Rough Anesthetic Recoveries

Renata S. Costa, DVM, MPhil, MANZCVS, GradDipEd, DACVAA
Midwestern University
Glendale, Arizona

Anesthetic recovery is a critical part of the anesthesia process.[1-3] During the recovery period, the effects of anesthetic agents may still be present, and the patient may not have regained full consciousness and can react abruptly and unexpectedly. Therefore, the postanesthetic period requires attentive monitoring. It is also imperative that an appropriate perioperative plan be developed to minimize the risk for a rough recovery and/or to allow for timely intervention before patients accidently cause injury to themselves or those around them.

Patient- and anesthesia-related factors can cause a rough recovery, and understanding common contributing factors can help determine the most likely diagnosis and best treatment plan.* Although it can be difficult to differentiate pain from other behaviors (eg, anxiety, stress, dysphoria)—as many of the physiologic responses are similar[4-7]—assessment of behavior prior to administering any agents, use of multidimensional pain scales, and knowledge of drug effects and duration of action can help facilitate correct interpretation of behaviors displayed in the postanesthetic period.

The common causes of rough recoveries in dogs and cats discussed in this article are emergence delirium, pain, anxiety, bladder distension, opioid dysphoria, and benzodiazepine disinhibition.[4-6,8,9] Clinical signs are often similar regardless of the actual cause. Therefore, methodical assessment of the patient, as well as knowledge of when clinical signs started, drugs were administered, and patient pain level can help identify the most likely etiology of the rough recovery (see ***Rough Recovery Guidelines***).

*Drug dosages in this article are suggestions. Individual patients should be assessed to establish whether lower or higher doses are required based on adverse effects and patient status. Adequacy of the chosen drug should also be determined.

Emergence Delirium

Emergence delirium is a state of mental confusion and psychomotor agitation marked by hyperexcitability, restlessness, uncontrolled thrashing, and vocalization. Patients do not interact with humans and are unaware of their environment.[7,10] Signs are abrupt and usually occur following rapid emergence from anesthesia when the patient has not yet regained complete consciousness. The etiology is unclear, but early anesthesia arousal following use of short-acting inhalation anesthetics may be a contributing factor.[6,10,11]

Timing of clinical signs can help differentiate emergence delirium from other causes of a rough recovery. Emergence delirium occurs in the immediate recovery period, typically soon after inhalant anesthesia is discontinued. Patients may thrash uncontrollably and require rapid intervention to prevent injury. Administration of a small dose of an induction agent such as propofol (0.5-1 mg/kg slow IV; cats and dogs) is recommended.[7] Propofol is commonly used due to its fast onset and short duration of action but should be administered slowly until clinical signs subside. Excessive and

ROUGH RECOVERY GUIDELINES

Fast action is crucial if recovery is rough and may cause harm. However, if there is time, the patient should be assessed and the cause of the rough recovery identified prior to administration of any medication. Following are some treatment options for common causes of rough recovery.

Emergence Delirium

- Small dose of induction agent
- Propofol (0.5-1 mg/kg slow IV; cats and dogs)
  - Stopped when clinical signs subside

Pain

It should be determined how painful the procedure was and whether the patient needs additional analgesia (based on patient response), as well as when the last dose of analgesic was given and the drug's duration of action. Not all patients with rough recovery that vocalize are painful. A pain scale should be used to determine a pain score, as pain assessment can help determine whether analgesia is needed.

- Analgesics (ie, opioids, NSAIDs) are needed with a high pain score or when the patient is being assessed and it is not clear whether the patient is in pain.

Anxiety, Fear, & Aggression

Based on assessment of the patient's temperament prior to anesthesia, extra sedation may be needed. If this is the case, one of the following drugs (if there are no contraindications) can be administered and the patient reassessed:

- Low-dose acepromazine (0.01 mg/kg IV; cats and dogs)
- Low-dose dexmedetomidine (0.001 mg/kg IV; cats and dogs)

Bladder Distension

The bladder should be expressed or the patient walked if possible.

Opioid Dysphoria

- Butorphanol (0.1 mg/kg IV or IM; cats and dogs)
- Naloxone (0.005-0.01 mg/kg slow IV; cats and dogs), diluted prior to administration. The usual concentration is 0.4 mg/mL, which should be diluted to obtain a new concentration of 0.04 mg/mL (eg, 1 mL of undiluted naloxone and 9 mL of saline). Recommended rate of administration of the dilution is 0.5-1 mL/40 seconds. Administration should be stopped when clinical signs subside.
  - Naloxone administered too fast or at a dose that is too large can reverse analgesia and cause the patient to become painful. A rescue analgesic protocol should be prepared ahead of time.
  - Careful monitoring is needed, and readministration may be warranted if signs return.

Benzodiazepine (ie, Midazolam/Diazepam) Disinhibition

- Flumazenil (0.01 mg/kg slow IV; cats and dogs)
  - Stopped when clinical signs subside

fast administration should be avoided to reduce the risk for apnea and hypotension due to vasodilation.

Pain

Clinical signs of pain include vocalization, restlessness, hyperventilation or panting, and aggression, especially when painful areas are touched.[12,13]

Pain can be diagnosed using a pain scale (eg, short-form Glasgow Composite Measure Pain Scale, Colorado State University Acute Pain Scale).[12,14] Knowledge of the analgesic protocol used, duration of action, and time of administration can also help reach a diagnosis. An analgesic trial with opioids (eg, methadone or hydromorphone [0.1 mg/kg IV], buprenorphine [0.02 mg/kg IV]; cats and dogs) or other analgesic agents (eg, ketamine [0.6 mg/kg/hour CRI; cats and dogs]; NSAIDs) should be instituted and the patient reassessed if there is uncertainty on whether the patient is still painful.

Anxiety, Fear, & Aggression

Anxiety is the uncertainty and fear that result from anticipation of a real or imaginary threat and often impairs physical and psychological functioning. Clinical signs include vocalization, panting, and restlessness.[15]

Patients in which adequate pain management has been implemented but persistent vocalization and restlessness continues may be experiencing fear, stress, and/or anxiety. Administration of a tranquilizer or sedative (eg, acepromazine [0.01 mg/kg IV], dexmedetomidine [0.001 mg/kg IV]; cats and dogs) can be considered if there are no contraindications (eg, previous allergic reaction to the agent, patient is hypovolemic)[4,7]; however, some dogs and cats may only have a temporary response. In these cases, especially if restlessness is due to anxiety, agents such as trazodone (3-10 mg/kg PO) or gabapentin (10-25 mg/kg PO) can be administered. The patient will need to be reassessed after initial treatment, as some patients may require higher doses of these agents. The aim, however, should be to administer the lowest dose possible to minimize the risk for adverse effects while still achieving the desired outcome. Trazodone enhances calmness, reduces anxiety, and produces mild sedation with no apparent relevant adverse effects in dogs.[16,17]

Patients that are anxious may respond to being held, but this is not always feasible. Nonpharmacologic alternatives include anxiety or pressure wraps (eg, a thunder jacket) that maintain swaddling pressure and acupressure aimed to induce calmness.[18,19]

Bladder Distension

Bladder-distension–related discomfort may result in vocalization, restlessness, tachycardia, and/or panting.[4,5,20] The bladder should be palpated and expressed prior to recovery.

During the postanesthetic period, if there are signs of discomfort and restlessness, bladder size and turgidity should be reassessed and the bladder gently expressed if it is distended—this may minimize discomfort.[5] Ambulatory patients should be walked.

Opioid Dysphoria

Opioids, especially μ agonists (eg, hydromorphone, fentanyl), can result in dysphoric recoveries marked by vocalization, restlessness, hyperthermia, panting, and/or lack of response to human contact.[4,8] Opioid-related dysphoria is often a diagnosis of exclusion made after pain and bladder distension are ruled out and in patients with no response following administration of sedatives and tranquilizers. In these cases, μ-agonist–opioid administration worsens clinical signs. This highlights the importance of accurate pain assessment prior to administering these agents.

Butorphanol is a κ-agonist, μ-antagonist opioid that can reverse the adverse effects of μ-agonist opioids[21] and provide mild analgesia. Naloxone is the actual reversal agent and results in rapid resolution of adverse effects[10,21]; however, this drug has the potential to reverse the analgesic properties of the opioid. To decrease the risk for reversing analgesia, naloxone (0.005-0.01 mg/kg; cats and dogs) should

be diluted (see ***Rough Recovery Guidelines***, page 91) to allow for slow IV administration (0.5-1 mL/40 seconds) and stopped when signs subside. A rescue analgesic protocol should always be prepared ahead of time, and the patient should be pain scored. Clinical signs that stop after reversal confirms the diagnosis of opioid dysphoria.

Benzodiazepine Disinhibition

Benzodiazepine disinhibition is a paradoxical response that follows administration of these sedatives (eg, diazepam, midazolam); this reaction is often observed in healthy dogs and cats. Signs may be seen immediately after administration and/or during the recovery period and include vocalization, hyperexcitability, ataxia, drooling, nystagmus, aggression, and sudden attempts to eat the fluid line and bandages.[22,23] A higher incidence of disinhibition occurs in healthy patients but the etiology is not completely understood.[24,25]

Benzodiazepine disinhibition is often a diagnosis of exclusion that is made when the patient fails to respond to analgesics, sedatives, and tranquilizers. Flumazenil (0.01 mg/kg slow IV; cats and dogs) is the reversal agent and results in rapid cessation of clinical signs,[25,26] confirming the diagnosis of benzodiazepine disinhibition.

Prognosis & Prevention

Reviewing patient history and medical records of previous sedation and anesthetic recoveries before medication is administered can help prevent a rough recovery. It is also important to properly record any rough recovery, treatment provided, and responses to treatment. Knowledge of previously noted complications can help clinician's anticipate potential future issues and implement pre-emptive strategies. Strategies may include modification of the anesthetic protocol and administration of preanesthetic drugs at home[27] and/or in the clinic. For example, a cat that previously experienced benzodiazepine-induced disinhibition on recovery should receive a different premedication protocol, or a dog with a known history of opioid-related dysphoria can often be managed with opioid-minimal/opioid-free protocols, emphasizing locoregional analgesia, NSAIDs, and CRIs of nonopioid drugs (eg, lidocaine, dexmedetomidine, ketamine). Consultation with a board-certified specialist in veterinary anesthesia and analgesia can be helpful in these cases.

Using a pain scoring scale prior to starting the procedure and prior to drug administration can help during the recovery period—for example, this can aid in differentiating whether vocalization is due to pain or anxiety. An adequate analgesic protocol is also a key component for optimal perioperative management and return to normal physiologic function. Some agents may need to be readministered depending on the procedure, patient response, type of analgesic used, time of drug administration, and duration of action of each drug. Suboptimal use of analgesics, but also unnecessary administration of drugs (eg, opioids) to nonpainful patients, can result in a rough recovery.

Conclusion

To correctly diagnose a rough anesthetic recovery, it is important to anticipate and reduce pain, anxiety, and fear (using pharmacologic and/or nonpharmacologic methods), as well as to understand the temperament of the patient, procedure, medications, and possible drug interactions. Knowledge of common causes of rough recoveries and appropriate treatment can aid in optimization of the recovery period.

A rescue analgesic protocol should always be prepared ahead of time, and the patient should be pain scored.

See page 73 for references.

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