

# STANDARDS OF CARE

## EMERGENCY AND CRITICAL CARE MEDICINE

2 CE CONTACT HOURS

FROM THE PUBLISHER OF COMPENDIUM

### DYSTOCIA

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**D**ystocia is a relatively common emergency presentation. It occurs in 3.3% to 5.8% of all feline pregnancies; in dogs, the overall rate is around 5%. However, dystocia rates are breed specific: only 0.8% to 2.3% of pregnancies in cats with a normal conformation result in dystocia, whereas in some large-headed and achondroplastic dog breeds, the rate can approach 100%.

Unnecessary veterinary attention can cause stress and associated problems during and after birth. Conversely, delaying intervention risks not only the fetuses but also the dam. Therefore, it is vital to be familiar with normal parturition, breed predispositions, and the cardinal signs of dystocia. Being comfortable with the different therapeutic options as well as their uses, risks, and contraindications is also critical to achieve the optimal outcome for the dam and offspring.

### DIAGNOSTIC CRITERIA

#### Historical Information

##### Breed Predisposition

- Dogs: Bulldogs, Boston terriers, Scottish terriers, pugs, Chihuahuas, Pekinese, Yorkshire terriers, dachshunds, miniature poodles.
  - Increased rates in German shepherds and Labrador and golden retrievers may be because of breed popularity rather than a true predisposition.
- Cats:
  - Siamese (10% of pregnancies).
  - Persian (7.1% of pregnancies).
  - Devon rex (18.2% of pregnancies).
  - Domestic shorthair.

#### Other Historical Considerations/Predispositions

- Reason for presentation (e.g., the dam has gone past the due date, has been straining without producing, has an abnormal discharge, appears unwell).
- Any previous whelping/queening history.
- Exact or estimated date(s) of breeding or mating.
- Time of any temperature drop.
- Time when the first signs of labor were noted.
- Time and nature of any discharge.
- Frequency of contractions.
- Number and viability of any neonates born previously; date of last delivery.
- Previous medical problems; history of pelvic fractures or pelvic trauma.
- Any problems noted during the pregnancy.
- Any treatments the owner has attempted before presentation.

#### Physical Examination Findings

Perform a full physical examination, with emphasis on abdominal palpation, to identify the following:

- Uterine size and tone; strength and regularity of any contractions.
- Number of fetuses.
- Presence of a fetus in the pelvic inlet.
- Presence and degree of abdominal pain.

#### Also in this issue:

- 6 Serotonin Toxicity

Perform a vaginal examination using sterile gloves and copious amounts of sterile, water-based lubricant to evaluate:

- Presence and nature of any discharge.
- Presence of vaginal or pelvic abnormalities.
- Presence of a fetus in pelvic canal (assessment of size, movement, and presentation).
- Degree of cervical dilation and any cervical abnormalities (if the cervix can be reached).
- Absence or strength of contractions. Gently stroking the dorsal vaginal wall or distending the cervix can stimulate contractions.

### Laboratory Findings

- Low ionized calcium and blood glucose can contribute to uterine inertia.
- Packed cell volume (PCV) drops throughout pregnancy (to approximately 30% in the bitch and 20% to 25% in the queen) due to increased plasma volume.
- Abnormalities in arterial blood gas analysis may be seen.

### Other Diagnostic Findings

#### Abdominal Radiography \$\$

- Assess fetal number, size, location, and position. Abnormalities may be a contraindication for medical treatment.
- Assess premature fetal death, confirmed by:
  - Intrafetal or intrauterine gas.
  - Hyperextension of the neck and limbs or other grossly abnormal positioning.
  - Collapse of the spine, overlapping bones of the skull.
- Evaluate pelvic depth, width, and morphology. Abnormalities may be a contraindication for medical treatment.

#### Ultrasound \$\$

- Best tool for assessing fetal viability and distress by counting fetal heart rates.
- Lowering of fetal heart rates to below 150 to 170 bpm indicates fetal distress, hypoxia, and the need for urgent intervention. Fetuses with heart rates below 130 bpm have a poor survival rate if they are not born immediately.
- A drop in fetal heart rate that correlates with uterine contractions suggests obstructive dystocia.

#### ABOUT VECCS

The Veterinary Emergency and Critical Care Society was formed in 1978 in an effort to raise the level of patient care for seriously ill or injured animals through quality education and communication programs. Over 3,500 members strong, VECCS has spawned three distinct national organizations—ACVECC (for veterinarians), AVECCT (for veterinary technicians), and SVECCS (for veterinary students)—whose focus is on training and core knowledge in veterinary emergency and critical care medicine.

For more information, visit [veccs.org](http://veccs.org).



#### KEY TO COSTS

\$ indicates relative costs of any diagnostic and treatment regimens listed.

\$ costs less than \$250

\$\$ costs between \$250 and \$500

\$\$\$ costs between \$500 and \$1,000

\$\$\$\$ costs more than \$1,000

#### Editorial Mission:

To provide busy practitioners with concise, peer-reviewed recommendations on current treatment standards drawn from published veterinary medical literature.

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## Summary of Diagnostic Criteria

- History of dystocia in previous whelpings.
- History of pelvic fractures.
- No signs of labor over 69 (bitch) or 65 days (queen) since breeding or last possible mating.
- Temperature has returned to normal after a noted drop  $\geq 24$  hr earlier with no signs of labor.
- No puppy or kitten born more than 2 hours after green vaginal discharge (indicating placental separation).
- A fetus in the birth canal cannot be moved with digital manipulation.
- No kitten born 15 to 30 minutes after rupture of fetal membranes.
- Presence of a hemorrhagic, purulent, or foul-smelling vaginal discharge.
- No birth after 3 to 4 hours of weak, infrequent contractions or 30 min of strong, persistent contractions.
- No further births 4 hours after the last puppy.
- There can be an increased delay between the births of kittens (24 to 36 hr) in normal parturition in the queen. These queens should be assessed and fetal stress evaluated, particularly in breeds at risk.
- Signs of severe abdominal pain or discomfort such as biting or growling/hissing at the abdomen/vulva.
- More than 24 hr since a recorded drop in serum progesterone below 2 ng/mL.
- Radiographs reveal maternal pelvic/abdominal abnormalities or fetal abnormalities.
- Ultrasonography reveals low fetal heart rates.

## Pathogenesis

Percentages shown are the incidences of this diagnosis in dystocia of bitches.

### Maternal Factors (60%–75%)

- Primary uterine inertia: 40%–72% (litter too large or too small, neuroendocrine imbalance, breed- or age-related factors, systemic disease).
- Obstruction 3%–12% (narrow pelvis/birth canal/cervix/vagina).

### Fetal Factors (25%–40%)

- Oversize: 7%–14%.
- Malformation: 1%–2%.
- Malpresentation: 15%–16%.
- Dead or glucocorticoid-deficient fetuses: 1%.

## TREATMENT RECOMMENDATIONS

### Initial Treatment

- If a fetus is in the birth canal, attempt digital/manual manipulation, minimizing the stress in the dam.

## ON THE NEWS FRONT

- Uterine monitoring using tocodynamometers, which sense changes in intrauterine and intraamniotic pressure, can be helpful in monitoring pregnancies, especially in at-risk dogs. Doppler units can also be used to monitor fetal heart rates.
- Gül and colleagues have suggested that there may be no need to close the uterus after cesarean section, which would cut down on surgery and anesthetic time if a low transverse cesarean incision is made. It was found that nonclosure of all layers of the uterus when low transverse cesarean incision was performed had no adverse effect on immediate and late postoperative complications in dogs. Nonclosure seemed to result in significantly less muscular necrosis and fibrosis than conventional closure. This indicates that nonclosure or at least simple closure with nonvigorous locking when performing a low transverse cesarean incision may be preferential in appropriate cases.

- Deposit a sterile, water-based lubricant over and beyond the fetus using a soft urinary catheter. If infusing, be careful not to enter the fetus' mouth. \$
- Pull the fetus gently by the limbs, head, or mandible in a caudoventral arc, and rotate the fetus' shoulders or pelvis through the dorsoventral plane to help passage through the dam's pelvis.
- Attempts to pull/reposition coinciding with contractions give best results.
- Severe damage can be caused to both the dam and fetus if excessive force or instruments like delivery forceps are used.

### Supportive Treatment

- Use IV isotonic fluids in cases of dehydration or hypovolemia. Titrate rates to the individual; as a rule of thumb, 10–20 mL/kg/hr in the bitch and 4–6 mL/kg/hr in the queen can be used. \$\$
- When blood glucose is low, supplement isotonic fluids with dextrose as required; 2.5%–5% is generally adequate. If severely decreased or clinical signs are present, a 0.25-g/kg bolus of dextrose can be given before the infusion. \$\$

### Medical Interventions \$\$

- Attempt only if there are no signs of obstructive dystocia and the fetuses appear normal.
- Radiographs must be obtained before any medical intervention.

- Prepare the team and equipment for a cesarean section in case of treatment failure or complications. Immediate surgical intervention is necessary if complications arise.

### Oxytocin

- 0.5–2.0 U per bitch, 0.25–0.5 U per queen, IM (preferred) or SC is effective in increasing the strength and duration of uterine contractions. Higher doses are not necessary and can be detrimental.
- Doses can be repeated two or three times at 30-min intervals or after a successful birth, but cesarean section should be considered if there is no progression.

### Calcium Gluconate

- 10% solution can be given at 0.5–1.5 mL/kg IV slowly to all dams before or at the same time as oxytocin to augment the effects of oxytocin.
- Administer over 20 to 30 min, either undiluted or diluted with isotonic fluids.
- Conduct continuous electrocardiographic monitoring and discontinue infusion if arrhythmias appear.
- Administer SC only when appropriate cardiac monitoring is not available. Dilute and divide between several sites if giving more than 5 to 10 mL; can cause pain, local irritation, and granuloma formation.

### Patient Monitoring

- Fetal heart rates should be monitored regularly during medical management.
- The dam should be reassessed regularly.

### Surgical Interventions \$\$\$\$

- All equipment should be set out before induction of anesthesia.
- Clip and perform initial preparation of the abdomen before anesthesia.
- Preoxygenate to reduce postinduction hypoxemia.

### Anesthetic Considerations

- Use drugs that have minimal effects on the fetuses and allow rapid induction and recovery of the dam. These drugs should have short durations of action, be rapidly metabolized by the dam or easily reversible, and be used to effect at the lowest doses possible.
- The following factors give dams a higher risk for anesthetic complications:
  - Decreased lung volume.
  - Increased oxygen demand and cardiac output.
  - Lower systolic blood pressure.
  - Decreased PCV with an increased plasma volume.

### Analgesia

- $\mu$  (R1) opiate agonists (e.g., hydromorphone, oxymorphone) do not reduce neonatal vigor but cause dose-related cardiorespiratory depression in the dam and fetuses. Use low to moderate doses, which can be increased once the fetuses have been removed.
- Transplacental transfer of buprenorphine is poor, but its effects cannot be antagonized.
- Midline infusions with lidocaine (not exceeding 2 mg/kg SC) are a quick and safe way of providing the dam with additional analgesia.
- Epidurals can be useful but are expensive and time consuming. Ataxia and micturition disorders can be present if local anesthetic agents are used.
- Single doses of a COX-2 selective NSAID (e.g., meloxicam, carprofen) can be provided to the dam once the fetuses have been removed.

### Induction

- Propofol given slowly to effect.
- Mask induction with isoflurane can be used but can be long and stressful for the mother.
- The following drugs have been linked to poor neonatal survival rates: ketamine, thiamylal, thiopental, medetomidine, xylazine, and methoxyflurane.

### Maintenance

- Intubation should be carried out as swiftly as possible because dams have decreased lower esophageal sphincter tone and are at greater risk for aspiration. Inhalant concentrations should be tailored to maintain an anesthetic plane as light as possible.
- Isoflurane is recommended due to minimal metabolism and more rapid recovery.
- The levels of anesthetic (both inhaled and injectable) used are inversely correlated to neonatal vigor.
- Isotonic crystalloids at 10 mL/kg/hr for bitches and 6 mL/kg/hr for queens should be used, barring individual-specific needs or contraindications.
- Tilting the dam 15° to 20° from midline does not improve blood pressure compared with dorsal recumbency and is not necessary.

### Cesarean Section and Ovariohysterectomy

- During cesarean section, the umbilical cords can be ligated and cut by the surgeon, or the entire fetal unit with the placenta can be passed to the assistant. In both cases, allowing 20 to 30 seconds before clamping the umbilical cord allows much of the blood in the extrafetal circulation to return to the fetus instead of being discarded with the placenta.
- Ovariohysterectomy at the time of cesarean section has been linked with increased morbidity.

- Indicators for immediate ovariohysterectomy:
  - Infected uterus.
  - Emphysematous fetuses.
  - Severe toxemia.
  - Extensive myometrial damage.
- En bloc removal of the uterus and removal and resuscitation of the fetuses carry no increase in neonatal mortality if the neonates are removed within 30 to 60 seconds. When this is not possible, a conventional cesarean section followed by ovariohysterectomy maximizes fetal survival.
- Routine use of postoperative antibiotics is not justified.

## Resuscitation of Neonates §

### Initial Resuscitation Techniques

- Remove the fetal membranes and fluids.
- Dry the mouth and nares, and suction with a bulb syringe.
- Neonatal respiratory depression due to inhalant anesthetics cannot be reversed until the neonate breathes, making the apnea self-perpetuating.
- Neonatal respiration can be stimulated by vigorous but gentle rubbing with a soft, warm towel.
- Artificial ventilation of the newborn via a tight-fitting face mask or a small endotracheal tube or catheter can be required.
- To prevent retrolental fibroplasia, inspired oxygen concentrations above 60% should be avoided or of limited duration.
- Place neonates in a warm (30°C–35°C or 86°F–95°F) incubator or in a box with warm, towel-wrapped water bottles until they can be presented to the mother.

### Secondary Resuscitation Techniques

- Intraosseous access is the best and fastest way to access the vascular space.
- Intraosseous catheters can be placed in the femur, humerus, or tibia.
- Some drugs can be administered transtracheally via endotracheal tube or injection:
  - **Naloxone:** Use if opiates have been used in the anesthetic protocol (0.1 mg/kg [or a drop sublingually] to reverse the respiratory depressant effect).
  - **Doxapram:** Unlikely to be useful and may be detrimental. Contraindicated in apneic and hypoxemic neonates.
  - **Atropine** and **glycopyrrolate:** Contraindicated with bradycardia in neonates, which is mediated by myocardial hypoxia. Oxygen supplementation is recommended in these cases.

## Cardiac Arrest

- Positive-pressure ventilation.
- Cardiac massage.
- **Epinephrine** at 0.1 mg/kg transtracheally or 0.01 mg/kg IV/IO.

## PROGNOSIS

- Duration and ease of labor correlate closely with the number and vigor of live offspring born.
- In the bitch, the risk of stillbirth is increased if labor lasts longer than 4.5 to 6 hours from the beginning of second-stage labor.
- Appropriate medical treatment is only 20% to 40% successful; most dams with dystocia require cesarean section.
- One study reported neonatal survival rates of puppies after cesarean section of 92% at birth and 80% at 7 days; however, overall neonatal mortality is believed to be closer to 20% to 30% for dogs and cats.
- Puppies from brachycephalic breeds have increased mortality rates.
- Postoperative complications and hospital stays are increased in bitches that undergo ovariohysterectomy at the time of cesarean section.
- Overall, the dystocia mortality rate for the bitch is about 1%.

## RECOMMENDED READING

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(continues on page 11)

- 1. Which is the most common cause of dystocia in the bitch?**
  - a. pelvic fractures
  - b. uterine inertia
  - c. fetal death
  - d. primiparous bitch
  
- 2. Which statement regarding diagnostic tests for dystocia is false?**
  - a. Radiographs allow evaluation of fetal positioning and size.
  - b. Ultrasound allows evaluation of fetal status and degree of fetal stress.
  - c. Anemia is common in pregnant bitches and clinically insignificant.
  - d. Hypercalcemia is commonly present.
  
- 3. Which statement regarding anesthesia for cesarean section is true?**
  - a. Ketamine is a drug of choice due to its minimal cardiovascular effects.
  - b. Buprenorphine should not be used because it crosses the placenta in large amounts.
  - c. Induction with propofol to effect is safe and fast.
  - d. Halothane is preferred for maintenance due to its hepatic metabolism.
  
- 4. Which statement is true with regard to neonatal resuscitation?**
  - a. Neonates should be kept on oxygen at 80% or more for at least 24 hours.
  - b. Artificial ventilation may be required.
  - c. If bradycardia is present, atropine must be administered.
  - d. Naloxone can be used to reverse inhalant anesthetics.
  
- 5. If medical management of dystocia is to be attempted, which statement is false?**
  - a. Oxytocin can be administered only once.
  - b. Radiographs are mandatory to evaluate fetal position and size.
  - c. Electrocardiographic monitoring is necessary when IV calcium gluconate is to be used.
  - d. The fetal heart rate should be monitored frequently for signs of fetal distress.

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