History

A 3-year-old sexually intact Blue Heeler-crossbred bitch was examined to determine the cause for an acute onset of vaginal bleeding, lethargy, diarrhea, and decreased appetite. The owner reported that the bitch appeared clinically normal earlier during the day. The bitch was allowed to roam unrestrained on the owner's cattle ranch. The owner had observed that male dogs were interested in the bitch during the past 2 days. The bitch's most recent estrus was 4 to 5 months prior to examination.

Abnormal findings detected during physical examination were a mild increase in rectal temperature (39.3°C [102.7°F]), a heart rate of 180 beats/min, a tense abdomen, grossly hemorrhagic vaginal discharge, and malaise. Diagnostic tests were conducted.

Electrolyte concentrations and results of serum biochemical analysis were within reference ranges. A CBC revealed hemoconcentration (PCV, 62%; reference range, 37% to 55%), prothrombin time (20 seconds; reference range, 12 to 17 seconds), and partial thromboplastin time (149 seconds; reference range, 71 to 102 seconds) were prolonged. Results for examination of a vaginal cytologic specimen were consistent with early degenerate neutrophils and abundant RBCs but no bacteria.

The abdominal fluid was submitted to a reference laboratory for biochemical analysis as well as aerobic and anaerobic bacterial culture and antimicrobial susceptibility testing. Glucose concentration of the abdominal fluid was 89 g/dL (serum glucose concentration of the bitch was 116 g/dL; reference range, 77 to 125 g/dL). Culture of the abdominal fluid did not yield aerobic or anaerobic bacteria. Cytologic analysis of the abdominal fluid by use of a modified Wright-Giemsa stain3 revealed marked suppurative inflammation with possible hemorrhage (Figure 1). The tentative diagnosis was acute onset of signs of abdominal pain, probably attributable to sepsis with concurrent coagulopathy.

Fluid therapy was initiated by use of a balanced electrolyte solution, with IV administration of a bolus of 20 mL/kg (9 mL/lb) that was followed by continuous infusion at 2.5 times the maintenance rate. Cefazolin4 (22 mg/kg [10 mg/lb], IV, q 8 h) was administered. Hydromorphone5 (0.08 mg/kg, 0.04 mg/lb, SC, q 6 h [as needed]) was administered for pain. A single dose of vitamin K16 (5 mg/kg [2.3 mg/lb], SC) was administered because of the prolongation of the prothrombin time and concerns about undetected anticoagulant rodenticide ingestion in a free-roaming bitch.

Exploratory surgery was performed. The bitch was anesthetized by IV administration of ketamine hydrochloride7 (5 mg/kg) and diazepam8 (0.2 mg/kg [0.09 mg/lb], intratracheally intubated, and maintained on isoflurane9 and oxygen.

We did not detect evidence of blunt abdominal trauma. Hyperemia was evident in the serosa in the midabdominal region and peritoneal wall. A full-thickness biopsy specimen was obtained from the jejunum. The ovaries appeared mildly cystic. The uterus was grossly normal but had increased mural glandular and vascular development consistent with estrus. An ovariohysterectomy and abdominal lavage were performed. No hemorrhagic problems were evident during surgery, and recovery from anesthesia was uneventful.

Results of histologic examination of the uterus and ovaries were consistent with estrus. Histologic examination of the jejunal biopsy specimen revealed acute external mural hemorrhage.

Question

What is the probable cause for the septic condition in this bitch? Please turn the page.
Acute peritonitis secondary to intra-abdominal semen deposition.

Results
The profound chemical peritonitis following intra-abdominal deposition of semen in the bitch reported here likely led to acute onset of the clinical signs of abdominal pain. The degree of the systemic inflammatory response illustrated the severity of the reaction to foreign protein antigens in the semen (Figure 2). Because the hemogram was performed within a few hours after the presumed breeding, peripheral leukocytosis was not detected.

Discussion
Common differential diagnoses for a sexually intact bitch with acute onset of signs of abdominal pain include pyometra, uterine rupture, and uterine torsion. Acute peritonitis secondary to the deposition of semen into the abdominal cavity should also be considered in any estrual bitch with acute onset of signs of abdominal pain and a history of exposure to sexually intact male dogs. Potentially, unsupervised estrual bitches and bitches that have recently been ovariohysterectomized while in proestrus or estrus could be expected to have stripping of the vaginal mucosa in preparation for the copulatory lock because of the large amount of spermatozoa-free prostatic fluid in the final fraction of canine ejaculates, but it is believed that semen typically does not enter the peritoneal cavity of bitches after mating. It is possible that with mismatched mates (ie, small bitch and large dog) or a diseased uterus, the pressure of the copulatory lock may force semen into the peritoneal cavity through a tear in the uterus or perhaps via retrograde flow through the uterine tubes, similar to the situation in bitches with a closed-cervix pyometra. Intra-peritoneal deposition of semen in estrual bitches that have been recently ovariohysterectomized potentially could result from disruption of the freely ligated uterine stump during unintentional breedings. Therefore, we recommend that such bitches be housed separately from sexually intact male dogs for 10 to 14 days after surgery.

It is unlikely that a person who uses good techniques would perforate the genital tract of a bitch during artificial insemination; however, traumatic perforation should be a consideration in bitches that have recently been artificially inseminated. It is logical to assume that endoscopically guided transcervical insemination techniques are less likely to result in perforation of the genital tract than cervical catheterizations accomplished only by use of palpation and manipulation.

Intra-abdominal deposition of semen is believed to result in peritonitis because of the foreign protein antigens in the semen (prostatic portion of the ejaculate as well as the spermatozoa-rich fraction). In humans, spermatozoa are extensively washed prior to intra-peritoneal insemination to remove seminal fluid and minimize any immune reaction against spermatozoa. Anaphylactic shock, peritonitis, formation of adhesions, and production of antispermatozoa antibodies are complications of intra-peritoneal insemination in mares and humans. Testing for species-specific antispermatozoa antibodies has been experimentally performed in dogs, but it is technically demanding and not commercially available. The urgency needed to clinically manage a bitch with signs of acute onset of abdominal pain does not permit use of such a test in a timely manner.

The bitch reported here had clinical signs consistent with systemic inflammatory response syndrome (SIRS). When SIRS is undiagnosed and untreated, the inflammatory mediators involved can lead to dysfunction of multiple organ systems. The slightly prolonged prothrombin and partial thromboplastin times may have been evidence of early disseminated intravascular coagulation with consumption of clotting factors and fibrinolysis secondary to the inflammatory response. These variables were not reevaluated because there was no clinical evidence of coagulopathy during or after surgery.

Evidence of severe suppurative inflammation in the abdominal fluid and concern for sepsis were the criteria for exploratory laparotomy in this bitch. A glucose concentration that is lower in the abdominal fluid than in the serum is highly suggestive of a septic process. Even though aerobic and anaerobic bacterial culture did not yield organisms, the risk for sepsis was high.

Normal vaginal flora (gram-positive and -negative organisms) and contamination from semen are potential sources of bacterial infection for intra-peritoneal deposition of semen. Stabilization of a bitch followed by exploratory laparotomy for diagnostic and therapeutic peritoneal lavage is advised when peritonitis attributable to intra-abdominal deposition of semen is suspected.

Outcome
After surgery, the bitch continued to receive the balanced electrolyte solution, IV, at twice the mainte-
nance rate and hydromorphone was administered as needed for pain. Ticarcillin\(^{c}\) (45 mg/kg [20.5 mg/lb], IV, q 6 h) was substituted for cefazolin to expand the antimicrobial spectrum for possible anaerobic bacteria.

The PCV and concentrations of total solids and electrolytes were reevaluated. Concentrations of electrolytes were within reference ranges. The PCV was 62%, and concentration of total solids was 4.8 g/dL. These laboratory tests were repeated the subsequent day. At that time, the PCV was 41% and concentration of total solids was 4.2 g/dL.

The hemorrhagic vaginal discharge was no longer evident by 12 hours after surgery. The bitch had a normal appetite and unremarkable findings during a physical examination conducted 36 hours after surgery, therefore, it was discharged 48 hours after admission with instructions to the owner to administer amoxicillin-clavulanic acid\(^{d}\) (375 mg, PO, q 12 h) for 10 days.

\(^{c}\)Modified Wright-Giemsa stain, Fisher Diagnostics, Middletown, Va.
\(^{d}\)Normosol-R, 1 L, Abbott Laboratories, North Chicago, Ill.
\(^{e}\)Cefazolin, 1-g injectable, West-Ward Pharmaceutical Corp, Eatontown, NJ.
\(^{f}\)Hydromorphone, 2 mg/mL, Elkins-Sinn Inc, Cherry Hill, NJ.
\(^{g}\)Vitamin K1, 10 mg/mL, Phoenix Pharmaceutical Inc, St Joseph, Mo.
\(^{h}\)Ketamine HCl, 100 mg/mL, Phoenix Pharmaceutical Inc, St Joseph, Mo.
\(^{i}\)Diazepam, 5 mg/mL, Abbott Laboratories, North Chicago, Ill.
\(^{j}\)Isoflurane 99.9%, Phoenix Pharmaceutical Inc, St Joseph, Mo.

"References"


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