



Emergency Procedures Wetlab

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CARDIOPULMONARY RESUSCITATION (CPR)

First Aid and Emergency Care,
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Cardiopulmonary resuscitation (CPR) is the treatment required to save an animal (or human) life when he or she has suffered respiratory and/or cardiac arrest. CPR consists of two parts:

Rescue breathing and chest compressions.

These two techniques combine to keep the lungs supplied with oxygen and keep blood circulating, carrying oxygen to the other parts of the body.

Basic CPR is CPR performed by trained bystanders at the scene of the arrest.

Advanced CPR is CPR performed by trained teams of professionals.

Basic CPR is the most important, and will be described in this section.

All tissues require a steady source of oxygen. If the source is interrupted for only a few minutes, irreversible damage may be done. If an arrest occurs, basic CPR must be initiated at the scene.

Basic CPR: Rescue Breathing

Make Certain the Animal is Actually Arrested and Unconscious

Talk to the animal first. Gently touch and attempt to awaken the pet. You could be seriously injured should you attempt to perform CPR on a pet who was only sleeping heavily and was startled awake.

Ensure an Open Airway

Extend the head and neck and pull the tongue forward.

Look in the mouth and remove any saliva or vomitus. If it is too dark to see into the mouth, sweep your finger deep into the mouth and even into the throat to remove any vomitus or foreign body. Be aware of a hard, smooth, bone-like structure deep in the throat. This is likely to be the hyoid apparatus (Adam's apple). Serious injury could result if you pull on the hyoid apparatus.



Observe for Effective Breathing

Sometimes an animal will begin to breathe spontaneously when the head is put in the position discussed above (head and neck extended, tongue pulled forward). Watch for the rise and fall of the chest while listening closely for sounds of breathing. If no breathing is evident in 10 seconds, begin rescue breathing.

Begin Rescue Breathing

Rescue breathing is performed by covering the animal's nose with your mouth and forcefully blowing your breath into his lungs. In cats and small dogs, you must hold the corners of the mouth tightly closed while you force the air in.

In larger dogs, the tongue should be pulled forward and the mouth and lips held shut using both hands cupped around the muzzle. Force the air into the lungs until you see the chest expand. Take your mouth away when the chest has fully expended. The lungs will deflate on their own. Air should be forced into the animal's lungs until you see the chest expand.



Give 3 to 5 Full Breaths

After several breaths are given, stop for a few seconds to recheck for breathing and heart function. If the pet is still not breathing, continue rescue breathing 20-25 times per minute in cats or small dogs, or 12-20 times per minute in medium or large dogs. Push down on the stomach area every few seconds to help expel the air that may have blown into the stomach. If the stomach is allowed to distend with air, the pressure will make the rescue breathing efforts less effective.

If Breathing is Shallow or Non-existent

and the animal is still unconscious, continue rescue breathing 10 to 15 times per minute and transport the animal to the nearest veterinary facility.

Basic CPR: Chest Compressions

After Giving 3 to 5 Breaths, Check for a Pulse

If no pulse is detectable, begin chest compressions.

In Small Dogs or Cats

Squeeze the chest using one or both hands around the chest. Depress the rib cage circumferentially. Do this 100 to 150 times per minute.



In Large Dogs

Compress the chest wall with one or two hands, depending on the size of the dog (and the size of the rescuer). If the dog is on her side, place the hand(s) on the side of the chest wall where it is widest. If the dog is on her back, place the hand(s) on the sternum (breastbone). Depress the rib cage or sternum 1.5 to 4 inches, depending on the dog's size. Do this 80 to 120 times per minute.

Coordinate Rescue Breathing and Chest Compressions

Give breaths during the compressions, if possible. If it is not possible to give breaths during the compressions, give two breaths after every 12 compressions.

When Two or More Rescuers are Working Together

Rescue breathing should be given during every second or third heart compression.

Continue CPR Until ...

- You become exhausted and can't continue.
- You get the animal transported to a veterinary facility and professionals can take over. The pulse is palpable or heartbeats are felt and they are strong and regular. In the vast majority of cases, artificial ventilations will continue to be required for a period of time, even though heart function has returned. This is due to nervous system depression secondary to the arrest.

Secondary Survey

The secondary survey is performed once resuscitation measures have been successfully performed or when it is decided that resuscitation measures are not required. In some circumstances (because of ongoing resuscitation), the secondary survey is never completed and the animal is transported directly to the veterinarian or emergency hospital during resuscitation.

A general examination (from the tip of the nose to the end of the tail) should be performed.

Determine and record:

- pulse rate and character
- respiratory rate and character
- mucous membrane color
- capillary refill time
- rectal temperature.

Examine the eyes, ears, nose, neck, mouth (if possible), chest, abdomen, back, pelvis, legs, and tail. First aid treatment should be performed as necessary during transport to the veterinarian.

INTRAVENOUS FACILITATIVE MANEUVRE

Dennis T. (Tim) Crowe, Jr.,

Introduction

This simple technique "facilitates" the placement of all peripheral and central catheters by cutting the skin over the top of the vessel using the bevel of an 18 g hypodermic needle. This technique allows easier placement of the catheter, especially when teflon catheters are used as these tend to form a 'burr' at the tip, especially in dehydrated patients, and those in shock. As less force is required to pass the catheter through the subcutaneous tissue and into the vein, this also allows the operator to "feel" the insertion and advancement of the catheter into the vessel. This manœuvre is less painful for the patient and therefore, reduces the chance of the patient moving from noxious stimuli at a very critical time in catheter placement. The facilitative manœuvre lessens the chance of bacterial contamination of the catheter as the catheter is not passed through the dermis where bacteria may still reside following the surgical preparation..

Indications

1. When the vessel cannot be seen or palpated (i.e., hypovolemic or hypotensive, edematous or obese patients,).
2. Dehydrated or geriatric patients
3. Optional all vessel catheterizations, peripheral or central

(Editor's note: tapered catheters constructed of violon [[Becton-Dickinson] are easily placed into a vein)

Contraindications

1. Lesions over the venipuncture site
2. Hematoma at the venipuncture site

Materials

1. Latex rubber, or other, tubing as a "tourniquet"
2. Supplies for surgical prep
3. 18 g (20 g preferred by some) hypodermic needle
4. Sterile gauze pad
5. Curved hemostats
6. IV catheter of choice
7. Tape to secure the catheter in place
8. Bandaging material
9. Antiseptic ointment (see footnote)
10. Analgesics
11. T-port extension set
12. Heparin saline flush

Procedure

In most cases pain relief with a pure mu agonist (hydromorphone 0.02-0.05mg/kg IM) is recommended for the emergency patient. An alternative selection, especially in frightened or uncontrollable patient's sedation with butorphenol 0.1-0.2 mg/kg mixed with ketamine 1-3 mg/kg in the same syringe administered into the epaxial muscles, is preferred by the author. The dose selected is dependent on the individual's level of pain and anxiety, but is usually administered to effect. Several minutes are required for full effect to be appreciated. This allows the procedure to be performed without undue stress and heightened pain. If the situation is emergent, the topical application of ethyl chloride or ice, or pinching the skin prior to cutting the skin may also confer pain relief. As these are ill or injured patients, flow-by oxygen is recommended throughout the procedure.

The hair is clipped with a No. 40 or 50 blade around the entire leg and several cm proximally and distally from the intended placement site of the catheter.

A surgical prep is performed. The author recommends a product that is rapidly bacteriocidal, is safe for open wounds without causing discomfort. (TechniCare Topical Antiseptic® - Microbicide Surgical Scrub which contains 3% chloroxylenol and 3% cocamidopropyl PG, dimonium chloride phosphate as the active ingredients)^b

An 18 g (20 g preferred by some) hypodermic needle is held like a short pencil by the thumb, index and middle finger with the bevel of the needle aligned with the operator's line of vision.

The skin of the vessel is moved slightly to the side of the vessel and held there by an assistant or the opposite hand of the operator. The author prefers to incise directly over the vein using the presumed anatomical location when not visualized.

Using the intrinsic muscles of the thumb, index and middle finger the bevel of the needle is drawn over the skin cutting for several millimeters. The cutting is repeated until the dermis is completely divided. Care is taken not to cut the vessel below the dermis, which may occur if the skin is not moved to the side of the vessel before cutting. The skin is allowed to retract back over the top of the vessel if it was pulled to the side initially.

Further careful dissection of the tissues on top and to each side of the vessel may be required to visualize the vessel. This is recommended in hypovolemic states where the vessel has minimal blood.

The catheter is then inserted through the small opening that is centered over the top of the vessel. Should greater visualization be required, the skin incision is extended and a small curved hemostat is used to dissect the vessel further. The tips of the hemostat are inserted lateral and ventral to each side of the vessel separating it from the surrounding tissue.

The tip of a curved mosquito hemostat is then inserted under the vessel where it isolates the vessel. By placing traction on the hemostat, the vessel is 'straightened' and elevated towards the operator. Traction on the hemostat stabilizes the vein preventing 'counter' traction of the vein as the catheter-needle unit penetrates the vessel wall.

The catheter is then inserted and advanced into the taut, stable retracted vessel. This "minicutdown" is very effective and recommended in severely hypovolemic, hypotensive patients.

It allows for direct, full visualization of the **vessel** and the retraction affords a clean entry into the vessel and advancement of the catheter, which would otherwise not be possible, or very difficult, due to lack of vessel filling. Some may prefer to close the incision proximal and distal to the catheter site using staples or sutures.

The catheter is then secured by rapid taping over sterile gauze covering the incision. The topical antiseptic ointment may be placed onto the incision prior to taping. To help the tape stick to the catheter and skin and to secure it well, the author recommends I.V. Prep (Smith & Nephew, Inc.), or a similar product that provides a sticky base. It is applied topically on the catheter and the intact skin in the area of the exit site.

A T-port connected to the catheter is recommended to facilitate bolus injections and secure catheter placement.

The catheter is flushed with heparinized saline and further bandaging is placed from the toes proximally to avoid limb swelling distal to the catheter.

PLACING A THORACOSTOMY TUBE (CHEST DRAIN)

Karol Mathews

Indications

When continuous suction is required to evacuate the pleural space i.e. tension pneumothorax, several thoracocenteses required to control pneumothorax, pyothorax, chylothorax, or pleurodesis. NOTE: There is usually time to perform sterile, surgical technique. However if there is tension pneumothorax (barrel chest), then rapid placement is required. Even a small opening into chest is adequate as an emergency procedure to relieve pressure.

After placement, the patient requires constant supervision or guaranteed “animal-proof” protection from patient removal.

Materials

- Chest tube
The largest-bore chest tube that can comfortably fit between 2 ribs to allow for thick viscous fluid or clots. However, for **pneumothorax** the smaller size tube (12-16Fr Fr,) or over-the-guidewire 7Fr or 14 gauge central venous catheters (Mila International, Arrow International) can be placed dorsally into the pleural space. The dilator is not required.

Cats & dogs	<7 kg	14 Fr chest tube
dogs	7 – 15 kg	16-18 Fr chest tube
dogs	16 – 30 kg	18-22 Fr chest tube
dogs	>30 kg	22 Fr chest tube

Types of Tubes: Polyvinylchloride, red rubber, silicone.

Silicone rubber is least likely to become occluded; red rubber tubes are the least desirable due to irritation and are non-radiopaque. Fenestrations in these tubes should be limited to the distal one-third. Pre-place the clamp and stopcock onto the end of tube if a stylet is not used.

- Adaptor to fit the chest tube
- Extension set with clamp and 3-way stopcock
- 60mL syringe
- Tape or orthopedic wire to secure adaptor and extension set
- 2-0 non-absorbable suture on a cutting needle.
- Furacin ointment, gauze square and bandage material

Procedure

There are numerous techniques for placement of the tube, this is one. Choose the side with significant pathology. However, as the mediastinum is fenestrated, with bilateral pathology, either side will do. An exception is pyothorax, here bilateral drains are recommended. Clip hair from shoulder to last rib and dorsal to ventral midline. Surgically prepare the skin.

Where possible, general anesthesia is recommended for placing large-bore tubes in cats; opioid and local anesthesia is suitable for dogs. Local anesthesia is adequate for over-the-guidewire catheter placement in cats and dogs.

Oxygen supplementation must be administered. The animal is placed in lateral or sternal recumbency. Drape for tube placement if possible.

A gloved assistant grasps the skin behind the elbow and pulls cranially for fluid drain or caudally for air removal. 1-3mL 1% or 2% lidocaine infiltrated in skin down to pleura at 7th intercostal space at junction of upper 1/3 and lower 2/3 of chest wall. Wait at least 2 min.

(1) catheter placement; the guidewire is inserted into the pleural space through the accompanying needle, remove the needle, pass the catheter over the guidewire and remove the guidewire Suture the catheter to the skin with accompanying clamp.

(2) For tube placement, the skin incision should be approximately the same size as the tube. Dissect down through subcutaneous tissues and intercostal muscle with Mayo scissors. Penetrate pleura (away from caudal aspects of rib). Pass tube with stylet, Kelly or Carmalt or curved hemostatic forceps – directing anterior ventral for fluid, and posterior-dorsal for air removal. Clamp tube as stylet is removed. Release skin which automatically migrates over the tube forming a tunnel preventing air entering pleural space. Place adaptor and extension, aspirate immediately if necessary.

Otherwise, secure the tube to the chest wall (in the tunneled area) by a deep suture. A purse string suture and friction knot (Chinese handcuff) is also used to attach the tube to the skin. Secure the adaptor to the chest drain with orthopedic wire, or ‘barber pole’ the tape (stretch and ‘spiral’ around, not wrap horizontally) over the chest drain, adaptor and onto the extension set. Furacin antibiotic ointment and gauze are placed over the insertion site. Comfortable bandage is applied.

The extension and clamp, Heimlich valve or continuous suction is connected to the tube. All connections are adequately sealed with tape to prevent leaks/disconnection. Secure the bandage at the cranial and caudal aspects, to the body, with sticky tape to avoid slipping.

Tube Maintenance

Dressing change and skin cleansing with warm sterile saline is recommended as needed. We do not feel this should be routine as it is usually not warranted.

The bandage should be examined several times/day and changed when necessary or every 48 h. The patient should be adequately supervised to avoid tube dislodgement/disconnection.

The tube is removed when no longer needed (fluid and/or air accumulation has cleared – fluid \leq 2 mL/kg/24h). Chest tube irritation and lymph fluid accumulation can produce fluid at approximately 2 mL/kg/24h. When removing, place gauze sponge and antibiotic ointment over thoracostomy site and tube, remove tube with rapid motion. Circumferential bandage should be applied for 24 – 48 h to prevent pneumothorax.

TRACHEOSTOMY

Karol Mathews

Indication

Emergency access to the trachea or tracheostomy tube placement prior to positive pressure ventilation.

Materials

- Shiley endotracheal tube or Cuffed (high volume, low pressure) endotracheal tube, 2 sizes smaller than a well-fitting endotracheal tube.
- Umbilical tape
- Sterile gauze with sterile antibacterial ointment

Procedure

Anesthetize the patient if not unconscious. Place in dorsal recumbency, head extended, forelimbs extended caudally clip, and prep quickly, drape if time permits.

Make an incision from caudal larynx for approximately 5 – 7 cm caudally. Stabilize larynx with left hand, incise through the sternohyoideus/thyroideus muscle separation; the muscle bellies are separated and held apart. The trachea is elevated with a curved Kelly or Carmault hemostatic forcep.

The trachea is incised between 3rd and 4th or 4th and 5th rings, or below the obstruction (or through the 3rd and 5th rings if a very small patients).

A Shiley or cuffed endotracheal tube is placed through the opening. The cuff is inflated and the patient ventilated on 100% O₂.

Place two “stay sutures” around the tracheal rings on either side of the incision. These sutures can be used to elevate the tracheal opening and facilitate tube change.

Suture the incision to the tracheostomy tube. Place sterile ointment and gauze over incision but under tracheostomy tube. Secure with umbilical tape through the end of each side of the endotracheal tube and pass around the neck.

Tube selection

Ideal is double cannula (Shiley). High volume low pressure cuff. Silicone is best as it tends to resist occlusion by tracheal secretions.

Endotracheal tube cut longitudinally to form 2 butterfly flanges. Make holes at the end of each flange for umbilical tape. Avoid cutting the ‘air’ channel to the cuff.

Size: Diameter slightly smaller than endotracheal tube used for oral intubation (approximately 2/3 tracheal diameter)