

General anaesthesia in a case of Laparotomy on a Harbour Seal (*Phoca vitulina*)

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Introduction

Both in the treatment of disease and for purposes of scientific study there is a need for general anaesthesia of seals. Since general anaesthesia makes inroads on the physiology of the animal, the anaesthesia should be specifically tuned to the physiology of the animal to be anaesthetized. In this context adaptation to the specific physiology of ventilation and circulation are essential.

With seals, for example, the extra quantity of smooth muscular tissue around the bronchii and bronchioli is a factor to be taken into account. Moreover, there are specific adaptations to the circulation in the shape of venous pooling in the venous sinuses, and regulation of the peripheral circulation. These adaptations must not be restricted to the period of general anaesthesia, but should be closely watched over during the post-operative period. The considerations of a physiological kind lead to the conclusion that a balanced general anaesthesia with proper monitoring of circulation and ventilation would appear to be the best method.

Method

Monitoring was achieved with percutaneous pulse oximetry using a Nellcor set.

With a percutaneous sensor on the interdigital membrane of a hind flipper continuous information was obtained about heart rate, peripheral blood circulation, and oxygen saturation of the peripheral blood (see Fig. 1).

As premedication Bricanyl† was administered. Bricanyl (terbutaline sulphate) is a sympaticomimetic. It relieves bronchial spasms without causing acceleration of the heart rate. Its action is based on highly selective blocking of beta-2 receptors in the trachea and bronchial musculature. The time required by this drug to take effect is relatively short, about 5 minutes, and its effect mostly lasts at least 4

hours. The dose administered intramuscularly was 0.25 mg per 20 kg body weight.

General anaesthesia was introduced using Ketamine and Valium. Ketamine (ketamine hydrochloride) causes a dissociative anaesthesia with deep analgesia. The dose administered was 6 mg per kg body weight. Valium (diazepam) was added in a dose of 0.2 mg per kg body weight. This prevented excitation caused by Ketamine and also induced a mild relaxation. Both Ketamine‡ and Valium§ were administered intramuscularly.

After 15 minutes to allow the drugs to take effect the seal had been sufficiently sedated anaesthesiologically for the animal to be put on the operating table without reaction.

The anaesthesia was potentiated using a nitrous oxide/oxygen mixture with a 2:1 ratio, with a nitrous oxide flow of 6 litres per minute and 3 litres of oxygen per minute (Fig. 1).

To this was added the anaesthetic Ethrane¶ (Enflurane) in doses of 1-2%, using a specially calibrated evaporator. Ethrane provides good anaesthesia and analgesia with slight muscle relaxation. By administering Ethrane saliva and bronchial secretion is not stimulated, while pharynx and larynx reflexes are suppressed quickly and effectively.

The gas mixture could be administered by letting the seal breathe in a closed space (see Fig. 2).

Using this method an anaesthesia of 90 minutes was effected, during which a laparotomy was carried out with a left lateral incision to implant a sensor in the free abdominal cavity.

Discussion

Good preconditioning of the seal to be anaesthetized is very important to avoid complications.

To prevent aspiration, a period without food of at least 3 hours should be observed. This period must not be longer than 5 hours, however, otherwise dehydration symptoms are likely to develop.

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†Bricanyl manufactured by Astra.

‡Ketamine manufactured by Parke-Davis

§Valium manufactured by Roche

¶Ethrane manufactured by Abbott

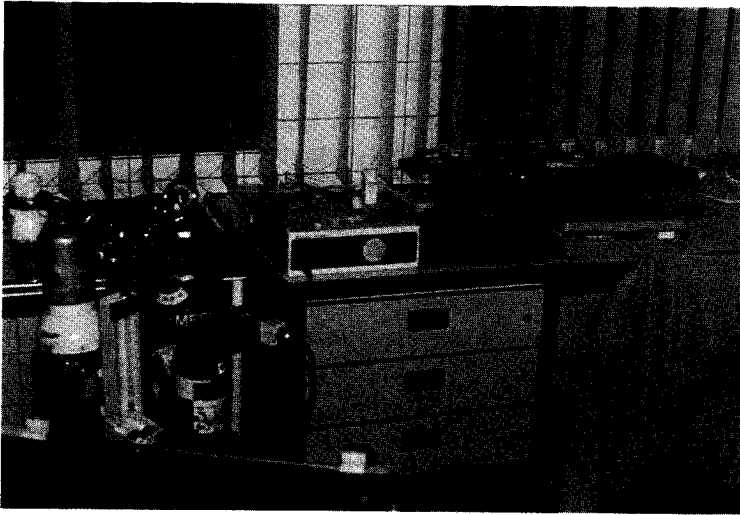


Figure 1. Anaesthesia and monitoring equipment. Left: percutaneous pulse oximeter (Nellcor). Right: flow meter set for nitrous oxide/oxygen mixture and calibrated Ethrane evaporator.



Figure 2. The seal under anaesthesia. The nitrous oxide/oxygen/Ethane mixture is administered in a closed space.

Further, the seal must be externally dry and preferably kept in a space with a constant temperature of approx. 20°C and a relative humidity of more than 55%.

These two measures will ensure a stable, open peripheral circulation, which in turn will cause satisfactory distribution of the intramuscularly administered drugs.

Following premedication it is most important that the seal should be kept in quiet surroundings. After

the administration of Ketamine and Valium external stimuli should be avoided so as not to elicit excitation.

The monitoring system enables the depth of the analgesia to be satisfactorily controlled. With sufficiently deep anaesthesia the oxygen saturation is about 98%, the heart rate around 100/min, and there is a good peripheral pulse.

During this phase nitrous oxide/oxygen in a 2:1 ratio will suffice. If the heart rate rises to 120/min

with falling oxygen saturation and weakening peripheral pulse, the Ethrane concentration may be increased to 2%. This will ensure that within minutes stable physiological values are regained once more.

While a balance is thus carefully maintained, all the necessary physiological data of the seal are monitored and this enables the depth of anaesthesia to be constantly adapted. On completion of the operation Ethrane and nitrous oxide administration may be stopped. After giving oxygen for 10 minutes the seal was fully awake again.

Recommendations

1. Space with stable temperature and relative humidity
2. Good premedication adapted to the animal to be anaesthetized
3. Separation operative group and anaesthesia group
4. Good monitoring to achieve balanced anaesthesia
5. Good after-care facilities.

In the post-operative phase the seal may feature a rapidly rising body temperature. If this occurs directly after surgery it is probably always due to dehydration. That is why about 2 hours after the anaesthesia administration of moisture should commence using oral rehydration salts 100 cc per 10 kg body weight. These salts are to be administered hourly and the procedure must be repeated 3 times.

As a result of the analgesia the resistance to infections tends to deteriorate. Especially in seals, where lung parasites like parafilaroides are endemic, the anaesthesia may give rise to exacerbations after some days to 2 weeks after the anaesthesia. Administering antibiotics as a preventative measure appears to be sensible only after screening of mouth and anus has produced a good picture of the bacteria present and their resistance patterns.

Giving proper attention to the factors described above has led to satisfactory anaesthesia of seals, in which the physiological characteristics of the animal are taken into full account.