ACUPUNCTURE - INTRODUCTION

Acupuncture (AP) can be used to obtain pain relief in clinical disorders or as an alternative or complementary method of inducing pain control during surgical procedures. AP analgesia (AA) is a misnomer. It should really be called AP hypoalgesia. It is a pain inhibition phenomenon caused by stimulation of peripheral nerves via certain AP points.

The degree of pain inhibition may be complete or partial. In vet surgery, the AA technique, if applied carefully, often is sufficient to allow surgery without the use of other anaesthetics. Consciousness is retained throughout the operation but many animals become slightly drowsy (as if slightly sedated) during and for a short time after AA stimulation. All other sensations (touch, traction, pressure, tickle etc) and reflexes (to sight or sound stimuli, fear, traction etc) are intact. **AA** can be induced by simple **AP** (manual twirling of the needles) but it is more common to use electrical stimulation (**ES**) via the needles. In this case the technique is called Electro-**AP** analgesia (**EAA**).

In emergencies a slight degree of hypo-algesia can be obtained in humans and animals by heavy digital pressure over the correct AP/nerve points. This method may have application in time of war or national disasters, when anaesthetists and anaesthetics may not be available. AA also can be induced by other stimuli, such as injection or electro-static fields applied to the points. Since the late 1980s, research on uses of low-power (cold) Laser as an AA stimulus is ongoing, with some positive results. However, it is too early to attempt to assess that method.

Stimuli via the AA points are carried in the peripheral sensory nerves to the spinal cord. They reach the midbrain via the ascending spino-thalamic tracts. In the midbrain the ascending signals cause release of endorphin, serotonin and other neurotransmitters which activate a "descending inhibition mechanism" and prevent the "pain signals" from the surgical area from reaching the cerebral cortex. Thus, AA can be said to "close" various "pain gates" in the nervous system. These gates are thought to be located in the spinal cord, thalamus and possibly other areas. The result is that the human (and, presumably, the animal) patient can feel the knife, the touch and traction etc but does not "feel pain". Stimulation-Produced-Analgesia (SPA): Since the 1970s, western researchers, working independently of the Chinese, found that various types of stimuli applied indirectly or directly to the nervous system can reduce or abolish clinical and operative pain. Transcutaneous Electro-Stimulation Analgesia (TESA) has been used in childbirth in the human female and is somewhat comparable to EAA. Dorsal Column Stimulation (DCS) of the spinal cord has been used in intractable pain in humans. ES via electrodes implanted in specific sites in human or animal brain can induce a high degree of analgesia, usually involving the entire body. Direct ES of human thalamic or spinal areas can abolish clinical pain. Vaginal stimulation (electrical or mechanical) can cause potent whole-body analgesia in rats.

TYPES OF OPERATIONS UNDER AA

Since the mid 1970s, major surgery has been done in animals under AA as the sole analgesic agent in many countries in the West. These include France, Germany, Austria, Belgium, USA, Canada and Australia.

Workers in Eastern countries such as China, Japan, Taiwan etc have used the method for many years. The animal species involved include horses, mules, donkeys, cattle, sheep, goats, pigs, monkeys, dogs, cats, rats, cavies, guinea pigs and mice.

Types of surgery successfully done in animals include:

- caesarean section, ovario-hysterectomy;
- gastric and intestinal surgery;
- nephrectomy;
- removal of mammary and skin tumours;
- surgery of the eye, ear, anal and vaginal region, limbs and teats;
- surgery on the lip, oesophagus, trachea, frontal sinuses;

- rumen;
- navel hernia repair;
- surgery on the bladder and urethra;
- orthopaedic surgery (bones, joints);
- removal of parotid and submaxillary glands;
- castration, orchidopexy, inguinal hernia.

The late Dr. Westermayer's method for reposition of the prolapsed uterus has been mentioned already, as has AP therapy for the relief of dystocia.

EQUIPMENT AND METHODS OF RESTRAINT FOR AA

Equipment

Most AA is done using electrostimulation (ES) through needles in the correct points (Electro-AP analgesia = EAA). The choice of points will be discussed later. Many different types of electrostimulator are on the market. Some are made in China, others in Japan, USA, Canada, Europe and Australia etc.

The equipment should be strong, portable and battery-operated. It should have outputs for at least 8 electrodes. There is little standardization of equipment. Newer models for human use would be adequate for EAA in animals. It is safer to use models which deliver a bipolar waveform, (+) and (-), at each electrode. This prevents the development of serious electrolytic lesions which could arise if a monopolar waveform was used for long periods, as in prolonged surgery.

The Model 71-3 General Purpose Electro-AP Apparatus is suitable for AA as well as AP therapy. I had 8 teeth extracted and 8 teeth filled under EAA with the Model 71-3. I used mainly ChiaChe (ST06) plus Earlobe "Dental Analgesia Point" on the affected side. Needles were inserted 12-20 mm in the points. Voltage was increased slowly to maximum tolerance (anaesthesia mode, dense-disperse waveform). Occasionally adjustable waveform at 5-10 Hz was used.

After 30 minutes of induction, the output was usually at a setting of 4-5 on a 10 point scale. When heavy needle-probing of the gum caused no pain, dentistry could begin. Dental fillings under EAA were uneventful except in deep root fillings. If "nerve pain" arose, turning up the voltage usually controlled it.

Extraction was painless or caused minimal pain in 5/8 cases but 3/8 extractions caused moderate to severe pain but were completed without the use of drug analgesia. An impacted wisdom-tooth required 10 minutes of very strong rocking to remove it from its socket. There was rather severe pressure-pain with that attempt but I was able to tolerate it without asking for another anaesthetic. My dentist told me that most patients could not have had the tooth removed unless they had general anaesthesia.

In human patients, Caesarean section has been done in Japan using electro-static or electromagnetic fields around the hands and feet. The apparatus used does not appear to have been tested in Europe or America. Childbirth has been helped in 60-80% of women treated by transcutaneous ES analgesia (TESA) of the thoraco-lumbo-sacral region. The apparatus used was the Travisens, available from Dan Sjo Elektronik AB, Box 144-17224, Sundbyberg, Sweden. TESA does not appear to have been tested in animals.

Restraint for AA in animals

Surgery under AA requires adequate restraint because consciousness and all sensations and reflexes (except those of pain) are retained.
In large animals, operations under AA may be performed with the animal in the standing position or in dorsal, lateral or ventral recumbency, depending on the type of operation and whether or not the animal is quiet. Horses and nervous cattle should be knocked by ropes or a short-acting knock-down anaesthetic. Nervous animals may be given a tranquilliser i/v.

Recumbent animals should be roped securely and an attendant should ensure that the head is kept down. A blindfold over the animal's eyes helps to avoid fright by visual stimuli. Unnecessary noise, movement and fuss should be kept to a minimum.

The standing position may be used for surgery in quiet cattle. An attendant may hold the nose and the animal should be restrained in a suitable cattle crate, or ropes may be used through rings in the wall to keep the animal in one position. Kicking may be prevented by the usual methods as applied in operations under local anaesthesia.

Small animals are normally operated on in lateral, dorsal or ventral recumbency. If a special operation-harness is not available they are restrained by tying bandages from the hocks and elbows to suitable anchor-points on the operating table. Dogs are excellent subjects for AA but it is advisable to tie a tape bandage around the jaws to prevent biting. It helps if the owner or an attendant talks to the dog and comforts the animal from time to time during surgery. Cats are difficult animals to handle and some vets who have tried AA in cats have ceased to use the technique in this species.

AA TECHNIQUES IN LARGE AND SMALL ANIMALS

Electro-AP analgesia (EAA) is the most common method used. When the animal is properly restrained, AP needles are placed to the correct depth in the AA points related to the operation site.

The stimulator is checked to ensure that the power switch is off. The output leads are then connected to the needles. Do not connect the leads from one output across the thoracic or posterior cervical region. This is especially advisable if the instrument uses (+) and (-) electrodes. In this case the correct connection would be as in the diagram on the next page.

An output circuit placed across the thorax may interfere with cardiac function and may, on rare occasions, cause cardiac arrest. Tape or suture the needles firmly in position. Otherwise, they are liable to become dislodged by muscle twitches induced by the stimulation, or by struggling in nervous animals.

When the needles are in position, the output controls are checked to ensure they are set at zero. Attach the leads and turn on the power switch.

Turn up the output controls slowly until the needles begin to twitch in time with the frequency of the stimulator. Increase the output voltage from each control to the maximum tolerance of the patient. At that point, the animal indicates a degree of discomfort or pain (restlessness, defensive reaction, struggling, vocalisation etc). Reduce the output to a "strong but acceptable level" (that which can be tolerated without obvious discomfort). Excessive stimulation reduces the EAA effect and to weak a stimulus may induce little or no analgesia. Note: A needle can not twitch unless it is embedded in reactive muscle. As long as one of a pair is twitching, the paired needle is also receiving a similar stimulus. Needles may not twitch in points such as GV26.

If output voltage is too high at such points, the animal will indicate discomfort. In that case, reduce the output to the tolerance of the patient. Every 5 minutes or so, after switch-on, the operation site is tested for analgesia using rat-tooth forceps, towel clip, clamp or pin prick. Initially, full sensitivity to pain is present, as indicated by local muscle twitch or guarding, vocalisation or defence reactions/struggling.

After 5-10 minutes, the response to pain stimulus decreases. After 20-40 minutes, in successful cases, the animal makes no response to strong pain stimuli in and around the operation site. The operation may then commence.

Pain stimuli may exceed the hypoalgesia (thereby inducing pain response by the animal) at certain stages of the operation, especially during incision and suturing of the skin, serosa (peritoneum, pleura etc) and incision of periosteum and nerves. During these stages of the operation the frequency or output voltage should be increased. This is normally sufficient to counteract the pain.

Occasionally (in those animals which respond poorly to AA) it may be necessary to use small volumes of local anaesthetic injection or spray at these stages. In the first few minutes after stimulation

begins it is usual for the animal to show a mild stress reaction (dilated pupils, increased blood pressure, faster respiration and heart rate). These quickly return to normal or near normal levels, and should remain at this level during the operation.

Studies of EEG patterns in animals under AA indicate that brain waves are in the alpha range (8-13 cycle per second) i.e., similar to those of drowsiness or light sleep. However, the animals are still conscious and can eat or drink and (in dogs) wag the tail if petted by someone they know. Because sight and hearing are unaffected (pupil reflex is also intact), unnecessary noise should be avoided and a blindfold may be desirable.

Pupillary dilation and salivation occurs in some animals. If salivation is excessive or retching/vomiting occurs, this usually indicates that excessive traction on mesentery/internal organs is the cause. This may be partly counteracted by increase in frequency or output of the AA stimuli.