

Introduction to anesthesia for medium-sized animals (dogs and pigs)

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Content of this video

- 1) Basics of anesthesia
- 2) Inhalation anesthesia using a ventilator
 - ① Preoperative management
 - ② Intraoperative management
 - 1) Respiratory management
 - 2) Circular management
 - 3) Fluid/metabolism management
 - 4) Brain/nervous system management
 - ③ Postoperative management

Standards for care and storage of experimental animals and alleviation of suffering

Notification of the Ministry of the Environment in 2013

4. Individual Criteria

1 Facilities for conducting experiments, etc.

(1) Considerations in conducting experiments, etc.

Experimenters should endeavor to use experimental animals appropriately to the extent necessary to achieve the purpose of the experiment. In addition, to the extent that it does not interfere with the achievement of the purpose of the experiment, etc., administer anesthetics, analgesics, etc., shorten the period of experimentation, etc. as much as possible Appropriate measures, such as keeping warm, should be taken so as not to inflict pain on experimental animals.

Refinement of the 3Rs of animal welfare
(reduction of pain)

Purpose of anesthesia

Animal health care during surgery.

1) Relieve animal pain.

2) Keep animals safe.

Unlike humans, general anesthesia may be required when it is absolutely necessary to keep the animal still.

General anesthesia and local anesthesia

General anesthesia

It is defined as “drug-induced loss of consciousness that does not arouse even with a painful stimulus”. That is, as a result of using a drug, the animal does not wake up even when a painful stimulus is applied.

Local anesthesia

A method of anesthesia in which an analgesic is injected into the surgical site to relieve pain only in that area.

Anesthesia given by a dentist during dental treatment.
In animals, 2% lidocaine is common.

Four elements of general anesthesia

- 1) Sedation/Hypnosis
- 2) Analgesia
- 3) Muscle relaxation
- 4) Suppression of harmful reflexes

It is difficult to satisfy these four factors with a single anesthetic and maintain the respiratory and circulatory systems.

Therefore, anesthesia that combines multiple drugs to maximize their action and minimize side effects is called "balanced anesthesia", and it is important to plan and practice anesthesia based on this concept.

Vital sign

A vital sign.

It includes blood pressure, pulse, respiration, and body temperature.

At the same time as being an important indicator that affects the life and death of animals,

A slight change indicates the state of health of the animal at that time.

	dogs	pigs
Body weight (kg)	15-20	40-200
Body temperature (°C)	38.3	39
Respiration rate (breaths/min)	25	12-18
Heart rate (beats/min, resting)	100	220

「Laboratory Animal Anaesthesia 4th (2015), Paul Flecknell (Author), Academic Press」

Injection anesthesia and Inhalation anesthesia

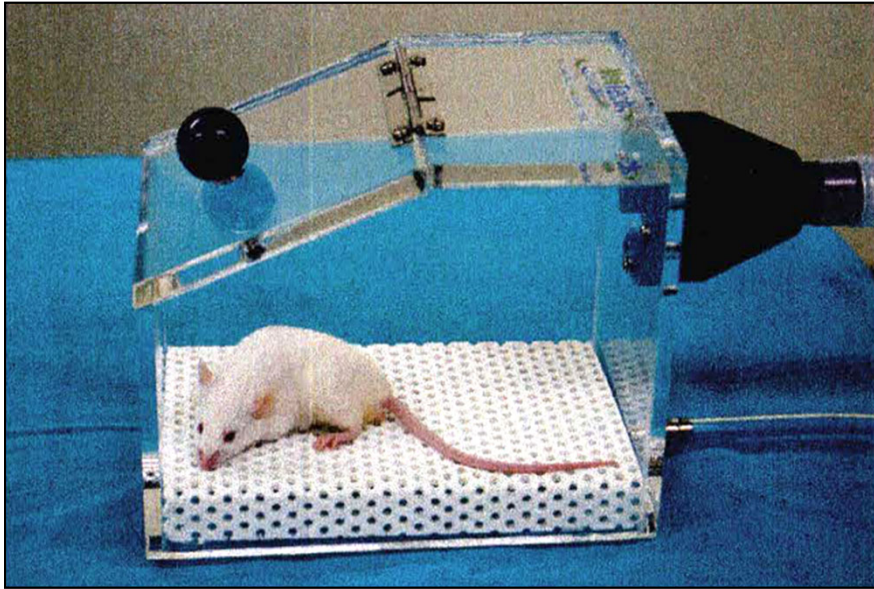
Anesthesia methods and drugs	dogs	pigs
Injection anesthesia		
Three kinds of mixed anesthetic		
Medetomidine	1.0 mg/kg, <i>i.m.</i>	0.1mg/kg, <i>i.m.</i>
Midazolam	1.0 mg/kg, <i>i.m.</i>	0.3 mg/kg, <i>i.m.</i>
Butorphanol	0.1 mg/kg, <i>i.m.</i>	0.3 mg/kg, <i>i.m.</i>
(antagonist) Atipamezole	2.5 mg/kg, <i>i.m.</i>	0.5 mg/kg, <i>i.m.</i>
Ketamine + xylazine	15 mg/kg <i>i.m.</i> +1 mg/kg <i>i.m.</i>	2-5 mg/kg <i>i.m.</i> +1 mg/kg <i>i.m.</i>
Propofol (5-10 minutes)	10-12 mg/kg, <i>i.v.</i>	2.5-3.5 mg/kg, <i>i.v.</i>
(more than 20 minutes)	maintained at 0.2-0.4 mg/kg/min	maintained at 0.1-0.2 mg/kg/min
Inhalation anesthesia		
Isoflurane	1~4%	1~4%
Sevoflurane	~5%	~5%

i.m. : Intramuscular administration 、 i.v. : Intravenous administration

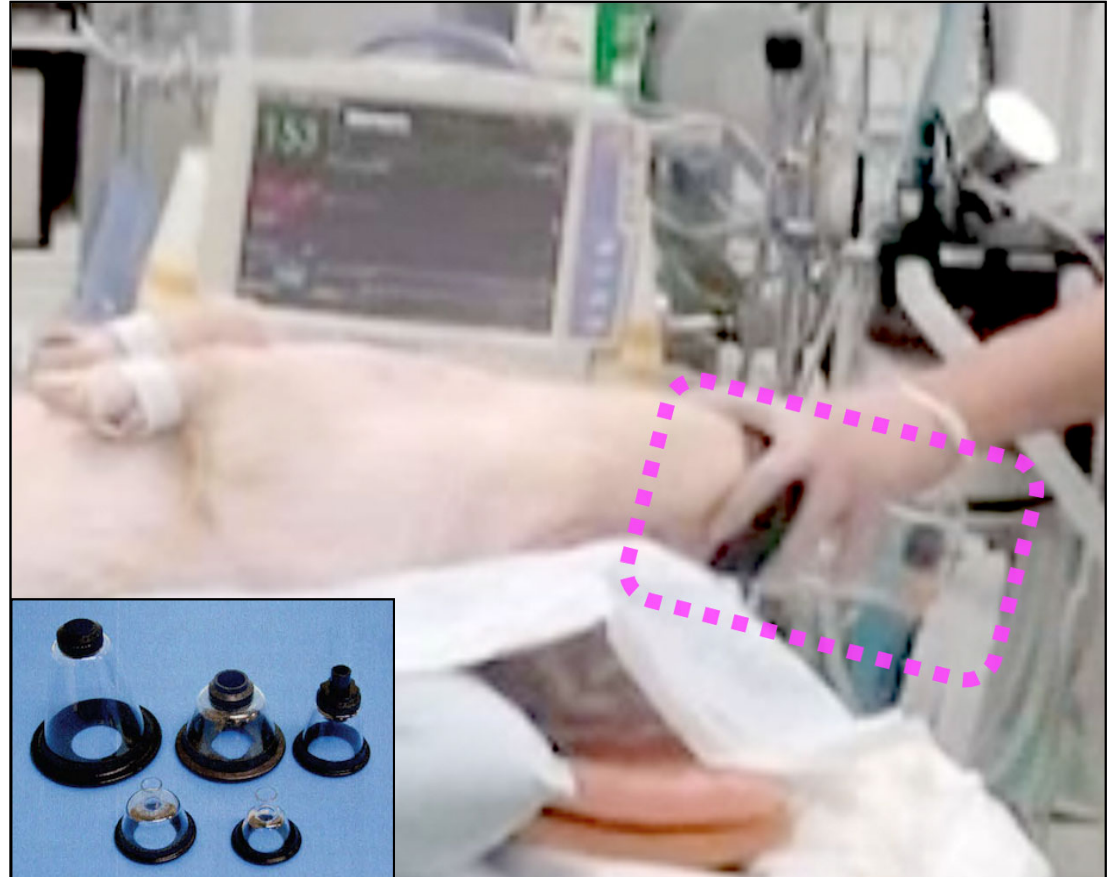
「Laboratory Animal Anaesthesia 4th (2015), Paul Flecknell (Author), Academic Press」

「Handbook of Laboratory Animal Management and Welfare 4th (2013), Sarah Wolfensohn (Author), Wiley-Blackwell

Various inhalation anesthesia



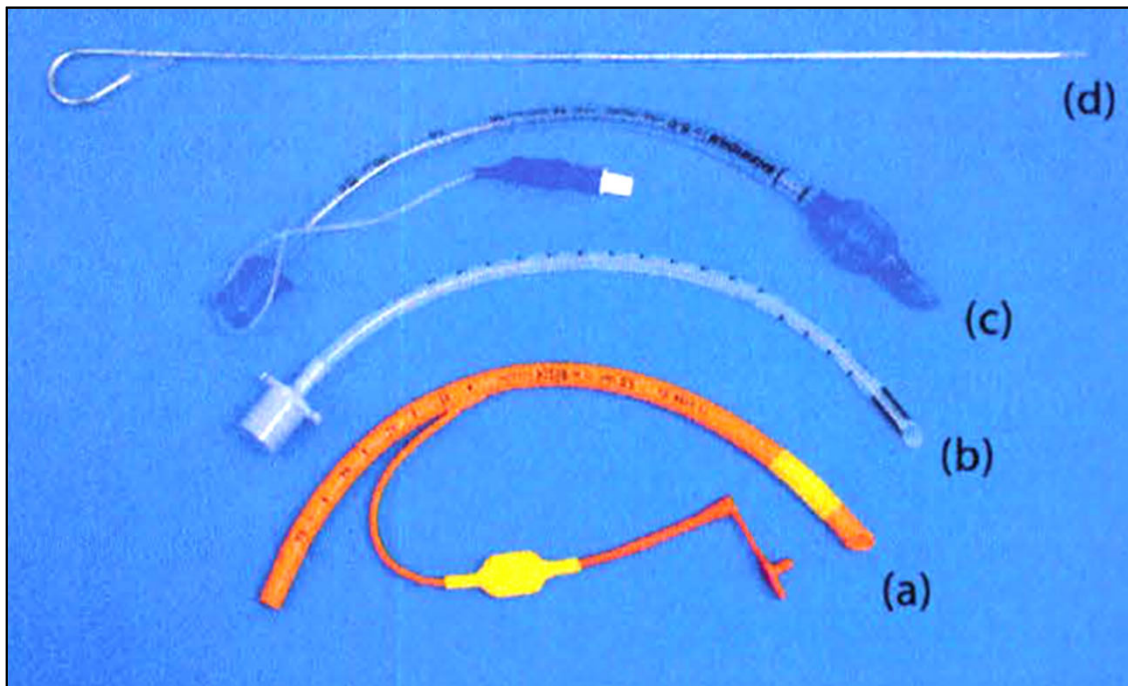
Inhalation anesthesia using a chamber



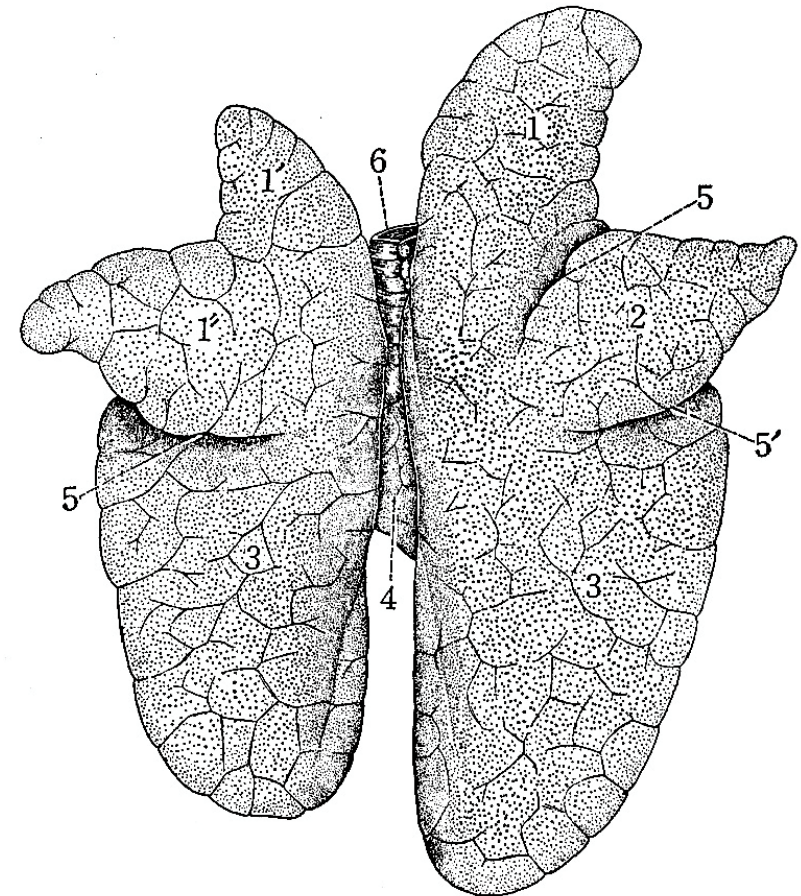
Inhalation anesthesia using a mask

「Laboratory Animal Anaesthesia 4th (2015), Paul Flecknell (Author), Academic Press」

Various inhalation anesthesia



tracheal tube



lung

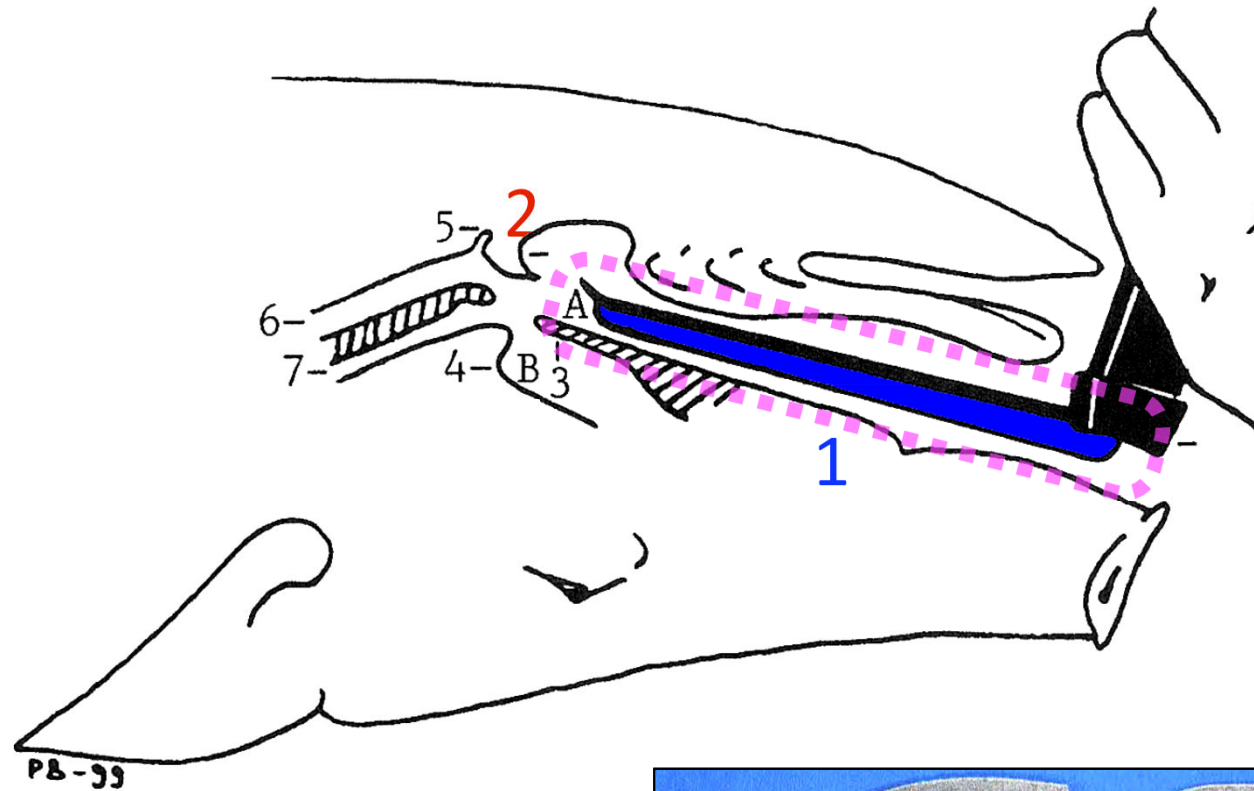
「Laboratory Animal Anaesthesia 4th (2015), Paul Flecknell (Author), Academic Press」

Premedicating pigs

drug	dosage	effect
Acepromazine	0.1-0.45 mg/kg, <i>i.m.</i>	Sedative
Azaperone	5-8 mg/kg, <i>i.m.</i>	Sedative
Diazepam	0.5-2 mg/kg, <i>i.m.</i>	Sedative/muscle relaxant
Atropine	0.05 mg/kg, <i>i.m.</i>	Parasympathetic blockade

「The Laboratory Swine (1999), Peter J. A. Bollen *et al.* (Author),」

Pig dissection and tracheal intubation



- 1 : 喉頭鏡 laryngoscope
- 2 : 喉頭蓋 epiglottis
- 3 : 軟口蓋 soft palate
- 4 : pharyngeal diverticle
- 5 : laryngeal diverticle
- 6 : 氣管 trachea
- 7 : 食道 esophagus
- A : 中咽頭 oropharynx
- B : nasopharynx

Tracheal intubation in swine



Optimal tracheal tube outer diameter

	body weight(kg)	Outer diameter of tracheal tube (mm)
dogs	0.5 -1.5	2 - 5
	> 1.5	4.0 - 15
pigs	1 - 10	2 - 6
	10 - 200	6 -15
monkeys	0.35 - 20	2 - 8

「Laboratory Animal Anaesthesia 4th (2015), Paul Flecknell (Author), Academic Press」

From pig premedication to tracheal intubation



Connect the tracheal tube to the anesthesia machine

Anesthesia machine

1) Vaporizer

Turn liquid anesthetic into gas.

2) Ventilator

Control lung movement.

3) Breathing circuit

Supplies and circulates anesthetic gas.

Anesthesia management

① Respiratory management

Respiration, oxygen saturation

② Circular management

Blood pressure, pulse rate, body temperature, cyanosis

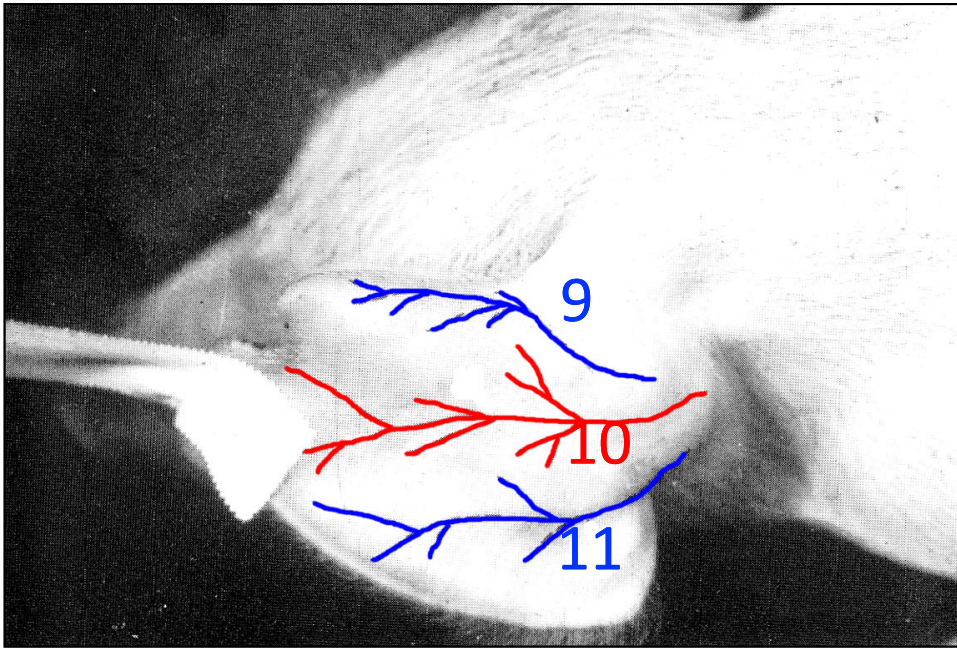
③ Fluid/metabolism management

Blood sugar level, urine volume, pH and acid-base balance, acidosis alkalosis, Base Exces (BE)

④ Brain/nervous system management

Disturbance of consciousness

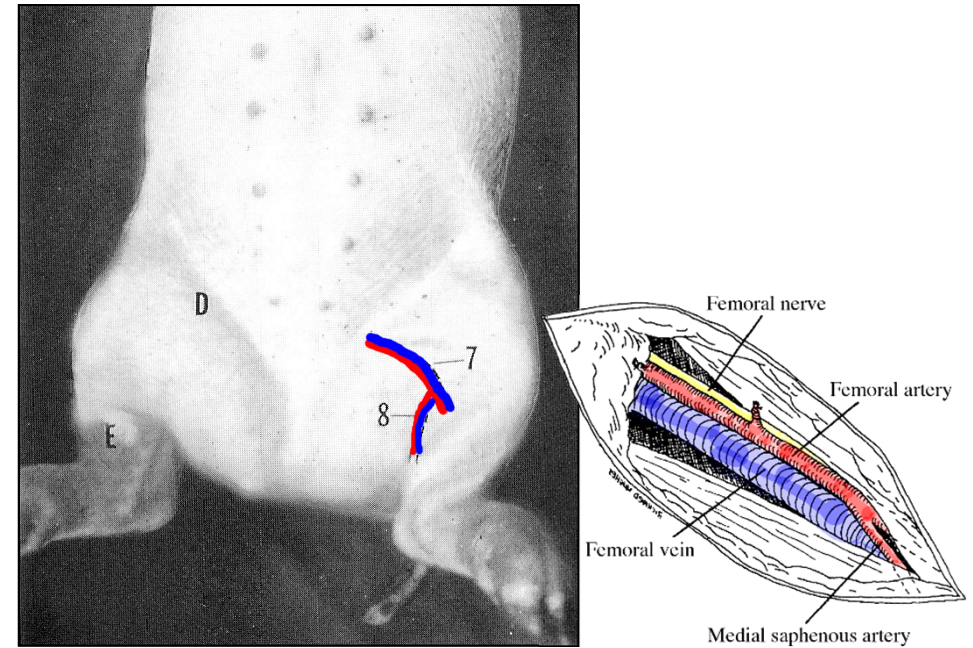
Superficial blood vessels of pigs



9 : medial auricular vein

10 : auricular artery

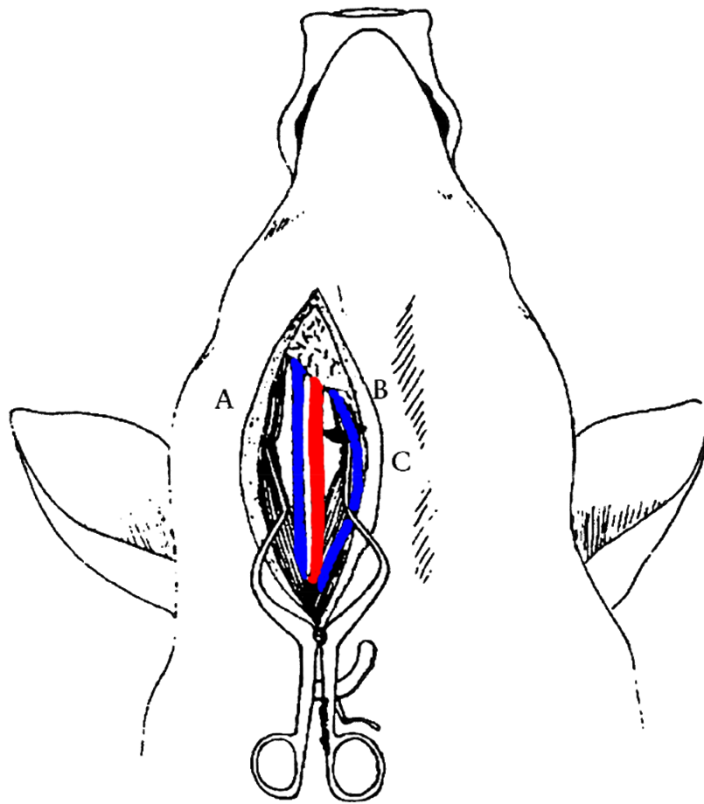
11 : lateral auricular vein



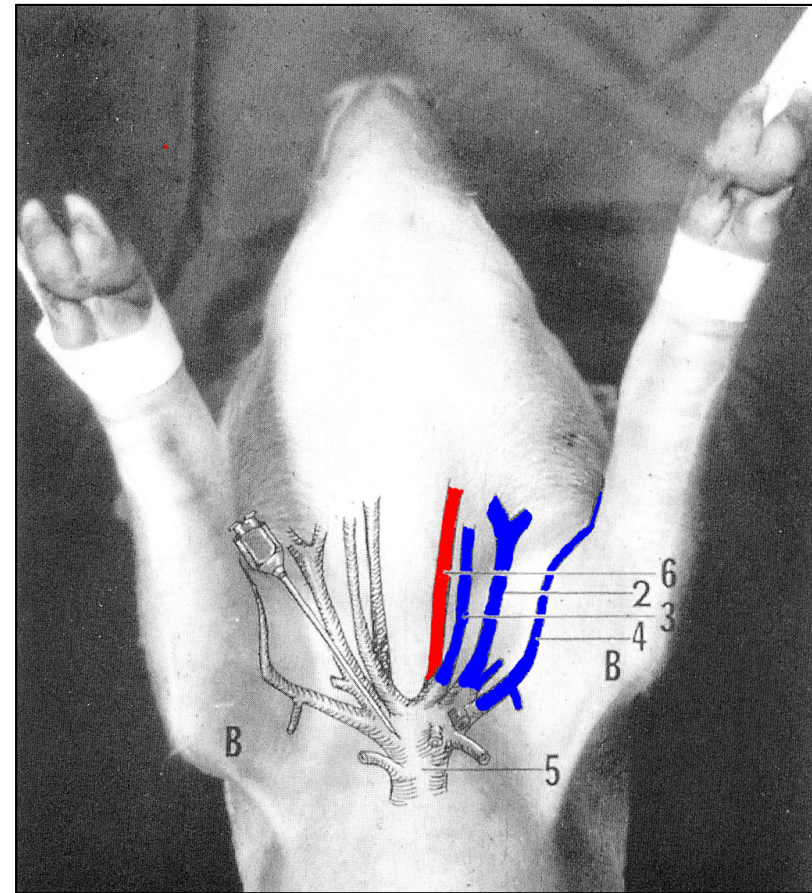
7 : femoral artery and vein

8 : medial saphenous artery and vein

Blood sampling site from pigs ~From the neck~



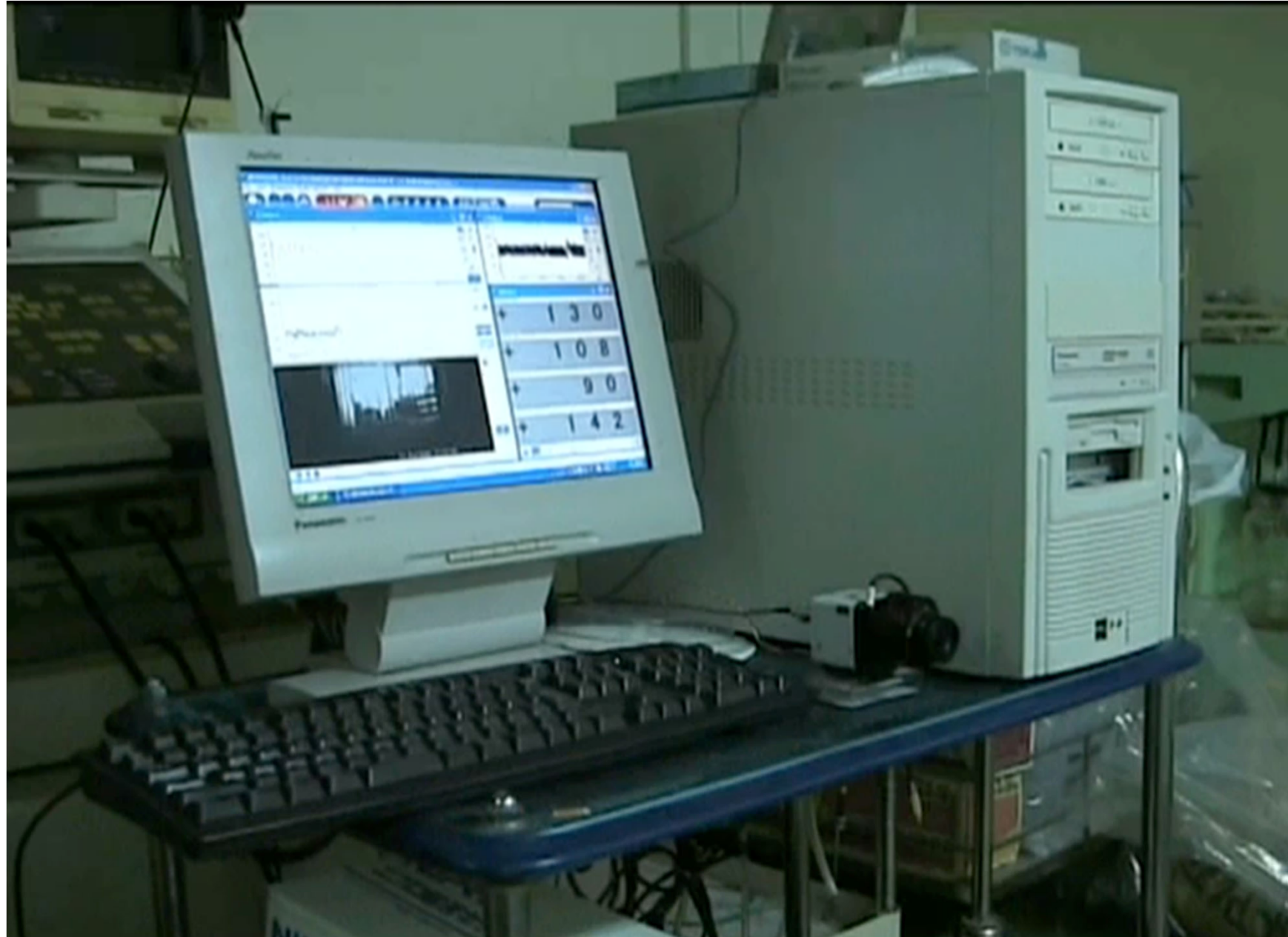
A : External jugular
 B : Common carotid artery
 C : Internal jugular vein



2 : External jugular vein 5 : Cavaal sinus
 2' : Cephalic vein sinus venarum,
 3 : Internal jugular vein sinus venarum cavarum
 4 : Axillary veins 6 : Common carotid artery
 (subclavian vein) B : Radial artery pulse check site

「Surgery, Anesthesia, and Experimental Techniques in Swine (1998), M Michael Swindle(Author), Wiley-Blackwell」

An example of postoperative management of pigs



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