse in the nerve cells of the acupuncture points can lead to hyper polarisation and thus to unblocking of irritations; whereby the demonstrable pain reduction can be attributed to the laser as well as it stimulates acupuncture points in the same way as needles. The healing of wounds and repair of damaged ligaments are processes requiring high energy inputs. With laser light, the energy required for the breakdown of waste building blocks and the synthesis of new building blocks for wound closure can be provided more quickly and ligament or wound repair accelerated. These processes are very helpful in common wounds and postoperative wound healing as well. Important investigations have been made by the pioneer of LLLT, E. Mester, on this topic, which demonstrated as early as 1969, that the proliferation of collagen threads and a marked increase in cell activity after 1-3 laser irradiation of wounds. The results justify the assumption that even in the area not directly irradiated, healing is significantly improved due to the increased diffusion of bioactive substances.

In the meantime hundreds of scientific publications verify the effects of LLLT. I would like to select some investigations about confirmed laser therapeutic- and laser acupuncture -effects in human wound healing:

- 1.) wound healing (Mester E. et al. 1969)
- 2.) improved capillary circulation in micro circulatory conditions (Skobelkin O. et al. 1990)
- 3.) in infected abdominal wounds after surgery (Palmgren N. et al. 1991)
- 4.) skin-transplant surgery and plastic surgery (Ginsbach G. 1990)
- 5.) regeneration of nerve lesions and inhibited nervous functioning. (Midamba E.D. 1993, Rochkind S. 1988)
- 6.) tissue metabolism (Abergel P. et al. 1984)
- 7.) intra operative use in spinal cord operation (Rochkind S. 1991)
- 8.) in haemorrhagic effects on synovial membrane (Calderhead R.G. et al. 1992)

In the following I will introduce some investigations about laser therapy and laser acupuncture supporting operations, accelerating wound healing and treating post operative complications especially made in veterinary medicine:

- 1.) Laser therapy in treating equine injuries (Kerns T. 1986)
- 2.) Laser- effects in soft tissue in veterinary medicine (Lloyd et al. 1991)
- 3.) Laser acupuncture in postoperative infected tendovaginitis and joints in horses. (Petermann 1999)

Although we have a lot of intensive studies in human and veterinary medicine the optimal laser power to be used for therapy and the length of treatment can still not be clearly established, since there is naturally a considerable difference between the shaved skin of the laboratory rat and the hairy skin of a dog or horse. On the basis of my own experience, one can presume an optimal effect on surface structures as normal superficial wounds in veterinary medicine for laser output of 50-100 mW (continuous beam) or 50 - 100 W peak pulse power (pulse lasers) over an irradiation time of approx. 20 - 40 sec. For deeper structures, articular cartilage in post minimal invasive surgery, ligaments, fistulae, post or intra operative radiation of deeper wounds, the treatment duration must be increased to approx. 2-3 min. per point.

A very important theme we have to speak about is not only energy input into tissue by laser but also Impulse frequencies in pulse-lasers and modulated frequencies in continues- wave- lasers. When these laser- frequencies are in resonance with the radiated structures of the body, we have very much better results than with every other frequency, that is not in resonance. This is common knowledge of day to day use for more than 20000 doctors which are members of the European Academy for Acupuncture and Auricular- Medicine which use the Bahr and Nogier- frequencies.

The foregoing summary of the current state of knowledge in laser acupuncture in post operatic fields shows unambiguously that the laser may be used effectively for the re establishing of traumatised tissue as well as for acupuncture treatment. Optimal wound treatment for individual patients thus involves local laser irradiation in combination with appropriate acupuncture points. The points which are suggested in the following are very helpful but can only be meant as cook- book -points and of course should be complemented by individually indicated points.

## **Healing of common wounds**

The most simple but nevertheless very effective indication for laser acupuncture is the encouragement of wound healing after trauma or operations, in particular when a rapid resilience of the wound closure should be achieved or the wound is located in an area which is difficult to immobilise, such as joints. Even in many cases of infected wounds, where normally long-term drainage would be required after surgical intervention, per primam healing can often be expected after laser acupuncture and suture dehiscence can be avoided. With wounds with larger loss of skin surface or after the removal of larger areas of hyper granulation tissue wound closure normally occurs very quickly and without complications. The master point of wound healing is of course the tonifying point of the spleen because this is the point for anabolism.

## **Primary or secondary infected wounds**

Even when wound inflammation has taken place in primary or also secondary infected wounds the treatment is also very effective in acute and chronic inflammation of the pastern and of acute and chronic infected tendovaginitis and joints. A markedly more rapid and complete reduction of accompanying tissue swelling and other symptoms of inflammation such as pain and heat also occurs.

As one sees laser acupuncture is also exceptionally useful in infectious local inflammations. Very many cases of post operative inflammation processes, e.g. from wound infection, can be cured by laser when previous treatment with antibiotics have proved ineffective and, much easier, can be avoided when carried out before infection had taken place. Laser irradiation also has an outstanding effect on the maturation and demarcation of suppurative tissue. With fistula formation and disturbance to the wound demarcation and above all for deep wounds, laser acupuncture is to be highly recommended. There have even been cases of old scars in which the demarcation had clearly not been closed, opening again after 1-2 laser treatments, cleaning themselves and finally closing up again. Lastly, I would like to cite the highly effective option of treating infected joint and tendon sheath inflammations. At commensurate cost, in most cases excellent treatment success can be expected here. Two of these patients I will introduce as case studies in the further lecture.

When the wound before or while operation has become infected you need for demarcation 4 very effective acupuncture points: TH 5, Sp 4, Gb 41, Ki 3.

## **Corneal injuries**

Laser acupuncture is indicated to treat corneal injuries and to avoid postoperative complications after eye surgery. In the eye laser irradiation is to apply strictly tangential to avoid retina irritation. In LLLT at the eye I prefer cw lasers, because I have only tissue that is easy to penetrate because it and optical medium. The frequency for LLLT is normally Fr. B and in cases of inflammation Fr. A from Nogier.

Acupuncture points are St1, TH23, B11, Liv3, Sp2 and Gb1. In cases of inflammation you can combine these points with Gb41 and TH5.

## **Castration wounds**

After castration of stallions laser acupuncture is a very good method to prevent secretion congestion and inflammation with big swellings of the scrotum.

Intra operative radiation with frequency B according to Nogier is to combine with acupuncture points B123 and CV3. When the wound is still infected you can apply local radiation with frequency A according to Nogier and give Ki3 and TH5.

## **Postoperative prevention in disturbing foci**

At last we have to speak about a very important preventive therapy after operation. I mean therapy of disturbing foci as scars. I know it is not really accepted by the whole scientific community, but I saw in much more than thousand cases how it immediately can work in chronic pain and allergy e.g. To take care for these problems laser acupuncture can set demarcation of tissue in motion and prevent the wound becoming a disturbing focus. You also can treat old scars that have already been established as disturbing focus with local frequency A and Ki3 and TH5.

## **Special wound healing problems in horses**

There is a special problem in the wound healing in the distal part of the limbs in horses. This is very different to all other animals and even different to small horses. Normally the wound contraction makes the biggest part in the healing of larger wounds. But in the distal part of the horses limbs we nearly find not any wound contraction. That means that the whole wound repair is only possible by epithelisation from the borderline of the normal skin. This is a very slow process, because the new epithelia only grows 1-3mm per month. The 2<sup>nd</sup> problem is the proliferation of hyper granulation tissue in these cases. Here laser acupuncture makes really miracles as I will show you in some patients.

## **Patients**

All the demonstrated patients had very serious problems with wound infections after injury or operation, which have had not been cured by normal treatment for a long standing time. One horse had stayed for 2 years in a clinic for wound healing without success. Another one had huge hyper granulation tissue in spite of intensive former treatment. One infection in the shoulder joint of a horse was caused by a sharp wooden post which had broken through. Post operative drainage and douche could not stop secretion, suppuration and suture dehiscence. In another patient a postoperative infected tarsitis followed a chip operation (in a clinically completely healthy horse), and in another one a postoperative infection of the digital synovial sheath of the fetlock resulted following an operation on the palmar annular ligament of the fetlock. Four stallions had fistulas of the funiculus testis and chronic swellings with lameness after castration. One horse had persistent purulent sinusitis after trepanation and tooth- extraction. One horse had extreme pain in the operation- area after “kissing spines” -operation for several month. One horse developed a necrotic laminitis of both hind legs after castration. One dog was completely paralysed in the left hind leg after a operation of a femur fracture for more than one year.

Prior to the start of laser acupuncture treatment, all of the patients had exhausted all conventional medical therapies over a long period of time, some of them in several clinics. The prognosis in most cases was either unfavourable or it had been suggested that the animal should be put to sleep. All of the animals were given anywhere from 9 to 20 laser acupuncture treatments with LLLT and individually selected acupuncture points. Treatment was carried out with an impulse laser (60 watts and 90 watts pulse peak power, 200 nsec pulse width, from Reimers und Janssen, Berlin). Following laser acupuncture all of the patients had succeeded in getting a very much better state and after a convalescence period it was possible to work again with all of the horses and the dog which was completely paralysed on his hind leg had full function of his leg again.

### **Case study 1**

A chip in the right ankle joint was noticed during a preventive X-ray examination of a two-year-old crossbred stallion. Following an endoscopic removal of the fragment, an infectious tarsitis developed. This was first treated by the clinic where the operation had taken place. Intensive treatment followed at three other clinics. 6 months after the operation, I examined the horse. The horse did not set the diseased limb down and only with great effort could it move forward with three legs. The circumference of the joint was 61 cm, while the healthy tarsal joint measures 42 cm. After fourteen days or seven treatments, the circumference of the joint had been reduced to 47 cm, and the horse could be walked and also be

exercised at a trot for about 5 minutes. After trotting for approximately one minute, the horse was able to move without a limp. After the third day of exercise, a new feverish inflammation of the joint appeared spontaneously, with over 41°C body temperature and pronounced swelling of the joint. During the acute phase, the inflammation was treated with antibiotics (parenteral and not intra-articular). After approximately four weeks with twelve additional treatments, the patient was released and gradually began training to full capacity at home in the following 3 month.

## **Case study 2**

Following a routine endoscopy of the digital synovial sheath of the fetlock in a six-year-old crossbred gelding, which took place within an operation on the palmar annular ligament of the fetlock, the healing of the wound was disturbed by a continuous discharge of synovia. Despite intensive therapy by the clinic where the operation had been performed, there was at first an infection of the tendon sheath and a necrotizing inflammation in the area where the operation took place. Six weeks after the operation, the clinic decided to suggest euthanasia to the owner, as continued deterioration of the horse's condition seemed definite and the infection of the tendon sheath could not be controlled. However, the owner decided to try acupuncture treatment for the horse, a decision which was strongly opposed by the clinic. These were the findings: approximately 6cm x 2cm sized area of wounds with escaping synovia and a necrotic centre. A brisk walk was indeed possible, but only with a highest degree of lameness. The foot was set down only at the tip of the toe. Due to the adhesions of the tendon sheath, it was not possible to use the fetlock joint to press down. The circumference of the fetlock joint was 49 cm (healthy joint measures 43 cm). After two treatments, one a day, no further secretion from the tendon sheath could be determined. A marked necrotic area of approximately 1 cm in diameter was considerably reduced (circumference still 46 cm). After five days, that means five treatments, the wound was completely dry and had shrunk to half its original size. After ten days the wound had almost completely closed (picture 5); there was now only a slight lameness when walking, which gradually disappeared. Even in trotting, only a slight to medium limp was noted. After a total of fourteen days of treatment, the patient was released, where it was receiving additional daily laser acupuncture treatments on scissors -marked points from its owner. The horse was gradually increasing its walking and trotting in order to further loosen the adhesions and to continue reducing the tendon's contraction. Half a year later the horse passed completely restored a horse selling investigation and was sold to another owner.

### **Case study 3**

A 3 year old gelding had a very serious post operative fistulation of the funiculus testis with a durable big swelling and stiffness of the hind limb. After 3 month period of therapy with several antibiotics by two different clinics and a second operation the gelding had a serious lost of weight and the fistulation had not been stopped. A therapy with laser acupuncture followed. 7 treatments with 5 minutes local laser-radiation frequency A from Nogier of the funiculus and laser acupuncture of the points Bl23, Ki3, TH5 and Sp4 were carried out with an interim of 3- 4 days. At the end of the therapy the fistula had been closed and the swelling and the stiffness of the hind limb had disappeared.

### **Case study 4**

A very good competition horse (jumper) had had a very serious pain still 10 weeks after “kissing spines” -operation on th7/th8. The pain was so hard, that the horse was extremely anxious to be touched in the operated area, when it came for acupuncture. The operation wound had closed and showed no sign of inflammation. During the previous treatment antiphlogistics, cortisone and for 2 weeks antibiotics had been given. The very valuable horse was in danger of being put to euthanasia. The following acupuncture treatment was carried out: local treatment of Th7th/Th8th with frequency A (anti inflammatory frequency) and frequency E (frequency for the spinal cord) each for 1 minute. As acupuncture points where treated TH 5 and Gb 41. Immediately after the first treatment the pain in the operation field had completely disappeared, even when strong pressure was applied. Five treatments, one a week, were necessary for complete restoring of the horse. After the 2<sup>nd</sup> treatment the horse could be started with training and after 8 weeks was placed in a „S“ jumping tournament

### **Case study 5**

An 8 year old Arabian stallion got a serious necrotic laminitis on both hind legs 3 days after castration by nearly complete stagnation of liver and kidney energy -flow. He came to me nearly standing only on his front legs. In spite of the very hard pain and the very bad prognosis we wanted to give him a chance for two days. We decided to put him to sleep, when he had no improvement after this time. Because of the 3 day former given anaesthesia we tried to remove the hoof -horn with nerve block and sedation. A complete digital nerve anaesthesia and fibularis- and tibialis- nerve anaesthesia was given. After surgery we saw large areas of necrotic laminitis on both hoofs. The daily treatment was local laser radiation of the hoof and the castration wound with frequency A from Nogier. We made daily new bandages with acridine fluids with homeopathic dilution of Calendula, Echinacea and Arnika.



Acupuncture points were given all 2 days: Bl 23, Bl 18, Liv 13, CV 3 (area of the castration wound)), Liv 3 and Ki 3. Two days later we considered a clear reduction of pain and after further 2 days we saw a very good demarcation of the necrotic areas in the hoof. After 3 weeks we had completely closed dry hoof horn and gave him back home to his owners. 1 month later he jumped over his pasture fence and made an excursion into the nearby wood.

### **Case study 6**

A 2 years old gelding had a hand palm sized lost of skin in the flexor area of the carpal joint. After 6 weeks of common treatment the wound looked really terrible because of hyper granulation tissue. The clinic decided to put the horse to sleep but the horse for a good luck found a new owner who knew about laser acupuncture, bought it from the slaughter and brought it to me for treatment because it former was a very expensive horse. After surgical removal of the hyper granulation tissue LLLT and laser acupuncture was applied. After half a year with 3 periods with each 10 treatments the wound was covered.

The treatment was daily treatment with LLLT and laser acupuncture and new bandages with copper sulphate fluids with homeopathic dilution of Calendula, Echinacea and Arnika. The acupuncture points where Sp2, for acceleration of wound healing ,3H5 for wound demarcation and Ki3 and Liv 8 because this horse had a yin deficiency in the hind leg from disturbing focus of the castration wound that was treated local with Fr. A from Nogier.

### **Case study 7**

This was a 3 year old gelding which was treated for more than 2 years in a clinic. The horse had a big scar granuloma and the wound didn't close after all the years of treatment. After removal of parts of the granuloma tissue and cleaning of the wound with a copper sulphate fluid with homeopathic dilution of Calendula, Echinacea and Arnika the horse was treated in the same way as the horse above. 2 weeks after the first treatment the wound looked very good and was nearly closed. After another week the wound closure was completed.

## **Discussion**

In all the patients, it could be seen that laser acupuncture had a rapid influence on wound healing, demarcation and inflammation. On the other hand, restitution of the degenerative consequences of the inflammation, including adhesions, defects in the cartilage and similar problems presented considerably greater difficulty and required far more time. Nonetheless, healing was achieved in all cases. These cases clearly demonstrate how it is possible to expand the limits of therapy with the help of laser acupuncture. There should also be said, that many operations can be avoided, if acupuncture would be tried as therapy before (without castration). Anyway, laser acupuncture is shown as a very good method to reduce post operative pain and to accelerate wound healing. And also in many cases, when an operation has not had the beneficial effect that was intended because of complications after the operation. But even in such cases, when the operation has worsened the former state of the patient, laser acupuncture is a possible way to help in many of them.

## References

- Basko I. (1983). A New Frontier: Laser Therapy. Calif Veterinarian.; 10: 17.
- Bergsmann, O. (1977) : Die biokybernetische Wirkung der Akupunktur im klinischen Versuch. Dtsch. Ztschr. f. Akup. 5, 131ff
- Calderhead R.G. et al. (1992) A Study on the Possible Haemorrhagic Effect of Extended Infrared Diode Laser Irradiation on Encapsulated and Exposed Synovial Membrane Articular Tissue in the Rat. LLLT-Reports, 1992, 65-69
- Ginsbach G. (1990) Laser Biostimulation in Plastic Surgery. Laser Therapy, 1993, 169- 173
- Karu T.I. (1987) Photobiological Fundamentals of Low-Power Laser Therapy. IEEE Journal of Quantum Electronics QE-23, 1703-1717
- Karu T. et al. (1993) Suppression of human blood chemiluminescence by diode laser irradiation. Laser Therapy 5, 103-109
- Kerns T: HeNe Lasers Show Promise in Treating Equine Injuries. Lasers & Applications. 1986; Dec: 39.
- Maeda T. (1989) Morphological Demonstration of Low Reactive Laser Therapeutic Pain Attenuation Effect of GaAlAs Diode Laser. LLLT-Reports, 1989, 23-31
- McKibbin L. and Paraschak D. (1983): A Study of the Effects of Lasering on Chronic Bowed Tendons at Whitney Hall Farm Limited, Canada, January, Lasers in Surgery and Medicine. 1983; 3: 55.
- Mester E. et al. (1969) Experimentelle Untersuchungen über die Wirkung von Laserstrahlen auf die Wundheilung. Z. Exper. Chirurgie 2, 94-101
- Midamba E.D. (1993) Low Reactive-Level 830nm GaAlAs Diode Laser Therapy Successfully Accelerates Regeneration of Peripheral Nerves in Human. Laser Therapy 1993, 5, 125-129
- Oshiro, T., Maeda, T. (1993) Application of 830nm Diode Laser LLLT as Successful Adjunctive Therapy of Hypertrophic Scars and Keloids. Laser Therapy 1993 155-166
- Palmgren N. et al. Low Level Laser Therapy of infected abdominal wounds after surgery. Lasers Surg Med. 1991; Suppl 3:11.
- Petermann, U. (1998) Lasertherapie in der Veterinärmedizin. Vet Impulse 24, 12-13
- Petermann, U. (1999) Laserakupunktur bei infizierter Tendinitis des Pferdes. Prakt. Tierarzt, 1/1999
- Popp, F.-A. (1984) Biologie des Lichtes, Paul Parey, Berlin/Hamburg

Rochkind S. et al. (1991) Intraoperative Clinical Use of LLLT Following Surgical Treatment of the Tethered Spinal Cord. LLLT-Reports, 1991, 113-117

Smith, K.C. (1991) The photobiological Basis of Low Level Laser Radiation Therapy. Laser Therapy, 19-24

Skobelkin O.K. et al. (1990) Blood Microcirculation under Laser Physio-and Reflexotherapy in Patients with lesions in Vessels of Low Extremities. LLLT-Reports 1990, 69-77

Warnke, U. (1987) Wie Licht-Energie zu Zell-Energie wird. Ärztliche Praxis Jahrg. 97, 3039-3040