Influence of preoperative complete blood cell counts on surgical outcomes in healthy horses: 102 cases (1986–1996)

Anne Rosemarie Toews, DVM, and John Ross Campbell, DVM, DVS

Objective—To assess the value of CBC as a preoperative test in healthy horses undergoing cryptorchidectomy.

Design—Retrospective study.

Animals—117 horses.

Procedure—Medical records were reviewed to identify horses that had had cryptorchidectomy. Of the 117 horses identified, 102 were found that did not have a known medical condition believed to adversely affect surgery. Preoperative CBC was assessed in terms of abnormalities detected and effects of these abnormalities on development of complications during and after surgery and patient management.

Results—Of 102 CBC performed, 55 contained abnormalities. Mild neutrophilia was detected in 40 horses. Of the remaining 15 horses with abnormal CBC, 8 had abnormalities that were considered potentially important. Changes in patient management and development of surgical complications were not associated with these 8 horses. Surgical complications were defined as intraoperative changes in blood pressure, excessive blood loss, development of postanesthetic myopathies, and postoperative wound or respiratory tract infections. Surgical complications developed in 17 horses. Of these, 6 horses had an abnormal CBC that was indicative of mild neutrophilia. Positive and negative predictive values of preoperative CBC on development of perioperative complications were 0.11 and 0.77, respectively.

Clinical Implications—On the basis of findings in our study, determination of preoperative CBC does not predict development of complications during or after surgery and does not alter patient management. (J Am Vet Med Assoc 1997;211:887–888)

At many institutions, routine preoperative evaluation of otherwise healthy horses that have been given general anesthesia includes obtaining a history and performing a physical examination and CBC. History and physical examination findings are the main components of assessment of health before surgery and general anesthesia. Complete blood cell counts are used to quantitate the number of WBC, hemoglobin concentrations, Hct, and number of platelets. To the best of our knowledge, studies have not been performed to assess the value of obtaining CBC in healthy horses prior to elective surgery. In light of this, statements as to the value of preoperative CBC determination in healthy horses are not supported by information provided in the veterinary literature.

In human medicine, cost containment has led to critical evaluation of routine laboratory testing before surgery. Results of many screening tests performed for surgery rarely aid in detecting abnormalities, and when abnormalities are detected, patient management is not substantially altered. Screening tests and procedures commonly performed before surgery on human patients include CBC, serum biochemical analyses, urinalysis, thoracic radiography, and electrocardiography. Wilson et al demonstrated that in 96% of people, decisions regarding fitness for elective surgery can be made on the basis of history and physical examination findings alone.

Because cryptorchidectomy is commonly performed on horses without underlying disease, it offers the opportunity to determine usefulness of preoperative CBC in a population of horses considered to be healthy. The purpose of the study reported here was to assess the value of CBC as a preoperative test in healthy horses before cryptorchidectomy.

Criteria for Selection of Cases

Medical records of 117 horses admitted to the Western College of Veterinary Medicine teaching hospital for cryptorchidectomy between 1986 and 1996 were reviewed. From these, 102 records were found in which horses did not have a known medical condition believed to adversely affect surgery for cryptorchidism. Horses receiving medications or with any other active disease process were excluded.

Procedures—Records were analyzed to determine the percentage of preoperative CBC with values outside of reference ranges. Variables examined included WBC counts, RBC counts, hemoglobin concentrations, PCV values, and platelet counts. In terms of WBC counts, variables included in the differential analysis were the numbers of segmented neutrophils, bands, eosinophils, basophils, lymphocytes, and monocytes per liter. Surgical complications were defined as intraoperative changes in blood pressure (particularly hypotension), excessive blood loss, postanesthetic myopathies, and postoperative wound or respiratory tract infections. Records were analyzed to determine whether patient management changed as a result of abnormalities detected on CBC and whether detection reduced development of surgical complications. Changes in patient management included cancellation or delay of surgery, preoperative blood transfusions, modification of anesthetic protocol, and initiation of any new treatment preoperatively.

Data Analysis

Positive predictive value was the proportion of all horses with an abnormal CBC that developed peri-
operative complications. Negative predictive value was the proportion of all horses with a normal CBC that did not develop complications.

**Results**

Of the 102 CBC performed, abnormalities were detected in 55 (53.9%). Mild neutrophilia (6.71 to 9.0 × 10⁶ segmented neutrophils/L; reference range, 2.7 to 6.7 × 10⁹ cells/L) was detected in 40 horses. Mild neutrophilia in these horses was attributed to the stress of transport and handling. Of the remaining 15 horses with abnormal CBC, 8 had abnormalities (7 horses had Hct < 32%; reference range, 32 to 52%; 1 horse had neutropenia [6.1 × 10⁹ segmented neutrophils/L]) that were more likely to be important in terms of development of complications during or after surgery. In these 8 horses, however, there were no preoperative interventions related to abnormal CBC, and surgical complications did not develop in these horses. In the 7 remaining horses, abnormalities consisted of eosinophilia in 3 horses (0.96 to 1.2 × 10⁹ eosinophils/L; reference range, 0.0 to 0.925 × 10⁹ cells/L), basophilia in 1 horse (0.2 × 10⁹ basophils/L; reference range, 0.0 to 0.017 × 10⁹ cells/L), and monocytes in 3 horses (0.8 to 0.97 × 10⁹ monocytes/L; reference range, 0.0 to 0.8 × 10⁹ cells/L). Surgery was delayed in any horse because of an abnormal CBC. Of the 102 horses, the following surgical complications developed in 17 (16.6%): hypotension (n = 14), postanesthetic myopathy (1), and hypertension (2). Of these 17 horses, only 6 had abnormal CBC preoperatively, which were indicative of mild neutrophilia.

Positive and negative predictive values of abnormal CBC on development of surgical complications were low (positive predictive value, 0.11; negative predictive value, 0.77; sensitivity, 0.35; specificity, 0.42). Thus, if an abnormal CBC was obtained, it was not useful at predicting whether a complication would develop during or after surgery. Positive and negative predictive values of abnormal CBC on development of surgical complications were also evaluated when CBC from horses with mild neutrophilia (attributed to the stress of transport and handling) were not included in the analyses. Positive predictive value became 0.00 (proportion of horses that have abnormal CBC that develop complications), and negative predictive value became 0.80 (sensitivity, 0.00; specificity, 0.82).

**Discussion**

Johnson et al. evaluated predictive values of routine preoperative laboratory tests in adult human beings that underwent outpatient procedures. Complete blood cell counts were abnormal in 9% of these patients, with most abnormalities being predictable on the basis of history and physical examination findings. Detected abnormalities did not influence the number of preoperative cancellations or development of intra- and postoperative complications. On the basis of these findings, they proposed eliminating or substituting CBC and urinalyses as screening tests with less costly alternatives; for example, determination of PCV values by centrifugation or simple urinalyses, using dipstick techniques. Narr et al. evaluated cost-effectiveness of preoperative laboratory screening tests (including CBC) in healthy human patients. On the basis of abnormal laboratory test results, they determined that surgical procedures were not delayed and there was no association between adverse surgical outcomes and preoperative test results. Turnbull and Buck assessed the value of screening tests (including CBC) in otherwise healthy people. They determined that positive predictive values of preoperative screening tests were only marginally superior to history and physical examination findings in predicting surgical complications. They concluded that the value of screening tests in otherwise healthy patients before surgery did not warrant the cost of performing them.

In a study designed to determine usefulness of measuring hemoglobin concentrations and Hct in healthy children prior to outpatient surgery, only 1.1% had low Hct. In those children with low Hct, surgical procedures were not canceled and anesthetic plans were not modified. Results of that and other studies indicate that Hct and hemoglobin concentrations in healthy children are not useful preoperative tests.

In this study, 6 horses with abnormal CBC (indicating mild neutrophilia) developed surgical complications, but it is unlikely that abnormal test results were associated with development of complications. For a screening test to be useful and cost-effective, it should have high positive and negative predictive values. Results of our study indicate that CBC in healthy horses before cryptorchidectomy provide low positive and negative predictive values with regard to development of complications during and after surgery. In addition, preoperative CBC do not result in changes in patient management.

**References**