

CHAPTER 6

EXAMINATION OF THE ORTHOPAEDIC PATIENT

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SECTION ONE

EVALUATION OF THE NONEMERGENCY PATIENT

CHARLES D. NEWTON

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Examination of the orthopaedic patient should be ritualized in the examiner's mind to the extent that the process is automatic. The goal is to ensure that all examinations are similar, thus preventing the misdiagnosis of problems by omission.

PATIENT IDENTIFICATION

Animals should be identified by age, species, breed, and sex; all pertinent information about the owners should also be recorded. Of major importance is a telephone number at which the owner can be quickly reached. Since most owners work away from home, a work telephone number as well as a home telephone number is imperative. Frequently, decisions critical to an animal's care cannot wait 4 to 8 hours until the owner can be reached.

PATIENT EXAMINATION

CHIEF COMPLAINT

The primary reason for the examination should be re- corded. This information may relate directly to the animal's problem or may simply describe a condition that may lead one to consider other systems. A complaint of "My dog cannot use his back legs" may reflect posterior paralysis, severe arthritis of affected joints, weakness from generalized disease, or toxemia, among other conditions. An owner's chief complaint should not be the basis of an immediate decision and diagnosis. Such "hands off" cerebral diagnoses are often incorrect. At best, the chief complaint is a beginning point for a thorough examination.

PATIENT HISTORY

A thorough knowledge of the history of an animal is necessary. Frequently a careful description of the history of onset of a problem will simplify the diagnosis. Most owners will divulge additional information if they are not interrogated. It is more effective to carry on a conversation while examining the animal than to sit down and ask questions for 5 minutes. While it is usually best to deal with the person who spends a major portion of the day with the animal, information from other family members should be included if it contributes to a better understanding of the problem. Specific areas of history that should be included are as follows.

HISTORY OF OTHER ILLNESS

Orthopaedic manifestation of a generalized disease is possible. Swollen distal extremities with a history of coughing and lack of stamina could logically be diagnosed as hypertrophic osteoarthropy.

GENETIC HISTORY OR PEDIGREE

Many orthopaedic diseases have a genetic component. Some problems are so frequently associated with certain breeds that the questions seem redundant. Of greater importance is an awareness of particular genetic problems associated with parents, grandparents, siblings, or progeny. While the degree of clinical manifestation of a genetic disease will vary from animal to animal, the problem may be present to some degree in the presenting animal. Such information from an owner can be helpful, especially when examining an adolescent animal, since adolescence is a period of development in which many genetic diseases begin to manifest themselves.

PREVIOUS INJURY OR ORTHOPAEDIC DISEASE

Previous trauma or orthopaedic disease may result in problems at a later date. The current diagnosis may be simplified by an awareness of the previous problem. Automobile trauma resulting in a dislocation of the elbow 4 years prior to the current presentation may appear to be unrelated. However, if the current complaint is lameness related to the same elbow, the

likelihood of degenerative joint disease due to previous trauma is high. Similarly, a history of hind limb problems due to medial patellar luxation may seem inconsequential to the owner, but acute lameness from a ruptured cranial cruciate ligament in the same knee may be the result of the lack of knee support due to the medial patellar luxation. Often new orthopaedic problems are not truly new, but rather are manifestations of a previous problem. Knowledge of previous injury or orthopaedic disease will simplify the orthopaedic examination by demonstrating a natural progression of the previous problem.

MANNER OF ONSET OF CHIEF COMPLAINT

While the onset of signs may not relate directly to prognosis, knowledge of the manner of onset assists the examiner in the organization of his thoughts. Many diseases are characterized by a specific age and characteristic onset of disability or lameness; with experience the examiner will recognize these frequently presented problems.

Although a gradation of time of onset exists, many problems are characterized by either acute onset or slow progressive onset. Acute onset of signs may signify an unrelated disease process, such as an automobile accident resulting in a fractured femur and immediate lameness; however, the same onset may occur with a chronic problem, such as an osteogenic tumor of the femur spontaneously fracturing and resulting in acute lameness. The former is symptomatic of an entirely new problem, whereas the latter is an acute manifestation of a chronic problem.

With disk disease, an acute paralysis generally indicates a less optimistic prognosis than a paralysis that progresses gradually over a 24- to 48-hour period. A history obtained from the owner may be used to help determine the course of treatment. Knowledge of time of onset is necessary to treat the animal properly.

A slow but progressive onset of signs characterizes other disease entities. Neoplasms usually result in progressive disability over a period of time, unless pathologic fracture results in acute dysfunction. Most degenerative joint disease is progressively disabling over months or even years. Dogs with medially luxating patellas may be normal when the patella is in place, although lame when luxation occurs. The severity of disease may be monitored by following the frequency of lameness. A progressive lameness indicates that the patella is subluxating more often, and correction may be necessary.

SIGNS SEEN BY OWNER

Most persons who live with pets in their homes are quite aware of their animals' physical problems. They note subtle differences that may have little meaning to the veterinarian if seen as an isolated event; however, when compared with normal behavior for the animal, they may reflect problems or disease. The veterinarian should always be willing to listen to the owner's enumeration of signs. Should the information be insignificant, it may be rejected, but frequently owners are aware of valuable information that cannot be obtained from a 10-minute physical examination. Taking the time to listen to an owner will often save time in the workup.

DURATION OF SIGNS

Long-standing disease with chronic lameness leads one to begin thinking about chronic entities, whereas symptoms of short duration suggest other possibilities. Examination of an animal with hind limb lameness of 4 days duration may be indicative of trauma rather than of malignancy. The problem could relate to a patellar or ligament dysfunction of the knee or problems of other ligaments of the hind leg. The eventual diagnosis may reflect a sudden change in a neoplasia, although this would rank low on a list of differential diagnoses.

A thorough integration of the owner's comments on signs, including onset and duration, and a realistic history of genetic problems or previous disease should assist in arriving at a differential diagnosis. This adds additional meaning to the physical examination as well as credibility to subtle or gross abnormalities palpated.

PAST TREATMENTS

Animals may have been treated effectively by the owner prior to presentation for examination. Such treatment masks the true severity of signs. If possible, animals should not be medicated for at least 24 hours prior to examination to adequately assess the severity of the abnormality.

A knowledge of past treatment is necessary to correct mistakes that may have been initiated by an unknowing owner. With the availability of over-the-counter drugs and prescription drugs for human consumption, many animals are on inappropriate medication or ineffective doses.

Owners should be questioned about drug reactions in the animal: they may know by trial and error which drugs benefit their pets, which they vomit, and which are ineffective.

VACCINATION HISTORY

The veterinarian should be aware of the entire vaccination history of the animal being examined or treated. Although this may seem insignificant, it often provides the key to diagnosis.

In large urban areas in which canine distemper is prevalent, a lapse in vaccination or an unvaccinated animal may result in disease. While distemper in its classic presentation is a respiratory disease, many animals will present at later times with the chronic damage of distemper neuritis. Unilateral and bilateral limb lameness can be seen as a result of distemper.

PHYSICAL EXAMINATION

GENERAL EXAMINATION

An examination of the entire animal must take place during an orthopaedic examination. It is incorrect to begin the examination on the obviously abnormal part of the animal. Misdiagnosis or mistreatment may result if all problems are not found and treated. There are no hard and fast rules that state that an orthopaedic patient presents with only one problem. Orthopaedic patients may have heart disease, diabetes, or other medical problems. All problems require the examiner's

awareness.

GENERAL APPEARANCE

Visualize the animal from head to tail. Note any abnormal positioning of limbs. Constantly check for symmetry; the contralateral limbs may be compared in an effort to determine the degree of abnormality present. Observe for superficial signs of other disease. Is there symmetric hair loss, symmetric muscle atrophy, or skin discoloration? This is best accomplished as a "hands-on" examination, taking only several minutes with superficial observation and handling of the entire animal.

TEMPERAMENT

Be aware of the animal's temperament either from observation or the owner's comments. This will help the subsequent examination, especially if the animal is difficult to handle. Stoic dogs are difficult to examine, since it takes extreme pain to elicit evidence of discomfort. This type of dog must be examined more vigorously than the average animal who responds as expected when in pain. Any change in temperament relevant to the onset of orthopaedic disease may be important.

REVIEW OF ALL BODY SYSTEMS

Perform a thorough examination of all body systems. Palpate, auscultate, and evaluate temperature, pulse, and respiration rate. Observe orthopaedic problems as they are encountered in this part of the examination; however, do not begin treatment, rather complete the entire systematic examination.

GAIT ABNORMALITY

Allow the animal full access to the examination room to observe gait abnormalities. If necessary take the animal outside for a more complete examination of gait. If an owner indicates that an animal warms into a lameness, exercising for an appropriate period of time until the lameness occurs is essential. Careful observation of gait abnormalities should assist in determining the affected limb. After completing the general examination, a thorough examination of the previously noted abnormalities may begin. Be aware of medical disease; do not concentrate on finding only one manifestation of an orthopaedic problem. Always treat the entire animal.

LOCAL EXAMINATION OF THE AFFECTED AREA.

Carefully handle the affected limb and examine it for obvious abnormality. If unsure as to the degree of abnormality, simultaneously examine the opposite limb, since a subtle ability to detect abnormalities may be achieved with this method. This first part of the examination will quickly note muscle atrophy, muscle tears, joint swelling, muscle flaccidity, muscle tremor, or other soft tissue abnormalities. It may be necessary to compare muscle mass by measuring limb diameter with a tape measure.

Inspect the skin for signs of recent trauma. Observe bruising, swelling, hematoma, lacerations, or puncture wounds. Note scars that indicate previous trauma or surgeries to the limb.

Palpate all bones in the affected extremity. Begin at the paw and palpate the shape and location of bones and bony prominences. Push on all bones to detect if digital palpation causes pain. Be aware of the texture of the cortices: are they smooth or rough? Obvious breaks in the continuity of the cortex should reflect a fracture.

When palpating bones be certain they are in the correct spatial location and the prominences are in the correct anatomical location. The basic knowledge necessary for a thorough orthopaedic examination is a complete understanding of normal anatomy. An examiner should be able to visualize normal anatomy and compare it mentally with that of the patient. The examiner's fingers must be able to detect any variation from normal. Anatomy is the basis of orthopaedics.

Palpate the limb or affected bone for areas of abnormal swelling, pain, or temperature. Palpate all joints for normal size and range of motion. Abnormal movement may reflect an injury. Knees must be examined for drawer motion. All other joints should be examined for medial or lateral collateral instability or for rotational abnormalities. Does the joint readily subluxate or luxate and then return to normal after manipulation? Check for joint effusion or swelling. A soft liquid feeling usually denotes intrasynovial fluid, whereas a hard swelling indicates a thickened fibrous capsule, a secondary response to instability.

The range of motion should be measured. Does the joint have normal flexion, extension, abduction, adduction, internal rotation, or external rotation? Measurement with a goniometer and comparison with the opposite side may be necessary. (See Appendix B.) Abnormalities in the range of motion may indicate intra-articular problems. Crepitus should draw attention to a specific joint or bone.

If animals are overpowering or uncooperative, local or general anesthesia may be necessary to complete the physical examination. Often the stifle can be efficiently assessed for instability after sedation or anesthesia.

NEUROLOGIC EXAMINATION

When animals present with primary neurologic diseases of the spinal cord, complete neurologic evaluations are necessary, including evaluation of the central nervous system and all peripheral nerves as determined by peripheral nerve reflexes.

When unilateral limb lameness seems to be of neurologic origin rather than bony origin, appropriate examination is necessary. This will often necessitate the use of special examinations, such as electroencephalography (EEG), electromyography (EMG), and studies of nerve conduction velocity.

SPECIAL EXAMINATIONS

Following a complete physical examination and specific orthopaedic examination, it is often necessary to use further diagnostic methods to arrive at a diagnosis. Radiography of affected bones, joints, or the spinal column may be performed. Should plain radiography prove inconclusive, special examinations such as myelography or arthrography may be needed.

These will be dealt with in the chapter on orthopaedic radiography ([Chapter 7](#)).

Joint disease may require joint aspiration (arthrocentesis) and synovial fluid analysis. Neoplasia may require biopsy or surgical excision followed by histology to determine a definitive diagnosis. Laboratory blood determinations, chemistries, and bacteriology are necessary for a complete diagnosis.

ARRIVING AT A DIAGNOSIS

After assimilation of all data from the history, physical examination, and special examination, either a final diagnosis or a list of differential diagnoses should be made.

PATIENT TREATMENT

Most problems can be handled in several ways, some noninvasively and others surgically. When explaining treatment modalities to the owner, the likelihood of success or failure should be indicated. The potential for complications should be outlined as well. Definitive treatment of the patient can proceed along the lines discussed with the owner; a noninvasive form of treatment or an invasive form of treatment.

SECTION TWO EVALUATION OF THE EMERGENCY PATIENT

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- [Physical Examination](#)
Orthopaedic Examination
Neurologic Examination
Abdominal Cavity Examination
Thoracic Cavity Examination
- [Radiographic Examination](#)

This discussion concerns the animal whose orthopaedic problems are the result of an acute polytraumatic incident; these patients represent a significant challenge in initial assessment and evaluation. This discussion presumes that the patient is no longer in critical condition and that immediate concerns for the preservation of life are no longer paramount, if such concerns existed previously. The animal under consideration is therefore in "stable" condition.

The initial physical and orthopaedic examination must be consistent and thorough. These assessments are generally carried out concurrently in order to minimize patient manipulation and attendant discomfort. The typical emergency patient has undergone rather severe trauma, and it is commonplace for concurrent fractures and ligamentous, neurologic, or other soft tissue injuries to accompany an obvious problem. All body systems must be examined thoroughly and rapidly.

PHYSICAL EXAMINATION

ORTHOPAEDIC EXAMINATION

When fractures occur near joints, it may be difficult to assess the integrity of contiguous ligamentous structures. While it is rather uncommon for cruciate or collateral ligament disruption to occur concomitant with a supracondylar femoral fracture, the experience of repairing a fracture only to discover, after recovery from anesthesia, that the animal has suffered major ligamentous trauma is sufficiently disconcerting to mandate careful evaluation of such possibilities both preoperatively and especially intraoperatively. It must also be remembered that it is difficult or impossible, by physical examination alone, to distinguish fractures occurring in the vicinity of joints from luxations. Radiography must be used routinely to establish a definitive diagnosis. Once fractures have been identified, a temporary splint may be rapidly applied to keep the animal comfortable during the remainder of the examination.

NEUROLOGIC EXAMINATION

Assessment of concurrent neurologic injury is of major importance and can be a challenging "art" when dealing with the severely traumatized animal. It is not uncommon for neurologic deficits observed soon after trauma to be transient and theoretically related to contusion, swelling, and edema of nerve tissue rather than to anatomical disruption of the neural elements. Many of these animals subsequently return to normal neurologic function days to weeks following the insult. The likelihood of this recovery is impossible to forecast in the acute phase, however, which complicates the discussion of therapeutic options and prognosis with the owner. In instances involving sciatic, radial, ulnar, and other peripheral nerves mediating limb function, electrophysiologic testing can aid in offering a reasonable prognosis, although a period of approximately 5 to 7 days after the injury must elapse before valid conclusions can be drawn.

ABDOMINAL CAVITY EXAMINATION

Soft tissue structures are commonly injured in the polytrauma patient. The urinary system is frequently traumatized in such animals, especially the lower urinary tract in association with pelvic fractures. The upper portions of the urinary system are not always spared, however, and it has been estimated that 10% to 20% of all dogs involved in automobile accidents suffer trauma that may affect the kidneys.⁽³⁾ Injury to the renal parenchyma may result from blunt or sharp trauma to the lumbar region and can range from minor bruising or subcapsular hematoma to disruption of the entire kidney. Renal injuries have

been classified, for simplicity, into three major categories, and the diagnosis and management of such injury has been discussed in detail elsewhere.(3)

The ureters may also sustain trauma but are involved less commonly than other portions of the urinary system. The ureters may be avulsed from the renal pelvis or ruptured. Injury to the ureters generally occurs in association with renal injury.(3)

The urinary bladder and urethra are probably the portions of the urinary system injured most frequently in the trauma patient. Judicious attempts to assess the integrity of the urinary bladder should be made at the time of the initial physical examination.

Injuries to the urethra are relatively common, particularly in association with pelvic fractures in general, and fractures involving the pubis in particular. The urethra may be transected at the time of trauma either directly by the intervention of sharp bone fragments or indirectly, when a distended bladder is forced cranially at the time of injury, thus tearing the urethra either at the neck of the bladder, in the area of the prostate gland, or at the ischial arch. Trauma to the prostate gland itself may also occur.

The passage of blood-stained urine should obviously prompt suspicion of urinary tract trauma. Trauma followed by depression, anuria, oliguria, anorexia, shock, and collapse is also indicative of urinary system disruption although certainly not specific for it. Because of the frequency of occurrence, rupture of the bladder should be suspected in all animals sustaining any significant abdominal trauma, especially if the animal remains in shock for more than 12 hours and if oliguria or anuria persists following adequate fluid volume replacement and continued intravenous fluid therapy.(3)

It may be possible to discern fluid accumulation within the abdominal cavity either clinically or radiographically, and the nature of this fluid may be determined by paracentesis and analysis.

Radiographic evaluation is of great assistance in assessing the integrity of the urinary system. Retroperitoneal hemorrhage and fluid accumulation associated with renal or ureteral trauma may be discernible. Contrast studies such as intravenous urography and positive or negative contrast cystography or urethrography are valuable aids in such evaluation and, short of exploratory surgery, may be the most definitive means of obtaining substantive information concerning urinary system function and integrity.

The relative importance of the various derangements occurring in the polytrauma patient must be kept in perspective. While rupture of the urinary bladder may often be of life-threatening significance in the cat, the consequences are seldom so immediately grave in the dog. Assessment of the integrity of the urinary system is certainly of lower priority than adequate fluid volume replacement to combat circulatory collapse and shock, or disruption of the large or small bowel. The performance of sophisticated radiographic studies designed to evaluate bladder or urethral disruption in the multiply traumatized patient, especially prior to critical physical assessment and adequate initial therapy, has all too often been retrospectively recognized as a fatal error.

The urinary system is certainly not the only area of potentially severe problems in animals sustaining blunt abdominal trauma. Critical and repeated assessment is necessary to detect problems related to hepatic, biliary tract, splenic, and gastrointestinal injury. Pain on abdominal palpation, radiographic evidence of expansion of the retroperitoneal space, ileus, or free abdominal fluid may aid in the recognition of such problems. While paracentesis is certainly worthwhile if positive results are obtained, diagnostic peritoneal lavage is a much more accurate and sensitive indicator of intra-abdominal hemorrhage, bile leakage, or perforation of a hollow viscus. These evaluations should be combined with clinical assessment and clinical laboratory support in an attempt to define obscure problems that may be responsible for the deterioration of a patient who had previously improved after initial therapy.

Diaphragmatic hernia also occurs as the result of blunt trauma and may be among the most frequently overlooked problems in the polytrauma patient. Such injuries may proceed to cause problems in either the immediate posttrauma period or as long as months later. Although the most common clinical sign associated with an acute diaphragmatic hernia is dyspnea, considerable variation exists owing to the variability in the position and size of the diaphragmatic tears and in the abdominal organs that become herniated. Initially, therefore, there may be no clinical signs associated with the hernia. Early radiographic signs may also be subtle or absent, even in the face of repeated evaluation. While it is recognized that clinical signs may be seen weeks to months or even years after the initial traumatic insult, unrecognized diaphragmatic hernias are potential causes of life-threatening intraoperative anesthetic problems.(2)

THORACIC CAVITY EXAMINATION

Frequently trauma patients also incur various types and degrees of thoracic damage. Rib fractures are seen commonly but in most instances are of little significance unless the fractures are such that a "flail chest" results. Under any circumstances, though, rib fractures may be accompanied by pneumothorax or hemothorax, or such complications may be present without any obvious damage to the thoracic wall. Pulmonary parenchymal hemorrhage, "neurogenic" pulmonary edema, hemopericardium, and pneumomediastinum are among the thoracic complications recognized in traumatized animals. Again, careful physical assessment along with an index of suspicion and radiographic evaluation will aid greatly in identification of such problems, enabling one to avoid the potentially serious complications that they can afford if not appreciated.

Because of the severity of trauma sustained by many orthopaedic patients, this population of animals also merits close scrutiny for manifestations of traumatic myocarditis. Extensive and severe cardiac contusion and injury from nonpenetrating trauma may occur even though little or no external evidence of chest injury is observed. These blunt injuries may include rupture of the interventricular septum, valvular damage, and tears of the atrium, but the most common is contusion with or without traumatic myocardial infarction. The area of traumatized myocardium has been shown to possess an electrical potential that differs from that of the surrounding heart muscle. This difference in electrical potential is believed to be

conductive to the development of cardiac arrhythmias.' A majority of such arrhythmias will manifest themselves within 48 hours of injury, but it is not uncommon for the appearance of electrocardiographic (ECG) abnormalities to be delayed. ECG findings may include sinus tachycardia, frequent premature ventricular contractions (PVCs), and ventricular tachycardia, but the most common findings are nonspecific ST-segment and T-wave changes.(1)

The clinical findings accompanying these ECG changes vary. A majority of patients suffer mild changes with little or no clinical signs. Depression and unresponsiveness are observed in other patients. The arrhythmias may also result in sudden and unexpected death, probably due to the production of ventricular tachycardia and ventricular fibrillation.(1) A practical approach to recognition of the problem is to obtain an ECG on admission in all animals with chest injuries and then to repeat the ECG in 24 to 48 hours if negative. (1) Even without evident chest injury, all orthopaedic trauma patients merit an intensive evaluation of their cardiovascular system, including a thorough physical examination, palpation of the femoral pulse, a screening ECG, and chest radiographs when indicated. A strong case can be made for the routine performance of lead 11 ECGs two to three times daily in the preoperative period in all orthopaedic patients who have experienced substantial trauma, since injury to the chest per se is not required to produce myocardial damage. Even without direct trauma to the bones of the chest wall, there may nonetheless be contusion of the myocardium due to the heart "slapping" against the sternum or vertebrae as sudden acceleration or deceleration occurs.(1)

In any case, if heart disease is detected, a general anesthetic should be avoided until the ECG abnormalities are resolved. Chemotherapeutic management of the condition should be dictated by the type and severity of the arrhythmia and the clinical manifestation. This topic is discussed by others.(4,5)

If the orthopaedic injury is such that surgical management cannot be delayed for a sufficient period, an alternate regimen of anesthetic management can be chosen to eliminate the myocardial-sensitizing characteristics of the thiobarbiturates and halothane. Epidural analgesia or various narcotic/barbiturate protocols may be suitable for such patients.

The lack of an appropriate index of suspicion of traumatic myocarditis resulting in cursory preanesthetic assessment of the cardiovascular system has undoubtedly been responsible for many intraoperative deaths.

RADIOGRAPHIC EXAMINATION

Once sufficient attention has been devoted to the above considerations, efforts can then be directed toward obtaining a high-quality radiographic evaluation of the orthopaedic injury. This is clearly an important component of the preoperative evaluation of the trauma patient, since information thus gained is critical in formulating a definitive plan of therapy and in presenting options and alternatives, prognoses, and financial estimates to the owner. Contingent upon the overall status of the animal and the location and suspected type of the injury, radiographic studies may be performed upon the awake patient; sedatives, tranquilizers, or neuroleptanalgesia may be employed, or radiographic examination of an obvious fracture may be postponed until the animal is anesthetized for definitive surgical or nonoperative management. This latter approach is often of value, since it avoids unnecessary and unwarranted pain and trauma to the patient. Additionally, the radiographic studies performed upon the anesthetized animal are often of superior quality, since motion and struggling are eliminated and exact positioning is facilitated. Adopting this approach, however, requires establishing a rather special rapport with an understanding and well-informed owner.

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