VETERINARY SPECIALTY
HOSPITAL

General Practice Surgery
Helpful Hints

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The intent of this continuing education lecture is to share frequently asked questions from veterinarians. If the lecture topic and format is helpful, please let us know and we will continue to use this format in upcoming lectures.

General Practice Surgery Tip # 1 – Canine Cruciate Ligament Injury If is looks like a cruciate injury, it probably is! The key to accurate diagnosis of a cranial cruciate ligament injury is the information gained form the orthopedic exam AND radiographic evaluation. The presentation of CCLI are varied and include 1) Insidious onset. Mild and static (often intermittent) lameness 2) Insidious onset, progressively worsening lameness 3)Acute onset, improved then worsening lameness 4) Insidious onset, progressive with an acute worsening of lameness 5) Acute onset, non-weight bearing lameness 6) Unable to use the pelvic limbs (bilateral CCLR).

In most cases, the diagnosis of rupture of the cranial cruciate ligament is made in the examination room. A good lameness examination usually takes 20 minutes. It is imperative to complete the orthopedic exam following the identification of a CCLR; while concurrent orthopedic injuries are uncommon, they can occur. Observe the dog when rising and sitting in the exam room. Dogs with cruciate injury tend to hesitate to sit, then will not sit on their haunches but rather sit on a side. This is because if the dog sits square, it puts a tremendous amount of cranial tibial thrust on the stifles which is painful with cruciate injury. The next important step is to observe the patient walking. This is especially important with a subtle lameness. A cruciate deficient stifle will have a shortened caudal stride and the stifle will be held in extension. Following observation of ambulation, start the physical examination by standing in back of the dog and grasp its hind limbs, checking for muscle atrophy. Then slide your hands to the inside of their stifles and compare sides. A dog with cruciate rupture of any appreciable time (over 4-6 weeks) will have a thickening on the medial aspect of the stifle (medial buttress). This is due to hypertrophy of the medial collateral ligament and is secondary to stifle instability. The most common cause of stifle instability is cruciate rupture; therefore, this is a very consistent sign indicative of chronic instability that should not be missed.

To perform the cranial drawer test, place one index finger on the tibial tuberosity and the thumb on the fibular head. With the opposite hand, place one index finger on the patella and the thumb on the lateral fabella. The distal femur is held firmly and the tibia moved caudally then cranially. This should be performed with the stifle in varying degrees of flexion. Any cranial movement or drawer is abnormal, except in young dogs where mild

cranial translation of the tibia can be normal. The degree of drawer with respect to the position of the stifle is significant and can infer the extent of the ligament injury. Crepitation during the cranial drawer test, or during flexion and extension of the stifle, may be indication of meniscal pathology or osteoarthritis.

The cranial tibial thrust test is also used to evaluate the integrity of the CCL and is performed with the dog in lateral recumbency. The stifle is held in 90 degrees of flexion with one hand while the other holds the tarsus. The index finger of the hand holding the stifle is placed across the straight patellar ligament. The tarsus is flexed forcibly without charging the angle of the stifle. Always ensure that you begin the test with the tibia in the neutral position. If the tibia translates forward with respect to the femur (cranial thrust), a CCL rupture is present.

Though the diagnosis of rupture of the cranial cruciate ligament is usually made in the examination room, radiographs should always be taken for three reasons. First, secondary signs of joint effusion and/or osteophyte formation will confirm pathology when cranial drawer is equivocal or not present. Second, the effusion and osteophytes represent the secondary signs of osteoarthritis. Even if the joint is perfectly stabilized, arthritis is by its nature progressive; therefore, 100 percent athletic function should not be expected. The radiograph will give you documentation of pre-existing osteoarthritis. Third, unexpected pathology such as an erosive bone tumor at the origin or insertion of the CCL could be present that has led to cruciate insufficiency.

Usually two views, a craniocaudal and mediolateral view, are taken. The field of view should include mid femur to mid tibia. The technique should allow visualization of the soft tissues and discernment of the joint capsule. If a tibial plateau leveling operation or tibial tuberosity advancement is planned, specific radiographic studies that will include the tarsus are performed.

After confirming radiographic technique, positioning, and field of view are appropriate, start interpretation with evaluation of the soft tissues. The presence of joint effusion suggests joint instability (cruciate rupture) or trauma and can be determined in two different ways from the lateral view. The infrapatellar fat pad occupies a considerable space within the stifle of a normal dog. It is seen as a fat density behind the straight patellar tendon. There is very little joint fluid in the normal stifle that is seen as a fluid density at the angle of the tibial plateau and femoral condyles. Joint fluid should not extend towards that patella in the normal stifle. Secondly, distension or caudal deviation of the caudal joint pouch can be noted radiographically and with experience, can be a consistent finding in patients with significant joint effusion.

Osteophytes signal the presence of chronic joint instability and osteoarthritis. Joint instability is often caused by cruciate insufficiency so these two conditions are commonly concurrent. The magnitude of osteophyte formation is proportional to the severity of the osteoarthritis. Osteophytes will be seen in several locations including 1) Proximal and distal aspect of the patella seen on lateral views. 2) Caudal tibial plateau seen on lateral views. 3) Medial tibial plateau seen on cranial/caudal views. 4) Lateral tibial plateau seen

on cranial/caudal views. 5) Intercondylar notch seen on cranial/caudal views. 6) Along the trochlear ridges. 7) Surrounding the origin of the long digital extensor tendon.

General Practice Surgery Tip # 2 – Lesions of the extremities. Lesion of the distal extremities (including the distal antebrachium, metacarpals/metatarsals, and digits) can be difficult and frustrating to manage surgically for both owners and veterinarians. In general, this difficulty arises from the lack of local skin available for wound closure. With respect to the digital area, the incidence of neoplastic lesions (SCC, MM, OSA) is high and while adjuvant treatment modalities may be indicated, surgical excision remains the initial treatment of choice. A recent study evaluating the correlation between fine-needle aspiration cytology and histopathology in the evaluation of cutaneous and subcutaneous masses from dogs and cats reported "the cytologic diagnosis was in agreement with the histopathologic diagnosis in 90.9% (221/243) of cases. For diagnosing neoplasia, cytology had a sensitivity of 89.3%, a specificity of 97.9%, a positive predictive value of 99.4%, and a negative predictive value of 68.7%."[1] While FNA may be the modality of choice for the diagnosis of MCT and histiocytomas, the extent of tumor excision required and thus the aggressiveness of the surgery required is best determined by a biopsy.

For smaller lesions of the foot (<5mm), excisional biopsies can be considered. Both excisional and incisional biopsies can be performed utilizing a scalpel blade or a punch biopsy. Regardless of the size of the lesion, tissue submitted for histopathology must include samples from the edge of the lesion at the junction between normal and abnormal tissue. The exception is OSA that requires sampling from the center of the lesion to enhance the diagnostic yield. Wound closure is dependent upon the size and location of the wound. For larger defects with significant tension, open wound management pending the final histopathology may be appropriate.

Given the likelihood for increased motion, the increased risk for external contamination and the inherent risk for self-traumatization, biopsy sites for distal extremity lesions should be bandaged.

General Practice Surgery Tip # 3 – Wounds of the Extremities. Similar to most trauma and emergency cases, the initial management of a wound is one of the most important factors affecting outcome. While cardiovascular stabilization of the patient is of primary importance, the initial wound management can begin while the patient is being stabilized. Once the patient is stable for anesthesia, a sterile, water soluble gel should be placed in the wounds to prevent any further contamination during preparation. Alternatively, a sterile paper drape can be cut to the size of the wound and stapled to the wound edges to prevent additional contamination of the wound bed. A large area surrounding the wound should be clipped and prepped in routine fashion with care not to allow alcohol to contact areas where the skin envelope has been compromised. Copious lavage with saline is often helpful prior to débridement to remove dirt, foreign material and blood that might prevent complete evaluation of the wound. Débridement of all necrotic and infected tissue is vital for successful wound management. Any remaining necrotic tissue will harbor bacteria and prevent effective phagocytosis. Débridement begins superficially and progresses deeper into the wound with tissue viability judged by

the tissue color and presence or absence of bleeding. When in doubt regarding the viability of tissue, the tissue should not be excised and re-evaluated at a later date. This is of primary importance for wound of the extremities when tissue for wound closure is generally limited.

During exploration, the wounds should be copiously lavaged. In the early post-trauma period, bacteria can be dislodged by lavage delivered at a pressure of 7-8 PSI. The concern regarding lavage with high pressure is not the imbedding of bacteria and foreign material deeper into the tissue but rather, the resultant tissue edema that can increase the risk of infection. Volume lavage alone is ineffective; the appropriate pressure for lavage can be generated by using a 35cc syringe and a 19 gauge needle (7-8 PSI delivered). LRS and 0.9% NaCL are considered superior lavage solutions. Tap water is considered appropriate in certain circumstances (highly contaminated wounds with a large surface area). Both 0.05% chlorhexidine diacetate (1/40 dilution of standard 2% solution) and 1% povidone-iodine are acceptable antiseptic lavage solutions. Chlorhexidine is preferred for the initial lavage as it is not inactivated by the presence of tissue proteins and has sustained residual activity.

The decision for closure of a bite wound after débridement and lavage is dependent on several factors. These include the wound's location, the degree of remaining contamination, adequacy of blood supply, wound tension, and the status of the patient. In the absence of quantitative bacterial cultures, the surgeon uses judgment to determine the probable success of closure. If any doubt exists concerning the viability of tissue or amount of infection remaining in the wound, closure should be delayed. Primary closure in bite wounds requires strict adherence to basic surgical principles. Only healthy tissue should be present after débridement and lavage. Hemostasis is critical as blood clots provide a superior medium for bacterial growth. Tissue layers should be gently apposed to minimize dead space with as few sutures as possible. Ideally, the wound should be tension free. One or more Penrose drains may also be required for dead space. Active suction drains are ideal but often not available in general practice and can be difficult to place in wounds of the distal extremities. If used, Penrose drains should exit through separate stab incisions in the sterile field, should have only the distal (gravity dependent) end of the drain exposed **and be covered by a sterile dressing postoperatively**.

In many bite wounds, delayed primary closure is the best alternative for wound management. The wound is left open after the initial débridement, and covered with a sterile, permeable dressing. This is surrounded by a thick absorbent layer of padding, a conforming bandage, and an elastic, adhesive bandage layer. Delayed primary closure allows for ongoing assessment of wound healing and additional débridement of the wound bed via wet-to-dry bandaging. Closure is usually performed 3 to 5 days after the initial surgery, unless further débridement is necessary. In some areas such as the distal limbs, extensive skin loss necessitates the use of a skin graft or flap for definitive repair.

General Practice Surgery Tip # 4 – Feeding following gastrointestinal surgery. The phrase “if the gut works – use it” is becoming an important adage. In past years,

significant concern exists regarding feeding patients following gastrointestinal surgery. The concern was that early feeding would increase the risk of enterotomy/gastrotomy site dehiscence due to the physical presence of ingesta within the bowel lumen. This concern arose despite the fact that no prospective studies in animals exist to support this argument. A recent trend in human medicine is towards early oral feeding and prospective studies exist that do not identify any increased morbidity or mortality associated with early feeding (feeding within the first 24 hrs postoperatively despite the presence of postoperative ileus)[2]. The advantages of early feeding include; 1) early nutrition support 2) decreased gut mucosal permeability resulting in decreased risk of bacterial translocation 3) promotion of a positive nitrogen balance and 4) cost effectiveness.

It should be noted that in recent years, the gut has been recognized to be metabolically active and immunologically important in critically ill patients. Complete bowel rest is associated with adverse changes in intestinal structure and function that cannot be reversed with parenteral nutrition. Prolonged small intestinal stasis (with lack of ingesta) leads to villous atrophy and increased intestinal mucosa permeability. The most important stimulus for mucosal cell proliferation and turnover is direct presence of nutrients in the intestinal lumen. Both experimental and clinical evidence support the recommendation that enteral feeding should be used in all patients that have sufficient gastrointestinal function to allow digestion and absorption of nutrients. Patients intolerant of total enteral nutrition may benefit from a combination of partial enteral and partial parenteral nutrition.

In general, my recommendation for feeding patients following gastrointestinal surgery are as follows: *Routine, uncomplicated enterotomy or R&A in a stable patient:*
Offer water @ 6hrs post recovery from anesthesia and food at 8-12hr.

Debilitated patient with major gastrointestinal surgery with or without peritonitis:
Offer water followed by food when patient is stable. Consider feeding tubes or parenteral feeding if prolonged recovery is anticipated.

Important guidelines for enteral feeding are as follows:

1. Calculate Resting Energy Requirement (RER)

Body Weight 2 to 45 kg:	RER= 30 x BW + 70
Body Weight < 2 or > 45 kg:	RER= 70 ($BW^{0.75}$)

2. Calculate illness energy requirement (IER)

Factor= 1.0-1.25

ER = RER x illness factor

3. Consider protein requirement	**Canine**	**Feline**
Standard requirement	4-8 g/100 kcal	6-9 g/100kcal
Decreased reqt. (hepatic or renal failure)	< 4 g/100 kcal	< 6 g/100 kcal

Increased reqt. (protein loss) > 8 g/100 kcal > 9 g/100 kcal

4. Calculate daily volume required

IER-energy density (kcal/ml) = mls of formula/day

Product	Caloric Content (kcal/mL or g)	Protein Content (g/100 kcal)	Protein Content (% Prot Cal)	Fat Content (% Fat Cal)	Carbohydrate Content (% CHO Cal)
Veterinary Polymeric					
CliniCare Canine powder*	0.9	6.0	24	64	12
CliniCare Canine liquid	0.9	5.5	25	59	16
Renal Care Canine	0.8	2.8	14	66	20
CliniCare Feline powder*	0.8	9.1	36	53	11
CliniCare Feline liquid	0.8	8.6	36	48	16
Renal Care Feline	0.8	5.6	25	60	15
Eukanuba Nutritional Recovery Diet	2.1	7.4	29	41	30
Prescription Diet a/d	1.3	8.8	36	51	13
Prescription Diet Feline p/d*	0.9	9.3	37	56	7
Prescription Diet Feline k/d***	0.9	4.4	21	67	13
Prescription Diet Feline c/d***	0.6	8.9	33	52	15
Prescription Diet Canine k/d***	0.6	3.1	13	49	39
Prescription Diet Canine u/d***	0.7	1.9	8	48	45
Prescription Diet Canine i/d***	0.6	5.9	24	31	45
Waltham Instant Concentration*	1.5	9.3	37	37	25
Nutri-Cal	4.6	0.3	1	62	37
Human Polymeric					
Jevity	1.1	4.2	18	30	52
Pulmocare	1.5	4.3	17	55	28
Osmolite HN	1.1	4.4	17	30	53
Sustacal	1.0	6.8	24	21	55
Ensure HN	1.1	6.0	23	40	38
Baby food, turkey	1.0	14.6	58	42	0
Human Monomeric					
Peptamen	1.0	4.4	16	33	51

* diluted with water according to manufacturer's directions
** blenderized 1/2 can (224 g) + 3/4 cup (170 mL) water
*** blenderized 1/2 can (224 g) + 1 1/4 cup (284 mL) water

* Adapted from LM Freeman, Tufts University School of Veterinary Medicine Clinical Hospital Notes

General Practice Surgery Tip # 5 – Orthogonal View Radiographs. The need for orthogonal view radiographs is paramount in orthopedic surgery. Although circumstances exist where complete radiographic evaluation may compromise the patient, incomplete studies can be equally detrimental to the long term health of the patient. While a high index of suspicion of a specific injury may exist following the orthopedic exam, radiographic evaluation is required not only for confirmation but also for evaluation of concurrent injuries. If complete radiographic evaluation is hampered by lack of patient cooperation, appropriate pain management and/or sedation will aid in pursuit of diagnostic radiographs.

[1] Vet Clin Pathol. March 2006;35(1):24-30. G Ghisleni, P Roccabianca, R Ceruti, D Stefanello, W Bertazzolo, U Bonfanti, M Caniatti Department of Veterinary Pathology, University of Milan, Italy.

[2] Ann Surgery. July 1995; 222(1): 73-7. Reissman P, et al. Department of Colorectal Surgery, Cleveland Clinic Florida, Fort Lauderdale, Florida, USA.