THE PRINCIPLES AND PRACTICE OF VETERINARY SURGICAL PATHOLOGY

Paul C. Stromberg DVM, PhD
Diplomate, American College of Veterinary Pathologists
Ohio State University
Stromberg.1@osu.edu
Copyright© The Ohio State University

“Life is short, the Art is long, opportunity is fleeting, experience delusive, judgment difficult”

Hippocrates of Cos ~ 460 BC

OBJECTIVES:
1. Provide an overview of the culture of surgical pathology in veterinary medicine
2. Review the elements and component parts of the biopsy process from specimen collection to communication of results
3. Define the responsibilities and expectations of all of the participants
4. Identify the problem areas and how to manage them

The Western Medical Paradigm is well known to all health care professionals. The basic approach is similar for veterinary medicine and emphasizes the centrality of accurate medical diagnosis. A glance at the flow diagram will reveal that the surgical biopsy procedure and the pathologist reading the biopsy sample are somewhat removed from the patient and outside the mainstream of medical information pertaining to the facts of the case.

This means that the pathologist must rely on members of the clinical team to provide important information that is almost always helpful in reaching a diagnostic conclusion or at least to rule out other diagnostic possibilities. This reliance makes the practice of
surgical pathology a somewhat unique activity in medicine because it requires different skills of two different but related groups of veterinarians in getting a diagnosis.

“WHAT IS SURGICAL PATHOLOGY”?

Surgical pathology is a transient partnership between a clinician and his support team of technicians and a pathologist on behalf of the patient to aid the clinician in:

1. Making or confirming a diagnosis
2. Assisting in the prognosis of the case by
   a. Assessing the progress of therapy
   b. Grading and staging of neoplasms
   c. Determining the completeness of surgical excision

“An activity practiced by two groups of veterinarians divided by a common purpose”

AUTOPSY PATHOLOGY VERSUS SURGICAL PATHOLOGY

Surgical pathology is fundamentally different from autopsy pathology in both its purpose and execution. The autopsy is performed to ascertain a cause of death, confirm or rule out a disease problem that may potentially affect other animals at risk or follow changes in an experimental design and to document these findings. The examination does not benefit the animal being examined. It is retrospective in its scope. It should be highly descriptive especially with respect to gross lesions which will be destroyed after the autopsy is completed. The only record of gross findings is the written description of what was observed. Because the blocks and histopathology slides are archived and available for review, exhaustive microscopic description is not necessary. Autopsy pathology from start to finish is usually (but not always!) performed and controlled by one individual and that confers a large advantage in finalizing the case.

Surgical pathology is prospective disease investigation on a patient under medical care that is still alive and whose disease course can theoretically be altered by therapy. There is a premium placed on speed and accuracy in the process that is not generally required in autopsies. There are however, numerous and significant problems in veterinary surgical pathology that can negatively impact the desired result of speedy and accurate specific clinical disease diagnosis.

The “Downside” of surgical pathology is:

1. The pathologist does not see the gross lesions
2. Often there is a poor or no history
3. The pathologist does not select the tissue and lesions to be examined
4. The pathologist usually does not trim or cut in the tissues so s/he cannot control artifacts or orient the specimens
5. Specimens are often very small, distorted and marginally adequate for thorough evaluation
6. The tissue is occasionally improperly fixed and partially autolyzed
7. The pathologists cannot get additional tissue to exam so they have to make a diagnosis with what they have before them
8. The clinician often needs an answer quickly so there is minimal time for reflection
9. The pathologist usually lacks corroborative data
10. The clinician will believe the diagnosis is accurate and act on it
11. The patient is still alive so the diagnosis better be correct
12. Legal liability in veterinary medicine is changing and may impact the pathologist as well as the clinician submitting the biopsy.

The “Upside” of surgical pathology is:

1. There is no autolysis (usually but not always)

The World of Veterinary Medicine
The practice of surgical pathology requires that the clinician and pathologist share an information base and understanding of the principles of medicine and pathophysiology. In addition they should both be aware of the problems and issues faced by each other in the collection and processing of the biopsy. Although both are knowledgeable about medicine, clinicians and pathologists inhabit very different parts of that world and have become isolated from each other geographically as well as scientifically. This isolation absolutely requires careful, timely and accurate communication among all of the parties in the biopsy process. It accounts for most of the problems, mistakes and complaints. Every solution to the problems encountered in surgical pathology begins with methods to improve communication

Communication is the biggest and most persistent problem in veterinary surgical pathology today

The Objective of the Biopsy = obtain a sample of tissue from a living patient to identify or characterize a pathologic process or ideally diagnose a specific disease so that a clinician can make a treatment decision. The surgeon or clinician is engaged in the decision to biopsy, sampling the tissue, preparation and submission to a pathology laboratory. The pathologist or his (her) laboratory continues the processing, creates the microscopic slide, evaluates the specimen and communicates the information back to the clinician.
“Ohne Diagnostic keine vernünftige Therapie. Erst untersuchen, dann urteilen, dann helfen”

(“Without diagnosis, there is no rational treatment. Examination comes first, then judgment, then one can give help”)

Carl Gerhardt, Würzburg, 1873

Biopsy is a highly efficient, cost effective diagnostic tool but increased sophistication in veterinary medicine is driving complexity in pathologic diagnosis. To justify the cost of new minimally invasive techniques we must maximize the diagnostic and therapeutic yield from the procedure. Clinicians want more useful information from each sample. At the same time there is a trend toward smaller and smaller pieces of tissue which conspires to confound the process. All of this change in clinical veterinary medicine creates increased pressure for a successful biopsy with resultant accurate and definitive diagnosis on the first sample. Given the cost of a laparoscopic biopsy (about $1,200), it is unlikely a second biopsy will be an option if the first did not yield a useful diagnosis. This “Perfect storm” of events demands that each party execute his or her part of the process correctly and that requires that each party understand what is needed and strive to provide it.

Surgical pathology is the practice of veterinary medicine and as such should be governed by the rules of good medical practice. Clinicians practice the principle of Total Patient Evaluation when making judgments about diagnosis and treatment. They consider all of the data and facts at hand. Likewise pathologists should not base their diagnosis just on what they see on the slide. Unfortunately, the slide is often all they have although many times it is enough. We reinforce this practice by how we test pathologists on the certification examination but we lose sight of the fact that the objective of the certification examination is quite different than that of a biopsy

Pathologists should describe what they see in the biopsy but make a final interpretation or diagnosis in the context of all the relevant information about the case. The diagnosis of canine cutaneous histiocytoma is often straightforward but if the patient has 50 widely disseminated similar skin masses its something else other than a simple histiocytoma. If the pathologist doesn’t know about the 50 masses, s/he will make an incorrect diagnosis of histiocytoma. Young residents often focus too intensely on the slide and forget about the patient.
The ability to perform a total patient evaluation depends almost entirely on the clinician. The pathologist is usually not directly involved in the clinical examination. Indeed in the current culture of veterinary practice, the pathologist may be thousands of miles away. It is well known in studies of diagnostic errors in human medicine that the failure to properly frame the case is an important factor in misdiagnosis. This is perhaps the most serious, widespread communication problem associated with surgical biopsy. At the least it is poor medical practice and constitutes “contributory negligence” if an incorrect diagnosis was given because of a lack of complete information.

The Possible Results and Outcome of the Biopsy Procedure

**A. The Best Outcome** - Rapid, accurate diagnosis of a specific clinical disease & the timely application of the appropriate therapy or at least communication of the scope of the problem to the patient owner. This in turn permits accurate prognosis of the clinical problem. The owner is satisfied with the process if not always the diagnosis. Public trust in vet med is upheld.

**B. The Worst Outcome** - Time, effort and money were spent with risk to the patient and no diagnosis was obtained. The expectation of a diagnosis is unmet and the clinician and owner are frustrated. Therapy is delayed or inappropriate and everyone involved feels badly (including the pathologist!). A dissatisfied owner develops a low opinion of the clinician and the clinician may lose confidence in the pathologist. Public faith in veterinary medicine is eroded and at worst, someone gets sued.
C. The “Middle Passage” - A partial diagnosis, often a morphologic diagnosis without focus is given that rules out some problems but does not translate into a specific clinical disease entity. The non specific nature of this does not completely meet the clinician’s expectations and a phone call ensues for clarification. The need for another biopsy may be indicated. There is considerable loss of time, money, and occasionally professional embarrassment attend this incomplete problem resolution. This is a common outcome in veterinary medicine.

THE FIRST RULE OF MEDICINE

Primum non nocere
(“Above all do no harm”)

“To help or at least to do no harm”
Epidemics I, II
The Hippocratic Corpus

THE FIRST RULE OF SURGICAL PATHOLOGY

“Don’t violate the 1st Rule of medicine.”

After that……

“Get a Diagnostic Biopsy”

It seems pretty logical that after all the time and expense of acquiring the tissue sample for histological interpretation, the clinician should make sure to send to the pathologist a biopsy from which the pathologist can render a diagnosis. Thus that is the most important task of the clinician. So to guide the clinician, we need a definition of what constitutes a “Diagnostic Biopsy”.

A Diagnostic Biopsy Is An:

1. Adequate amount of tissue
2. Representative of the pathologic process
3. Sufficiently free of artifacts to permit a definitive evaluation accompanied by a
4. Signalment, history, description of the lesion
5. With the clinicians’ differential Dx, rule/outs or thoughts.
How much tissue is enough? The answer is difficult and varies with the organ and nature of the process. A single *Blastomyces* organism in a FNA is enough. On the other hand, a Tru-cut biopsy of a large splenic mass is not likely to be adequate to confidently distinguish between a hemangiosarcoma and an infarcted hematoma. Indeed, sometimes 2-3 large wedge sections of a splenic mass are not enough. The likelihood of collecting diagnostic tissue varies directly with the percent of the lesion that is sampled and submitted. If the entire lesion is submitted, the probability of getting a diagnosis is high. But the trend in veterinary medicine today is clearly toward small and often very small biopsy samples. Clinicians have a wide array of techniques with which to obtain the sample. Pathologists accept this and should never question the technique used by the clinician which is often a “1st Rule of Medicine” decision. However, clinicians should know the limitations and potential problems associated with their choice of biopsy instrument. They should understand that the less tissue that is sampled and submitted the greater is the likelihood of not being able to provide a diagnostic biopsy to the pathologist.
BIOPSY TECHNIQUES AND INSTRUMENTS

A. **Fine Needle Aspirates** = A collection of individual cells w/a needle (~22-26g) by means of negative pressure created w/ a syringe. This is the realm of the clinical pathologist.

*Advantage:* It’s quick, easy, minimally invasive and very inexpensive.

*Use:* When significant conclusions may be established by evaluating individual dissociated cells without regard to the architectural arrangement of the cells to each other or the accompanying stroma.

*Disadvantage:* It’s extremely limited with no architecture

Because FNA’s are so easy and inexpensive and potentially so productive they are the way to begin nearly every diagnostic problem in surgical pathology. You must be cognizant that only a few good cells are being examined and remember the limitations. The clinician should have realistic expectations and follow the advice of the clinical pathologist. Often this is a 1st step technique to be followed up by another confirmatory procedure. The best application for this procedure is when

1. Individual cells can be diagnostic i.e. is it inflammation or neoplasia?
2. There are fluid rich lesions in body cavities or cysts
3. Cells are loosely attached i.e. bone marrow, lymph nodes, CSF, urine, joint fluid
4. There may be visible microorganisms

**Philosophy of FNA**

“Stick a needle in anything”

B. **Tru-cut or EZ Core Biopsies** = small caliber needles (~14g) that remove a core or narrow plug of tissue. Jamshidi needle, Michelle’s trephine

*Advantage:* Permits evaluation of architecture or the relationship of cells to stroma and other structural features of the tissue or organ. The needles are minimally invasive and because they are small, multiple samples can be obtained.

*Disadvantage:* A small amount of tissue is collected. Architecture can be evaluated but very little of it. It’s like “Looking through a port hole”.
A Tru-cut biopsy may not collect enough tissue to appreciate the architectural arrangement of the cells and thus lead to an incorrect interpretation. The differentiation of immature granulation tissue from a spindle cell sarcoma may depend on seeing a gradient of maturation in the tissue. Such a gradient may not be appreciated in small samples and sarcoma is over diagnosed.

C. **Punch Biopsies** = A simple tool that collects a larger cylindrical plug or core of tissue; typically 4, 6, or 8mm in diameter. Designed for skin biopsies but there are applications in many other soft tissues. “You can punch anything soft”

**Advantage:** Permits a larger view of the cells and architecture than needle cores. It is the preferred method for the diagnosis of dermatoses.

**Disadvantage:** Although it collects a larger piece than needle biopsies, it is still small.

D. **Endoscopic and Laparoscopic Biopsies** = Specialized instruments that give access to inaccessible spaces. The operator can directly observe and biopsy the tissue. GI, respiratory, urinary tract, body cavities, joints. Sample @ Rt angle (perpendicular) to the mucosa and don’t “skid” along the surface.

**Advantage:** It’s a minimally invasive way to observe and sample tissues and organs otherwise not available without open laparotomy, thoracotomy, and cystotomy. The operator can directly observe the tissue and sample it so they can ensure the biopsy will be the abnormal tissue. Another advantage of laparoscopy is that in addition to taking a sample, corrective or therapeutic surgery can be performed at the same time.

**Disadvantage:** It is still a small sample of tissue although often larger than the other needle biopsy techniques. The procedures require anesthesia which drives up the cost. Endoscopic samples have a unique set of issues related to specimen orientation and induced artifacts that pertain to the very small size and friable nature of the tissue sampled which are often mucosal membranes. “Pieces parts”
E. **Incisional Biopsies** = the surgical removal of a portion of the lesion.

*Advantage:* Provides a far greater amount of tissue than the other techniques that generally allows for complete evaluation of architecture. No special tools are needed beyond scalpel and forceps. Also cytology can be performed on the same specimen. Because the sample is larger there is less likelihood of handling artifacts which distort the tissue.

*Indications:* Performed when an excisional biopsy cannot be obtained.

F. **Excisional Biopsies** = The complete surgical removal of the lesion.

*Advantage:* 100% of the lesion can be provided for evaluation. Dx and treatment can be incorporated in the same procedure. ("I don’t know what it is but it’s gone"!)
Cytology and histopathology can be performed and correlated.

*Contraindications:* When the lesion is too large or in an inoperable location.

**REPRESENTATIVE OF THE PATHOLOGIC PROCESS**

Pathologists always begin by assuming the biopsy contains the lesion ("But it ain’t necessarily so"!). Nevertheless the benefit of the doubt is with the surgeon who saw and acquired the tissue sample. However, pathologic processes differ remarkably in their distribution through tissues and organs such that biopsies that do not provide the entire lesion could and often do produce tissue that is not representative of the disease.

**Uniform Lesions** = pathologic processes that present as a diffuse array of similar cells and tissue such that sampling anywhere yields the same diagnostic tissue. i.e. hepatic lipidosis

**Non-uniform Lesions** = processes that are punctuated or even dominated by non-specific secondary or reactive changes that can obscure the diagnostic cells or tissue. 1° bone sarcomas, mammary neoplasia, splenic HSA, soft tissue sarcomas. Such aggressive processes induce necrosis, inflammation or stromal reaction often scattered through the lesion and in very small biopsies may not be accompanied by the underlying pathologic cause.
The lesion may not be present or included in the biopsy because:

**The Principle**  
“If the lesion is not diffusely distributed in the tissue, there is a higher likelihood a small needle biopsy will miss it”

A. **It was not sampled** – the biopsy instrument did not collect the diagnostic tissue because the specimen was too shallow or too small. The lesion may be “normal tissue” adjacent to a discontinuous, multifocal process.  

**Management** – use a technique that permits direct visualization of the tissue sampled; ultrasound guided needle biopsy, CT guided needle biopsy, laparoscopic biopsy or open laparotomy or cystotomy.

B. **Necrosis, inflammation and reactive tissue** dominated the tissue and either destroyed the underlying problem or obscured it. Scar tissue and periosteal new bone can do the same.  

**Management** – take multiple samples; take the interface with normal and areas that look different. Sample 100% of the lesion if possible.

**SUFFICIENTLY FREE OF ARTIFACTS**

**Artifact** = A structure or substance not normally present, but produced by some external agent. Artifacts that prevent interpretation are “Fatal”

All biopsies contain artifacts related to collection and handling. The key thing about artifacts is knowing how they are produced and limiting their impact. The most common artifacts are related to collection and handling of the specimen during and immediately following the biopsy procedure when the tissue is still unfixed and subject to the most distortion. By and large the surgeon and surgery technician have the primary role in controlling artifacts.

**Surgical Crush Artifact** = damage and distortion of the cells and tissue architecture by physical force. Usually done by the biopsy instrument or forceps when the sample is grasped or when retrieving the tissue from the needle or the collection instrument. The cells usually appear on the slide as smeared DNA

**Cautery Artifact or Thermal Injury** = acute coagulation necrosis of the tissue produced by cryosurgery instruments. Cautery is an excellent “Thermal scalpel” and a tool in common usage today but the thermal energy radius can extend outward from the incision line to a considerable distance and destroy most of a
small specimen. If the lesion is in the millimeter size range, cautery could destroy it.

**The Principle**

“The smaller the specimen is, the greater the likelihood cautery will produce a “Fatal” artifact

**Freezing Artifact** = highly vacuolated appearance of tissue produced when immersion formalin fixed tissue is frozen and thawed. It occurs sporadically in temperate climates during winter months. The freezing most likely occurs in the collection box at private practices; possibly in the courier vehicle or a cargo hold of an aircraft. Control is by artifact recognition by the pathologist and communication of its occurrence to the clinician. The artifact is frequently “Fatal”.

**FIXATION** = the stabilization of protein so that the microscopic arrangement of cells and tissues is not altered by processing; the arrest of autolysis and putrefaction.

- **Autolysis** = the dissolving of cells by enzyme action from within

- **Putrefaction** = the breakdown of tissue by bacterial action (also called postmortem decomposition)

Both of these processes begin within a few minutes after the tissue is removed from the patient and can become significant within an hour depending on conditions. In renal biopsies and other tiny fragile exposed tissues that rapidly desiccate, it can occur within 5 min!

“Fixation is the singularly most important step in producing good histopathology slides”

Theory and Practice of Histotechnology
Sheehan and Hrapchak, 1980

** Fixation is performed by the clinician and surgery technician and is out of control of the pathologist.**

**The Characteristics of a good fixative are:**

- Rapid penetration
- Minimal distortion
- Kills bacteria and fungi (↓ putrefaction)
- Inactivates enzymes (↓ autolysis)
- Modifies the tissue to resist artifactual distortion
10% Neutral buffered formalin is the “Gold Standard” and is generally provided in prefilled containers or specimen jars by most pathology laboratories. This is convenient for practitioners as it ensures proper buffering and that the jars are within standards.

Because surgical biopsy specimens are removed from a living patient and immediately fixed, there is no autolysis in surgical pathology. Unfortunately, autolysis is not that uncommon and fixation artifacts are often seen although not always “Fatal”.

**Fixation Artifact** = the occurrence of autolysis and putrefaction in biopsy specimens due to delayed, improper or no fixation. (“Autolysis in the specimen jar”). Fixation artifact can be controlled by 2 simple procedures:

<table>
<thead>
<tr>
<th>The Guiding Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No tissue placed in fixative is ever thicker than 0.5-1.0cm</td>
</tr>
<tr>
<td>2. The amount of formalin should be at least 10-15X the volume of the tissue placed in it.</td>
</tr>
</tbody>
</table>

Most laboratories provide several different size options for biopsies specimens. Clinicians should select the tissue for submission, choose the right size formalin container and trim the tissue so that it is not thicker than 0.5-1.0cm. Large specimens such as spleens and large masses should be sliced at ~ 1cm intervals (so called “Bologna Slicing”) and make sure there is 10X as much formalin as tissue. Large pieces of tissue contain sufficient extracellular fluid that they can dilute the formalin to substantially less than 10% and the tissue will undergo autolysis in the jar. It is a common event that enough autolysis is present in such poorly fixed samples that it not only interferes with diagnosis but it can impair accurate counts of mitotic figures and even compromise subsequent immunohistochemistry.

**SIZE**

The single *most important variable* impacting the likelihood of getting a diagnostic biopsy is specimen size. The optimal size specimen is about 2cm because 100% of the lesion can fit into the processing cassette and all of it can be examined.

**Small specimens** such as endoscopic, rhinoscopic, Tru-cut specimens etc are highly liable to crush artifact. This is especially true of mucous membranes. The old practice of placing small specimens on sponges can produce significant crush artifact. The best approach is a screened capsule such as the CellSafe™ Biopsy Capsule (Mercedes Medical) which fits into the standard specimen jars and only needs to be removed from
the jar and dropped into the tissue processing cassette by the laboratory technician. The tissue is not handled again until it is embedded in paraffin. Because such small pieces of tissue may not collect diagnostic tissue and can be a challenge to properly orient in the cassette, very small pieces often produce non-diagnostic biopsies.

There is a specialized category of small specimens that are larger than endoscopic samples but still small enough that the trimmer or lab technician cannot see enough detail to properly orient the tissue for sections. This is a problem with small specimens that have polarized or directional architecture such as eyelids and ear canal masses. These specimens need to be tagged or inked by the clinician on the critical margins so the laboratory can trim the tissue correctly and the pathologist can evaluate the correct margin.

Large specimens such as amputations, splenectomies, large SQ masses, resist crush artifacts, but can be poorly fixed. In these specimens there are often substantial areas of necrosis and inflammation and the clinician may not have included diagnostic tissue when choosing the tissue to submit. It is important to “bologna slice” the larger specimen and then select the interface between abnormal and normal tissue and then subsample different looking areas of tissue for submission. As a general rule the larger the mass, the more subsamples should be taken. Splenic masses should include at least 4-6 pieces.

**ORIENTATION**

Orientation is a critical issue in biopsies, especially in very small specimens where it is not apparent to the pathologist or the laboratory. In endoscopic specimens this is determined by chance and there is little the lab can do to compensate for non-diagnostic samples. This is a very common problem with endoscopic biopsies of the GI where the tissue is both extremely small and polar in its architecture. Often I see only the cross sections of villi in such specimens. Some organs and tissue have a “Directional Organization” or “Polarity” to their architecture such that random sampling may not collect all of the components of the tissue. Examples of “Polar” tissue are skin, GI, kidney, urinary bladder, gall bladder, many joints and lymph nodes. If these tissues are not collected properly or oriented by the trimmer, the complete structure of the tissue may not be available for the pathologist to evaluate. “Non-polar tissues” include bone (except the growth plate) liver, spleen, prostate gland, nasal cavity, lung, pancreas and most glands. In these tissues almost any biopsy will produce useful diagnostic sample and the orientation of the tissue in the cassettes will not impact diagnosis.

It is the responsibility of the laboratory to translate the clinicians ink or tag markings and notes on the submission form so that the pathologist reading the histology can understand what the clinician did and which margins are the true surgical margins of importance. This is most easily done by inking the margins noted by the clinician. **Inking by the**
laboratory is currently sporadic at best and not done enough and the result is that too often the pathologist is guessing at what is the important margin. If the surgeon has not inked the important margin, the trim technician or pathology resident should ink the perceived surgical margin so there is no doubt about what the real margin is when looking at the tissue microscopically.

Optimally the clinician should place 1 biopsy location in one specimen jar but the economics in veterinary medicine today has permitted multiple specimens in the same jar. This is acceptable only if 1) the total tissue does not exceed the correct 10-15X tissue to formalin ratio and 2) the specimens are clearly identified by tags, ink or unique description so that the trimmer can identify which tissue came from what location. A common problem is 4 skin masses in one jar that are not identified with 3 of them being sebaceous adenomas and the 4th a Grade 2 mast cell tumor incompletely excised. Clearly one surgical site needs re-excision or adjuvant therapy but the clinician does not know which. This is poor medical practice at best and in the future could be the subject of litigation.

THE MARGIN PRINCIPLE

When choosing the margin of a mass resection to examine, the rule should be “Examine as much surface area as practical at the proximal (margin connected to the patient) end of the mass resection”. For some types of specimens that edge or margin is obvious but for many it is not clear unless the surgeon or clinician marks it. I often see the comment “Check margins” without being told which margin is which. Surgeons should tag or ink what margin is important and note this on the submission form. Surgical ink or dye can be obtained from a variety of commercially available sources (Mark-It Tissue Marking Dye, Richard-Allan Scientific or Thermo Scientific; Pre-filled Squeezable Dye Kit, Cancer Diagnostic, Inc).

ACCOMPANIED BY A SIGNALMENT, HISTORY AND DESCRIPTION OF THE LESIONS

THE COMMUNICATION PRINCIPLE FOR CLINICIANS

“Help the Pathologist to Help You”

Every surgical pathologist wants to know what the lesion looked like grossly or clinically. Histopathology evaluates only a tiny fraction of the affected tissue. In order to fully orient the pathologist and facilitate a total patient evaluation, clinicians or their technicians must describe what they saw. Excess panniculus looks exactly like a lipoma under the microscope. The correct diagnosis depends on the observation that there was a subcutaneous mass present.
**Descriptive Pathology** is a skill all veterinarians learned during their days in school but many have lost the skill most likely by “disuse atrophy”. It is understandable that we lose what we do not reinforce. Pathologists have not sufficiently communicated the importance of this to clinicians or clinicians do not understand the value of it. With the sophisticated imaging techniques made possible by minimal invasive surgery (MIS) and other modalities, clinicians now have the opportunity to directly observe lesions. This was always the case with open laparotomy but now made even more important by MIS and CT. What they see is extremely important in case management and of enormous value to the pathologists interpreting their biopsies. The ability to briefly and accurately describe what they see and communicate it to the pathologist may make the difference in a correct or missed diagnosis.

“Pathology is not just for autopsies… and it’s not just for pathologists anymore either”

Even indirect methods of observation or imaging such as ultrasound may yield valuable information about the lesion that can impact the case and help guide clinical case management. For instance whether the lesion is focal or multifocal is of great value to the pathologist and can guide the clinician in the choice of the best biopsy instrument.

**DESCRIPTIVE PATHOLOGY FOR BIOPSY SPECIMENS**

A thorough description of the lesion or specimen such as would be appropriate in an autopsy report is not required. It would take too long and be too inefficient and no surgeon is going to spend his or her time performing it. The purpose of gross description in a surgical biopsy report is fundamentally different. It is intended to orient the pathologist reading the histopathology slide and verify what the laboratory received. Speed and orientation to potentiate the right diagnosis are the key reasons for this exercise. Most surgical biopsy can be characterized as to

a. **Size** – absolute or a reference to common items in our culture. Coins, food items, balls from various sports seem to be frequently used. While absolute measurement in metric units is preferred, it is still better to know the lesion was “grape size” than not know anything at all.

b. **Color** – simple color; green, white, yellow, red, brown, black. It does not need to be artistically creative like “mauve” or “aquamarine”.

c. **Location** – the *exact anatomic location* from where the specimen was taken. “From the abdomen” could be on the skin surface, the subcutaneous tissue or within the peritoneal cavity. **Be precise**. It matters greatly to the pathologist reading the slide but who does not know the origin of the sample.
d. **Distribution** – critical. Especially in skin where the clinical appearance is more important than the histopathology. Whether a lesion is solitary, symmetrical or one of many widely scattered lesions is extremely important to the interpretation.

Clinicians and Surgeons!

“Describe what you see as if you were speaking to a blind man”

Assume the pathologist interpreting your biopsy is blind because as far as the clinical aspects of the case and the lesions are concerned, he or she might as well be. If you do not share this information with them, you may lead them into making the wrong diagnosis. A good test is to close your eyes and if you can visualize what you just described in its **precise anatomic location**, you have made a good gross description of the lesion you are biopsying. This self test is called “The Carpenter Test” after Dr. James Carpenter who established this principle years ago.

**Digital Photographs** are being submitted more frequently with biopsy specimens because of the ease of use but often these are being submitted in lieu of an accurate description and even history. I encourage their use because it is easy, quick, inexpensive and potentially useful. However, the quality of submitted photographs is highly variable. Sometimes these are extremely useful and even diagnostic. Occasionally I look at the photo and make the diagnosis before I look at the slide. However, more often than not the photos are not helpful because they are of poor quality, out of focus or have no frame of reference. You risk offending the clinician if he or she has submitted such a poor image. Whenever I can, I reinforce the principle that clinical photos can be helpful but to at least provide the basics or a description, **size, color, location and distribution**.

**SIGNALMENT AND HISTORY**

Everything in medicine begins with a signalment and history. Surgical pathology is no different. Clinicians have the mistaken impression that if they tell the pathologist anything it will bias him/her. This failure to “**Frame the Case**” is a frequent problem in human medicine and can lead to serious errors in medical judgment and misdiagnosis. It is a serious problem in veterinary surgical pathology and may be perceived as such by the attorneys litigating malpractice suits in the future. Clinical medicine should ask itself again “**What is the purpose of the surgical biopsy**”? 

“If the goal of the biopsy is to fool the pathologists, then tell them nothing.”

“If the goal of the biopsy is to get an accurate diagnosis quickly then
tell the pathologists what you know or think “

The pathologist should always be able to give a morphologic diagnosis but the clinician really wants the name of a specific clinical disease entity. In our obsession with morphologic diagnoses, we lose sight of the fact that for many clinicians “Morphologic Diagnosis” has limited value. Our ability to diagnose a specific clinical disease often depends on having a signalment and history so we can make a total patient evaluation. We cannot diagnose “FIP” unless we know the patient is a cat.

AUTOPSIES IN A JAR

There is a considerable difference between autopsy pathology and surgical pathology. In surgical pathology only a tiny part of the animal is examined. The pathologist does not select what is examined but the tissue is well fixed and there is no autolysis. In the autopsy, the pathologist can examine the entire animal and select the tissue to be trimmed in and looked at histologically. There is unlimited tissue, gross lesions are observed and correlated with the microscopic. Only autolysis compromises the analysis. Autopsies in a jar are the worst of both worlds. A relatively small part of the animal is evaluated and the pathologist does not get to pick the tissue to be evaluated. There is limited tissue, it is often poorly fixed and often is not accompanied by gross description, a signalment or history. This type of specimen is unique to veterinary medicine as there are no “Autopsies in a jar” in human medicine. Autopsies in a jar come in a couple varieties.

A. Single Lesion Diagnosis: An exploratory laparotomy was performed after the animal died. A lesion was observed by clinical imaging or grossly such as a mass. Visually abnormal tissue was seen i.e. pneumonia or enteritis. Alternately organ dysfunction was indicated by clinical parameters such as renal failure. In these scenarios, a single target organ submitted may be diagnostic and provide the answer the clinician is seeking.

B. Death of Uncertain Cause: In this case the animal has died after an illness with little or no indication of the cause. The clinician wants to rule out some cause or confirm a DDx and there were no apparent gross lesions. But the clinician submits only a couple of tissues and they do not contain any significant lesions to explain the death. Everyone is dissatisfied with the outcome.

C. Sudden Death of Uncertain Cause: In this case, an apparently healthy animal has died suddenly. This can occur in the pet owner’s home and a common suspicion is poisoning. It may also occur in the veterinarians practice where post operative death is a common history. The clinician has performed an autopsy but
found no gross lesions. It is critical that the clinician performing the autopsy rule out trauma (fracture, gun shot wounds, blunt force trauma, lacerations etc), bowel displacements (GDV, intussusceptions, torsions) foreign bodies and hemorrhage into body cavities. If the autopsy was inconclusive, the clinician should submit critical life sustaining organs whose failure could lead to rapid death without antecedent clinical signs

a. Heart  
b. Lungs  
c. Liver  
d. Kidney  
e. Gastrointestinal tract  
f. Occasionally brain may be needed

Autopsies in a jar are costly in time and resources and have a high likelihood of yielding no useful information. The process is dependent on clinicians performing a procedure that they learned in school but because of “disuse atrophy” are perhaps not performing it as well as they could. It is up to the pathology community to guide clinicians in what is needed in order to potentiate the outcome that everyone is looking for. The power of an autopsy comes from the ability to correlate both gross and microscopic findings which is often not the case with autopsies in a jar.

**Clinician Performed Autopsies:**

The common problems are lack of critical diagnostic tissues, an incomplete set of tissues, no documentation of gross findings or an incomplete history and signalment and almost always, autolysis because the autopsy was delayed or the tissue was poorly fixed (too much tissue in too small a container).

*The Guidelines:*

1. Examine, collect and properly fix a complete set of tissues. At least major organs.
2. Perform the autopsy ASAP before autolysis compromises a thorough microscopic analysis
3. Store the tissues in a large container; plastic bags, Tupperware in 10% NBF
4. Send selected tissues for examination in the standard jars provided but keep back the other tissues in case further tissue is needed
5. Completely fill out the submission form and provide the supplemental information so the pathologist can make a total patient evaluation; especially what did you see or not see.

**THE SUBMISSION FORM**

The submission form is a critical document in solving some of the communication problems in surgical pathology and many of the forms in use today are poorly designed
and do not promote the submission of a diagnostic biopsy. Generally there are 2 types of forms in use today.

---

**The Good Form**

This is an idealized form that is 100% dedicated to the biopsy. It provides adequate space for the clinician and veterinary technician to write. It prompts the clinician as to what information is desired and includes a patient diagram to locate the lesion. The page is not cluttered but easy to read and has space for the laboratory to make a trim diagram of what was done so the pathologist reading the slide can get oriented. This form sends the correct
message which is: “Your biopsy is important to us. We need some information from you. Help us to help you”

The Bad Form
This form was designed by accountants and not pathologists. Less than 10% of the space is dedicated to surgical biopsy. There is insufficient space for the clinician to write any useful information or for the lab to make any trim diagram or notes. The form does not communicate what is important or needed. It perpetuates the myth that a biopsy is another test you order like a CBC or biochemical panel. It simply sends the wrong
message. You will generally get little useful information about the biopsy or the clinical patient if this form is used for biopsy submission. Unfortunately, these forms are in wide use today.

**SUBMISSION FORM PRINCIPLE FOR CLINICIANS**

“Give the Pathologist What 4!”

1. **What did you see?** A gross description including precise location of the lesions
2. **What did you do?** What procedure did you perform? Did you take all or only part of the lesion?
3. **What do you think?** Your diagnosis or DDx
4. **What do you want?** R/O’s, special procedures, is it neoplasia or inflammation, margin evaluation etc. What do you want to know? Why did you do the biopsy?

“Surgical pathology depends heavily upon the input of surgeons and clinicians. They should know that a microscopic diagnosis is a subjective evaluation that acquires full meaning only when the pathologist is fully cognizant of the essential clinical data”

*Rosai and Ackerman’s Surgical Pathology*
Juan Rosai, 9th Ed, 2004

(In other words….Total Patient Evaluation)

**Information Elements of the Completed Biopsy Submission Form**

There are 5 important descriptive elements that should be included on every biopsy submission form.

1. **Signalment** – species, age, breed sex (intact or not)
2. **Clinical or Historical Data** – pertinent to the case; not the complete medical record. This should be brief, focused and to the point in 1-2 lines at most and include the duration of the problem.
3. **Precise location of the lesion** or origin of the sample. Which ear, digit, lobe of the lung or liver, what part of the body? Apply the “Carpenter Test”.
4. **Descriptive characteristics** – size, color, shape, distribution. What did you see?
5. **Clinician’s thoughts** – DDx, R/O’s. Tell the pathologist what you are thinking and what you want.

“What were you thinkin’?”
A well designed submission form leads the clinician through the “What 4”. It reminds the clinician and vet technician what information is needed and important. It communicates to the clinic that the pathologist wants help and provides the space for them to offer it. A good form increases the likelihood of making a total patient evaluation and decreases the chances of making a cognitive error in diagnosis by properly framing the case. We need to communicate to the clinicians the importance of this information. Experience has taught me that such forms help enormously and their application and distribution increases the communication exchange between clinicians and pathologists that is necessary to increase efficiency in surgical pathology. With web based, on line submission of biopsies available the creation of such forms is cheap and easy. The pathology community has to make an effort to market these to clinicians and currently that is not being done very well.

**Nondiagnostic Biopsies** = A specimen that is insufficient such that the pathologist cannot render a conclusion. It does not mean the lack of a specific disease or lesion rather the lack of high quality sufficient tissue or information that would support an opinion either way as to the presence or absence of a pathologic process. Usually it is caused by too little tissue but often it is lack of relevant supplemental information.

**THE PATHOLOGY LABORATORY**

When collection of the biopsy and preparation of the submission form are complete, the biopsy is handed off to the pathology laboratory and the clinician’s responsibility ends. The pathology laboratory is responsible for accepting the tissue, preparing the glass slide and translating the information on the submission form to orient the pathologist interpreting the histopathology. There are many problems and potential errors but in general these tasks are performed by a highly trained cadre of professional technicians who are certified. They use standard techniques that are 150 years old and there are many manuals and numerous books written about the process. Much is now automated. Many artifacts occur but most are recognizable and can be corrected and so most are not “Fatal”. **What is NOT standardized is trimming, specimen orientation, labeling and communication with the pathologist.**

**TRIMMING**

Usually the first interface the pathologist has with the case is the glass slide. Removal of the tissue from the specimen jar and trimming of the tissue into the processing cassette is usually done by a technician who is not reading the histopathology or in academic medical centers, the pathology resident. Therefore, communication between the person doing the trimming and orientation and the pathologist reading the slide is critical. In trimming tissues there are 3 elements:
a. **Sizing** – whatever the size of the surgical specimen, it must fit the dimensions of a standard 30mm x 25mm x 5mm processing cassette to be processed. Therefore, with larger specimens it is critical that the diagnostic tissue be included. For small specimens, everything fits into the cassette and 100% of the biopsy is evaluated. For larger specimens, the technician or resident must subsample. Make sure to include the interface with normal and communicate to the pathologist what you did. This includes yourself and the faculty pathologist reading the case with you if you are a pathology resident in a medical center.

b. **Orientation** of the specimen in the cassette - Remember that the surface that is face down in the cassette will be cut in that plane. This is not a problem in some tissue like liver, spleen, and lung or in tiny endoscopic pieces which you cannot orient but it is a problem in tissues with polarity to their organization like skin, GI, kidney and to some extent brain. Whether the specimen is cut in cross or longitudinal section is often a personal preference depending on how much of the lesion you want to examine and its relationship to adjacent structures. **It’s critical in skin biopsies** that the specimen is cut in a plane that is parallel to the direction of the hair to increase the chances of getting longitudinal sections of the follicles and adnexae.

![Diagram of Plane of Section Through the Lesion](image)

**THE MARGIN PRINCIPLE**

When choosing the margin of a mass resection to examine, the rule should be “**Examine as much surface area as practical at the proximal (margin connected to the patient) end of the mass resection**”. For some types of specimens that edge or margin is obvious but
for many it is not clear unless the surgeon or clinician marks it. I often see the comment “Check margins” without being told which margin is which. **Surgeons should tag or ink what margin is important** and note this on the submission form. Surgical ink or dye can be obtained from a variety of commercially available sources (*Mark-It Tissue Marking Dye*, Richard-Allen Scientific or Thermo Scientific; *Pre-filled Squeezable Dye Kit*, Cancer Diagnostic, Inc).

**Margins**, like orientation, are determined at the time of sizing and trimming. It is critical in evaluation for completeness of excision that the correct surgical margin be properly oriented and faced in the cassette or else an inaccurate “margin read” is produced. For small specimens in which the entire lesion can be placed in the cassette, it is not usually a problem but for larger specimens, the trimmer has to choose what margin to include and how to orient it. Because of these issues with large specimens pathologists *are guessing about excision status far more commonly than they care to admit and it is due to improper trimming and failure of the clinician to indicate by ink or suture tag which margin is of interest.*

When trimming larger specimens, remember the most important issue is **first get a diagnosis then trim for completeness of excision** if that is desired by the clinician. *The Margin Principle restated = “Look at as much surface area as possible or practical on the margin connected to the patient”* This often requires a section through the lesion and additional sections on the edge or margins. With large specimens this can result in many cassettes which can add considerably to the cost. With respect to margin orientation there are 2 approaches.

**Perpendicular Margin** = *the margin is cut perpendicular to the surgeon’s plane of cut.* This is the traditional plane of cut. Most pathologists are used to this section.
**Advantage:** The distance of the tumor to the margin can be seen. This is recommended when a small rim of tissue (<0.2cm) would be considered a negative or “Clean Margin”. Best employed when an epithelial tumor is suspected.

**Disadvantage:** Very little surface area is actually evaluated; only 3-5µm or the thickness of the paraffin section.

**En face or Parallel Margin = the margin is cut parallel to the surgeon’s plane of cut.** This margin is unconventional currently in veterinary pathology. It increases the surface area examined but eliminates the relationship between the lesion and the edge.

**Advantage:** A 100X-1000X increase in the amount of surface area that is examined. You can examine the entire cross sectional area of some structures like the GI, digits, ear canal ablations, tails etc.

**Disadvantage:** you cannot see the relationship between the tumor and the surgical margin. This type of trim must be indicated by the technician because any tumor cells seen in this section is a positive or so called “Dirty margin”.
Bowel Resection for Intestinal Mass

Trimmed Bowel Resection Specimen

- En face cut at specimen margin
- X-sec cut through mass
- En face cut
- Longitudinal cut through mass
A Dose of Reality about Surgical Margins

Everyone should be realistic about the accuracy of the “margin read” but especially the clinicians who do not look at these specimens. In perpendicular sections of the margin the amount of actual surface area that is examined is very small. Although in some types of neoplasms, it may be enough, in others, particularly cutaneous round cells tumors and soft tissue sarcomas, it may not be as reliable as every one thinks.

THE TRIM DIAGRAM

Communication between the person trimming and orienting of the tissue in the processing cassette and the pathologist reading the slide is critical. The most efficient and effective way to accomplish this is by a hand drawn diagram depicting the specimen. This orients the pathologist, illustrates what tissue is in the cassette, which and what kind of margins were trimmed and what is the plane of section. Residents should do this on every case even when they are reading the slide because it reminds them of what they did at trimming and helps the faculty pathologist orient to the case. It’s critical in commercial labs where the pathologist does not see the case until the slide mat arrives.

A good trim diagram should indicate 1) shape of the specimen, 2) how many cuts were made and in 3) what plane of section, 4) which margins are inked with what color ink and 5) which cassettes hold which cuts. It translates what the surgeon did for the pathologist who usually does not see the gross specimen. Most laboratories do this but there is no standard protocol and there is marked variability in these diagrams from extremely useful to not helpful to confusing and inaccurate. It is a problem that affects accurate diagnosis and may be a target for litigation in the future with the laboratories assuming the liability.
THE END PRODUCT

The standard end product of the laboratory is still the "H&E slide". It is the end result of a process that is basically unchanged for 150 years but still has tremendous value and
efficiency in rendering a diagnosis. The majority of specimens end here but there many additional processes now available that can be performed by cutting additional sections and applying different stains to enhance the power of the microscopic slide. The cost of these special biochemical stains is nominal. **Immunophenotyping** or **immunohistochemistry (IHC)** is a relatively recent technique in which specific cellular proteins can be identified by antibodies. These are usually performed in batteries using different antibodies on additional sections cut from the same block. While potentially useful, the results are often not as clear cut as desired and require some interpretation by the pathologist. The problems are due to:

1. Using many antibodies developed for human tissue
2. Cross reactivity varies between species for many antibodies
3. Ab binding may vary with the technique
4. Different neoplasms may have variable and overlapping expression of proteins
5. Quality of the biopsied tissue

This is still a powerful technique that has aided in the diagnosis of neoplasms but the cost is currently not trivial and can amount to several hundred dollars (to the clinician) for a complete analysis. In academic medical centers where the cost may be underwritten for educational purposes, IHC is used far more commonly than in commercial labs. For instance, in the Veterinary Medical Center at OSU every single lymphoma is typed whether the clinician asks for it or not.

**THE PATHOLOGIST**

The pathologist takes the glass slide and turns it into a pathology report. To many in the world of clinical medicine this can be a large “**Black Box**” and there is great misunderstanding as to how this process works and what factors impact the result. Histopathology is:

“*Pattern Recognition*”.

It is a highly personalized perception skill heavily based in experience that requires frequent reinforcement. It is more data driven among young pathologists and becomes more intuitive with time and experience. This intuition is a real skill and extremely useful but it is *inherently dangerous* and experienced pathologists should be aware of the problems and pitfalls in its application. Pattern recognition can be affected by many external and internal variables that you cannot control or are even aware of.
THE PATHOLOGY REPORT

This is the public face on what happens inside of the “Black Box”. We should remember this is the way the world perceives us. It is also the way the legal profession will perceive us and hold us accountable. Forms vary among institutions but typically consist of 3-5 fields. The form should be easy to read and easy for the clinician to find what he or she needs to know. Pathology reports should stand alone: that is they should contain all of the essential information such that a clinician of average skill can make sense of the case without additional material or data.

A. History or Clinical - a brief one line summary of the nature of the clinical complaint or reason the biopsy was taken. I usually lift this information from the submission form (if provided) and place it into the appropriate space on the form. This process often serves to “Orient” the pathologist’s thinking and supplements the clinician’s records later. It “Frames” the problem but it is the clinician’s responsibility to provide this. If there is no such data, I often write “No history” in that part of the report.

B. Gross – A brief summary of what the clinician saw and the lab received. At the minimum size, shape, location, color. This adds to the completeness of the report and documents the lesion. This description, if provided is checked with the trim diagram to verify that it all adds up or makes sense. I often put this in the same space as “History”.

C. Microscopic Description – A brief but separate description of each type of tissue examined with a summary of the important lesions or changes observed. Each entry begins with the block or tissue examined i.e. Lung, Lt caudal lobe or Skin, Rt hock.

D. Types of Diagnosis – The pathologist should always give a morphologic diagnosis. The important key is to then interpret this into a specific clinical disease whenever possible. Clinicians treat diseases, not morphologic diagnoses (mostly anyway).
“The most important field of the report is the “Diagnosis”. We regard the field termed “Microscopic” as an optional feature of the report, which in many cases is unnecessary. When included, it should be short and to the point. The surgeon usually is not too interested in whether the nucleoli are acidophilic, basophilic or amphophilic but rather what that means.”

Rosai and Ackerman’s Surgical Pathology, 9th Ed
Juan Rosai, 2004

The Morphologic Diagnosis = a phrase or one line summary of the primary, characteristic or most important pathologic processes present on the slides. It is a non specific summary of what the pathologist saw, expressed in pathologist’s terms. It is our stock in trade and the “Pathologists realm” of medicine. We place huge emphasis on training our students in its definition and application. So much so that we may forget that this perspective is not always shared by clinicians nor does it always have the same meaning to them as to us. Except where there is advanced autolysis or fatal artifact, a pathologist should almost always be able to give a morphologic diagnosis.

Specific Clinical Disease Diagnosis = the translation of the observed morphologic lesions present in the tissue into the name of a clinical disease entity in veterinary medicine which is the “Clinician’s realm” of medicine. It is the best and most desired outcome of the biopsy process. Whenever possible translate your findings into a specific clinical disease. It is what almost all clinicians want and really need. However the pathologist’s ability to do this often depends upon the quantity and quality of information supplied by the clinician.

Often the ability to proceed from Morphologic Diagnosis to Specific Clinical Disease Diagnosis depends on making a Total Patient Evaluation. Clinicians understand the concept of total patient evaluation and do not make a diagnosis from just the history. They also look at PE findings, lab work, images etc. yet surgical pathologists are expected to do just that in a high percentage of cases. This principle also applies to diagnosis in surgical pathology as well. The pathologist should have all relevant information about the case before s(he) makes a diagnosis. Our diagnosis is often influenced by data not present on the slide. We should interpret the pattern we see in the context of the whole animal (“Read a slide, but interpret a patient”). Incomplete clinical information or lack of proper “Framing” of the case is a major hurdle in preventing a total patient evaluation and is one of the most significant communication problems affecting veterinary surgical pathology. It is also a major factor in causing cognitive errors in the diagnosis of image patterns. It is useful for clinicians to understand that the pathologist has an extremely limited view of the case and depends upon them to supply the broader view. It is our responsibility to tell the world of clinical medicine the importance of this.
“Pathologists traditionally have been regarded to be more scientific than many of their colleagues. A mystic perversion of this assumption prevails among those clinicians who believe that the pathologist, given only a piece of tissue, has all of the other ingredients necessary to produce a statement of absolute truth at the end of this report. More dangerous to mankind is a pathologist with the same concept.”

“As an off-duty exercise, pathologists frequently like to play games with slides as” pure unknowns”. Sometimes with their brains and microscopes They can give a remarkably accurate reconstruction of the disease process, pronounce the exact diagnosis and flush with pride at the awed applause of those gathered around the optical alter. And sometimes they can be absolutely wrong. Showmanship has no place in life and death diagnosis.”

The limitations of Histologic Diagnosis,
Oscar Rambo

E. **Comments** This is the section in which you communicate to the clinician what your diagnosis may mean and explain other important aspects of the case. It is potentially the most useful section after the diagnosis

**COMMUNICATION PRINCIPLES FOR THE SURGICAL PATHOLOGIST**

“Give the clinicians what they need to manage the case!”

“First Get a Diagnosis”

**WHAT THE CLINICIAN NEEDS**

**THE PURPOSE OF THE SURGICAL BIOPSY REPORT**

“To diagnose a disease or pathologic process in a living animal under medical care so that the clinician can make a management decision”

It’s a communication device more than an archival document. The importance of the document lies in 3 qualities: **Speed, accuracy and effective, unambiguous communication.** It should not be filled up with details not germane to diagnosis, pathogenesis or prognosis.
**What Clinicians Need in the Biopsy Report**

What is needed is dictated by the specifics of the case under consideration. This varies from case to case and depends on the organ or tissue and pathologic process (diagnosis). It should be driven by the pathologic process, not the individual clinician’s desires. Every liver biopsy should be treated the same and should not vary from one clinician’s preference to another’s. Veterinary medicine is not longer monolithic. Specialization has created “Family Practitioners” and “Specialists”. Biopsy reports should meet the needs of both. A general practitioner may not want as much detail as the specialists but the specialist s(he) refers the case to may regard the detail as essential and call you to provide it. Therefore, the case should receive the detail required regardless of what the clinician asks for. A good surgical pathologist should know what is important about each specific tissue and process and provide it. We need to establish a standard of practice and that standard should come from the pathology community in consultation with clinicians.

Although what is needed is dictated by the tissue and disease process, in general it is descriptive elements with potential pathogenic, therapeutic and prognostic significance.

**What Clinicians Want in the Biopsy Report**

This varies widely according to “taste”, what they are used to and “other motivations”. Some labs let clinicians choose a long or short description with the clear assumption that the detailed report costs more. This is a bad idea. It is a marketing decision with no medical justification. It’s also unprecedented in medicine when a client decides how a physician practices his/her specialty.

1. Pathologists lose control of the reporting process
2. It promotes inconsistency in reporting. Some reports have too little and some too much. The general practitioner may not want (and certainly to for pay for) a detailed report but the tissue, pathologic process and the specialist may require it for proper case management.
3. It adds cost for the client often with no added benefit to the patient. The clinician should be able to get what the case requires in a basic report.
4. It may increase work for the pathologist and promote fatigue with no real value to the patient.

What is reported should be decided by the individual case requirements, not the clinician’s preference. This may be a profitable business practice but its poor medical practice. It’s not done in human medicine or veterinary radiology.
“We will never satisfy everyone’s wants, but we should meet everyone’s needs.”

Needs should be driven by the case requirements not the clinicians preferences

Why do clinicians want long descriptions in biopsy reports? Uncertain and probably varied reasons. I suspect most want to ensure they get the important details which should be to increase their understanding of the pathogenesis and mechanisms of disease so they can make better treatment decisions. However, often they do not know what details are really important. Others may want to feel they are getting their money's worth, or create a reference collection of cases with complete descriptions to help them learn histopathology. A darker motive may be to increase their profits from a more expensive biopsy. It would be worthwhile to focus on the main purpose of the biopsy again. “To diagnose a disease or pathologic process in a living animal under medical care so the clinician can make a management decision”

PATHOLOGY DESCRIPTIONS

The Uncertainty Principles

“Uncertainty stimulates description”
{Anything the pathologist is uncertain of or is open to interpretation by others should at least be partially characterized}

“The amount written is inversely proportional to the certainty of the diagnosis

“Write enough to justify your interpretation WHEN NEEDED”

“Anticipate the clinician’s uncertainty”

Some tissues should always be described when the details are important to understanding the pathogenesis and mechanisms that could impact or inform management. i.e. dermatitis/dermatosis, liver, GI, renal disease and malignant neoplasms.

What does NOT need description in a surgical biopsy report? “Anything easily recognized by a veterinary pathologist of average skill in the field”. Lesions not open to a broad range of interpretation by skilled pathologists. Clinically insignificant lesions need no description such as
benign neoplasms, nevi, hamartomas, normal tissues or clinically unimportant lesions unless you are uncertain about it and a little description will help to focus your mind on the diagnosis. Anything that is not contributory or important to the diagnosis, pathogenesis, interpretation or prognosis needs no description.

What needs descriptive detail are “Clinically significant lesions that are open to interpretation by different pathologists of average skill in the field”. If the diagnosis you give would be agreed upon by most of your colleagues, why waste time and effort on details. If most of your colleagues would readily agree it’s a sarcoma, you don’t need to justify why you diagnosed a sarcoma. But, if a poorly differentiated sarcoma contained osteoid, you might want to mention that to justify your diagnosis. Your description in such cases serves to justify to your colleagues (or anyone reading the report) why you made the diagnosis you did recognizing that others may have a different interpretation.

**Malignant Neoplasms**

Many malignant (but not benign) neoplasms require some descriptive detail when it will help the clinician manage the case. For many the diagnosis is all that has been shown by evidence based medicine to be important. Where a scientific rationale exists to “Grade” malignant tumors, the pathologist should do so. The diagnosis “mast cell tumor” is no longer adequate. Although there are problems with all grading schemes, mast cell tumors and soft tissue sarcomas should be graded according to the published guidelines. In general for all malignant tumors what is important to describe are elements of the tumor that pertain to the presumed aggressiveness and therefore potential prognostic significance.

1. Degree of differentiation – well, moderate, poor or anaplastic
2. Local tissue invasion
3. Vascular space invasion (intravasation)
4. Reactive fibrosis or desmoplasia
5. Necrosis and Inflammation
6. Encapsulation
7. Mitotic index WHEN DEMONSTRATED TO BE PREDICTIVE. Always **count the number per 10 hpf not an average/field**
8. Excision status – did the surgeon get all of the tumor

Many malignant neoplasms present with mixed features that may leave the diagnosis open to interpretation. In these cases you may want to include unique descriptive characteristics that support or justify your interpretation. What did you see that led to your diagnosis of amelanotic malignant melanoma versus extramedullary plasmacytoma in the oral cavity. This process can help your cognitive thinking to arrive at the correct diagnosis. But the wholesale description in every case of the chromatin, nucleoli, cytoplasm, stroma, etc to fill space is unnecessary especially if there is no peer reviewed,
published evidence to support its actual usefulness. Stick to the pathologically meaningful stuff and avoid the minutia.

Who should control the descriptive process? Pathologists. They are in the best position to know what and how much to describe in each case. These criteria should be developed in consultation with clinicians but we must insist on evidence of based medicine for their requests. If evidence based medicine is not the foundation of our professional behavior we are not grounded in scientific principles and are practicing alchemy, not medicine. We need prospective studies to validate new criteria for useful descriptive detail and grading schemes. There is a tendency to accept every new scheme as the best (Dogma of the day). Let’s agree to do the science correctly and let that principle be our guide.

COMMUNICATION 101 FOR SURGICAL PATHOLOGISTS

In the comments section, tell the clinician what your observations mean but be careful. Like elaborate descriptions, some labs include long macros about the entity they have described to add “heft” to the report. While this may be fine for some general practitioners, specialists are often insulted by this especially if the information is not current. The oncologists I work with know far more about the behavior and prognosis of primary bone sarcomas than I do. These areas of veterinary medicine are changing very rapidly. Out of date or incorrect comments could be a professional embarrassment. The specialists at the OSU Veterinary Medical Center see many referrals which usually come with a primary pathology report and I get many comments, mostly negative, about these. I try to tailor my comments to the clinicians I know. I give more perhaps to the general practitioner and much less to the specialists. “How well do you know your clients” is a good question to ask yourself. Diagnostic pathology practices that build solid relationships will be successful in the long run. This could be somewhat problematic in the current culture of large publically traded international reference labs.

Likewise, when I talk to clinicians I ask the question, “Do you know your pathologist by his or her 1st name”? Uniformity in a clinician’s pathology reports is a good thing given the variability in what the pathology community is producing. We know this is true in the grading of mast cell tumors. I tell clinicians if they find a pathologist they like, stick with them.

Rather than produce long macros about the diagnosis, I use the comments section to discuss unique aspects of the case that perhaps affected my interpretation and they do not know about that could be useful to them. The presence of artifacts, the sample quality; “Was the tissue sufficient for diagnosis”? or was the biopsy “nondiagnostic” and why. It is feedback on their technique that may establish why there was some uncertainty about your diagnosis. As we will see, this may be important in the looming onslaught of litigation that I think is coming in veterinary medicine. I may also discuss unique aspects of the diagnostic
dilemma such as the distinction between IBD and intestinal LSA but I walk a razor’s edge depending on the practitioner’s level of specialization if I know what it is.

In addition I always address specific questions the clinician had (either direct or implied). Rule outs, DDx, “I suspect renal histoplasmosis”, “Is it acute or chronic renal failure?” “Is it neoplasia vs. inflammation?” Such responsiveness communicates engagement in the clinician’s problem and teaches them the value of their input. Unless you are also boarded in a clinical specialty, it is inappropriate for you to recommend treatment. I often get asked my opinion about this and usually I decline to answer by saying that “I am not in the treatment business anymore”. I do this because I am not competent to give this advice and now increasingly for potential legal liability reasons. At most I may recommend further tests like IHC or special stains or I comment “off the record” on the phone but not in writing. When the submission forms lacks useful information that would potentially impact my interpretation I let the clinician know.

“Definitive interpretation requires a signalment history, clinical appearance and distribution of the lesions”

“I am uncertain what the nature of the clinical complaint is”

These are gentle and professional ways of telling the clinician that the pathologist needs more information than was provided to give a more accurate assessment (A total patient evaluation). This is a constant problem but it is worth the effort. No clinician has ever called me and “read me the riot act”. Almost all are embarrassed, apologize and explain what I already know that they were too busy or handed the form to the veterinary technician who did not have the information or know the importance of providing it. I am always gracious and understanding. I comment this is a common problem in surgical pathology and we have a good discussion about what my report likely means in light of the additional information. Often I write an addendum to the report so they have a complete record. A proper submission form reduces this problem

**The “Uncertainty Principle”…..Again**

“Nothing competes with honesty in the surgical pathology report”

Pathology is often not black and white. It is very important to let the clinicians know when you are confident about your diagnosis and when there is some doubt or what you observed is open to discussion by your peers. Although pathologists are by nature
confident and aggressive in their posture we should remember that in this aspect of our jobs the patient’s welfare is of utmost importance. ("First do not harm"). We need to remember the patient is still alive and the clinician is going to believe what we say and act on it. Part of what the clinician needs to know is how firm our diagnosis is so they can judge the risk of their own management. It is helpful in this regard if the pathologist is knowledgeable about the potential consequences of their diagnosis or what a mistake in their diagnosis might mean. If we say its lymphoma and it is not, the patient may receive $2,000 of unnecessary chemotherapy. Not only is this undue risk for the patient but increasingly we may be legally liable for damages associated with this. The way to manage this is to alert the clinician about your uncertainty and let them manage the course of action. ("Set your ego aside, it’s about the patient"). Experienced pathologists understand that important decisions must be made every day in the face of uncertainty. You just have to become comfortable with that.

Honor every reasonable special request made by clinicians such as re-cuts, trimming more tissue, looking at the slide again, adding a statement to the report or a comment on something. These should be added to the original report in an addendum.
When you write a surgical pathology report, keep in mind you are potentially speaking to 4 different individuals. Be mindful of what you write in the report as you may have to live with it.

1. The **clinician** who submitted the biopsy
2. The **specialist** to whom the patient may be referred
3. The **patient’s owner (and their attorney)** - the report is a public document that is subject to discovery in a legal proceeding and can be introduced in court. The owner has a right to see this report so keep in mind what you say and how it represents the profession
4. **Yourself** – this is useful information for phone consults when you are not near the slide. It provides a record of what you saw at the time of your diagnosis and what you based your interpretation on.

**Telephone Consults**

*When should the clinician call the pathologist?* When the report doesn’t make sense or the facts don’t add up or correlate with what the clinician was thinking. The difference between a splenic HSA and a hematoma with infarction is the classic dilemma.

If everything worked perfectly there would be no phone consults but this is not realistic. I relish contact with clinicians. They can be extremely useful in building relationships. It’s better than email which is perhaps more convenient but also less personal. **Don’t ever pass up the chance to create a teaching moment** and remember the information flows both ways. For pathologists who are not working in academic medical centers, these opportunities are fleeting. Rarely is the exchange negative. Almost all are positive and fruitful leaving both parties satisfied. Phone tag, however, can be a problem. Invariably the phone rings the day after I have left the country for 2 wks. This is why it pays huge dividends to **do everything possible to increase clarity and decrease confusion before the case gets to the “Phone call stage”**.

**Second Opinions**

These are a fact of life and pathologists should readily agree to perform them as well as have their own diagnoses reviewed. Don’t take it personally. All doctors learn by making mistakes and the chance to have a case reviewed with a different opinion is another fleeting opportunity you should not pass up. The diagnostic error rate in human medicine is higher than you would imagine and I have no doubt that it is just as high in veterinary medicine, including pathology. The statement, "*How can two board certified pathologists look at the same slide and make two different*
“diagnoses” illustrates the depth of misunderstanding by clinicians of how the world of diagnostic histopathology works. It is useful for clinicians to remember that if both the original diagnosis and the 2nd opinion agree, that increases the confidence in the diagnosis but if the diagnoses differ, then what”? Who says the 2nd opinion is always the correct one? There should be no finger pointing when the diagnoses differ. The take home message for clinicians and focus should be “Proceed with caution”.

THE LIMITATIONS OF A SURGICAL BIOPSY
(‘A man’s got to know his limitations”)

Everyone has to have reasonable Expectations about what can be accomplished in the traditional paradigm of surgical pathology

It’s as much art as science. It requires much beyond the pathologist’s control.

Its pattern analysis, not numerical data interpretation

A Surgical Biopsy is
A subjective evaluation of visual patterns that represent pathologic processes. Patterns are Highly variable and overlapping. Often requires considerable human judgment

A Surgical Biopsy is NOT
Another lab test you order like a hemogram or chemical profile.

[ Objective measurements of discrete variables reported in metric units by a machine ]
LEGAL LIABILITY IN VETERINARY MEDICINE

Ten years ago law suits against veterinarians were rare. Since then the number has risen dramatically. Suits against pathologists for “Misdiagnosis” and Professional negligence” are uncommon but that may be changing. Veterinary pathologists like other specialists such as surgeons, ophthalmologists, internists etc will be perceived to have deep pockets because of our specialized training and qualification and we too will be a target.

What is driving the increase in law suits?

1. Deep emotional bonds owners have for their pets

2. The increased expectations that our pets will live longer fostered by the increased sophistication in companion animal medicine

3. “Google”. “If it’s on the internet, it must be true”. Easy access to an enormous amount of information which is often not accurate. i.e.” My vet vaccinated my dog. I read on the internet that vaccination causes cancer, so my vet gave my dog cancer”

4. Changing Social Attitudes

   a. Animal rights groups – there is an explosion in animal rights groups seeking expanded damages in veterinary malpractice suits

   b. “If my pet dies, I hurt, and somebody’s got to pay”!

Data Analysis vs Pattern Recognition

**Clinical Data**

PCV = 36  
(Ref range = 40-50)

**Conclusion**

“The patient is slightly anemic”

**Surgical Biopsy**

It’s either lymphoma or it’s not...

Its never “slightly” lymphoma
c. Our culture encourages the **anthropomorphization of animals** in general and pets in particular. Whales have the right to vote in California!!!

5. **Veterinary Liability insurance** – when professionals are insured, litigation always increases.
6. An increased mistrust in traditional institutions and relationships
7. Depersonalization and erosion of interpersonal communication

**What Constitutes Veterinary Malpractice?**

**Negligence** = a cause of action entitling a person who has sustained personal injury or property damage to recover money from one who has breached some legal duty owed to that person. The plaintiff must demonstrate the existence of a legal duty and prove the defendant breached it. **Professional negligence** is a sub-category of negligence and may also be called “Malpractice”. Four elements are required to prove a professional veterinary negligence case.

1. The existence of a client/veterinarian relationship involving the exchange of money for services.
2. Expert veterinary testimony establishing the appropriate standard of care which should have been applied in the case.
3. Expert testimony averring the defendant veterinarian breached that standard of professional care
4. Expert testimony establishing a causal link between the breach of the standard and physical injury to the animal which, in turn, resulted in the diminution of the fair market value of the animal

“Did you exercise the standard of care expected of licensed veterinarians possessing similar training, education, and experience while practicing veterinary medicine under like or similar circumstances”?

**It can only proven by an expert with similar credentials who will testify** as to:

1. What the standard of care is
2. Will provide affirmative evidence that you “screwed up”
3. Establish a causal link between damage and the decreased worth of the animal.

In others words, **the defendant needs a pathologist to prove another pathologist is guilty** of professional negligence!

It is important to understand that the **Standard of Care** is set by veterinarians who possess similar education, training, and experience, practicing veterinary medicine
(pathology) under like of similar circumstances; not necessarily by professors or academicians in veterinary schools.

Currently in most states, animals are property with a fair market value. Damage you caused has to decrease the fair market value of the pet as measured immediately before and after the alleged negligent act which caused the injury. If the pet is still alive, usually there is no damage. In other words, damage awards are currently limited to economic loss. **BUT** ………that is changing. If animals acquire “Rights” non-economic damages, such as “pain and suffering” and “emotional distress”, may be awarded. Eight states have already changed this and more are trying to do so. For the reasons stated above, diagnostic veterinary pathologists **WILL** be targeted. And remember you can win the lawsuit but still lose time, money, reputation and professional standing.

If you made the wrong diagnosis because of poor history, incorrect or no data the clinician may be guilty of “Contributory negligence” and will be sued with you. The legal defense strategy for you may be to deny the pathologists liability because:

1. Superseding intervening cause and you will be at odds with the clinician; not a position that invites harmony or good future relationships
2. The pathologist owes no legal duty to the pet owner because the contract is with the clinician. Again a strategy that “separates” the pathologist interests from the clinician’s interest.

These are untested strategies and there are no precedents established yet.

**The Standard of Care**

Veterinary pathologists set the standard of care but currently it **does not appear to include a duty to refuse to render any opinion unless you are first provided complete information**. This is not practical in veterinary medicine. In many cases we pick up sufficient information from the slide that we can render an opinion but the lack of this information is often a significant problem. If you don’t have critical information to be definitive, leave a paper trail of recommendations or document the issues that impacted your interpretation.

**Misdiagnosis**

The law does not require that you be correct 100% of the time but it may require you to be correct in the case before the court. You can be held accountable for what you say in biopsy reports.

Lymph Node Bx: If you diagnose LSA when the patient has lymphoid hyperplasia and the dog receives $2,000 of chemotherapy that he does not need, can the owner sue to recover this loss? The answer is “Yes”.
In states allowing recovery of non-economic damages, owners can sue for emotional damages, pain and suffering, reimbursement of fees and subsequent veterinary fees.

Is Surgical Pathology the Practice of Veterinary Medicine?

Opinions vary. Most pathologists think they are practicing medicine. But many state licensing boards do not agree. “The giving of a diagnosis to a colleague is not practice.” Many do not require a license. ACVP Council looked into this issue several years ago. AVMA did not want to give an opinion. The ACVP made a policy statement that if licenses were required, it should be based on specialty training and not on clinical competency examinations. Certification by a specialty college is more relevant than clinical competency.

However, that does not matter because attorneys believe we are practicing veterinary medicine and will argue the point in court. Human pathologists practice medicine and are licensed and regulated by state medical boards. They are covered by liability insurance. If you are not covered by a license, either personal or institutional, it could bias a judge or jury. At the least it might create poor public relations. Public pressure may eventually require that we become licensed.

Managing the Legal Risks

*Risk management starts with effective communication*. It is the first line of defense and the best way to manage risk in liability litigation

1. Nothing competes with honesty in a biopsy report. Give what you can honestly give under the circumstances of the biopsy. If you communicate to the clinician your concerns about a definitive diagnosis, you are protecting yourself. But **don’t go overboard and create doubt on every case**. You can always suggest additional testing when necessary like immunohistochemistry on some neoplasms.

   a. “Based on my training and experience and the information provided, I can’t make a definitive diagnosis.”
   b. “Further study is required for a diagnosis”
   c. *Definitive interpretation requires a signalment, history and distribution of the lesions*. This teaches clinicians about what is needed to make a diagnosis and protects you.

2. Show logical thought processes in the report when necessary. Express doubts if you have any and give a differential diagnosis. Logical thought processes also help in avoiding cognitive errors in pattern recognition.
The Good News about Liability

Defense attorneys and insurance companies are aggressively defending veterinarians. There is pressure not to settle cases but to litigate them in court so as to discourage suits. Make sure you have a license to practice medicine somewhere in the USA. If you are working for an institution, veterinary college or private laboratory, make sure there is an institutional license that covers you. Also carry liability insurance and check to see if your institution is covered. If you are by yourself, purchase a policy. It’s pretty cheap; somewhere around $300/year for $1,000,000.00.

Clinicians:

What you do during the biopsy matters…greatly! [Tissue selection and handling]

What you do not do after the biopsy matters even more! [Fixation and supplemental date etc]
Get a diagnostic biopsy the 1st time you sample
Help the pathologist to help you

Let the pathologists decide how to report but communicate to them what is needed and the evidence based medical reasons for it.

Diagnostic Labs:

Surgical biopsy is not another lab test to be ordered by checking off a box in a list of tests you offer. It’s really a “Referral without patient”. Your laboratory should reflect that by providing a good (and probably separate) biopsy submission form, separate from your list of tests and check boxes. Failure to do so perpetuates the myth about what biopsies really are.

Also make sure the trim technicians are communicating with w/ the pathologists reading the cases

Pathologists:

Be aware of the errors in cognitive thinking and control them as much as possible. Pay attention to workload and fatigue and slow down the cognitive process whenever you can.

Take an active role in setting the standard of care

Promote more interaction with clinical sciences and bridge the gap between pathology and clinical medicine. Don’t work in isolation. Talk to clinicians whenever possible and find out what they need.
Continued education of clients in the form of feedback and provide more consistency in what we report and the way we report it.

Give the clinicians what they need to manage the case and insist on “evidence based medicine”.

**Training Programs:**

Education of our pathology students and residents about the specific and rapidly changing demands in clinical medicine

Education of clinical medicine and surgery residents as well as the pathology students about their responsibilities in surgical pathology. Problem resolution starts by teaching the next generation what the issues are and how to manage them.

The Yin & Yang symbol derived from ancient Chinese understanding of how things work represents the dual nature of the universe and the interaction of two energies in continual movement. It is the cyclical interaction of opposing forces that act on everything so that no one principle continually dominates the other. As such this symbol embodies the continual dynamic tension in the surgical pathology arena between clinicians and pathologists who must balance the needs of the patient against the 1st Rule of Medicine and the 1st Rule of Surgical Pathology.

“*Life is short, the Art is long, opportunity is fleeting, experience delusive, judgment difficult*”

Hippocrates of Cos ~ 460 BC

Perhaps the most often quoted statement in the collection of ancient medicine that has been attributed to Hippocrates sums up the difficulties faced by physicians who would pursue a career in the healing arts. The practice of medicine is long and arduous and cannot be mastered in any human life time. As medical knowledge has exploded since the Renaissance, every one of us understands how difficult it is to keep pace with the challenges, its complexity and changes. Opportunity, experience and judgment are all relevant and important features of surgical pathology in veterinary medicine that carry the same implications as for clinicians. In our practice of diagnostic pathology, do we understand how truly rare are the opportunities to study disease, learn anything meaningful and add significantly to the sum of knowledge already generated? How rare are the opportunities for meaningful feedback which is one of the important mechanisms by which we learn. We all recognize the value of “experience” in diagnostic pathology but we also understand that often our
own individual collection of experiences can be misleading and lead us down the wrong path. And of course, it always comes down to “judgment” when making a difficult diagnosis.

“And finally, there is judgment. We try to teach it to our students, but we wonder if we understand it ourselves. Sometimes the course that seems right for this particular patient today is exactly opposite of what seemed right for someone with what seemed to be exactly the same problem yesterday. If even statistics give fuzzy answers, how much more unsteady must be judgment? Were it infallible, doctors would never disagree. The problem thus distills itself down to the first aphorism of Hippocrates; judgment is difficult to learn, to apply and even to recognize; medicine has few certainties---the ancients correctly called it the Art.

Sherwin B. Nuland MD
from “Doctors, The Illustrated History of Medical Pioneers”

It should be clear that there is both “science” and “art” in the practice of veterinary surgical pathology. In addition, the culture of veterinary medicine has created some unique features not seen in human medicine that confound the process further and add to our burden. It would be useful if all engaged in or dependent upon this relatively inexpensive, time tested, highly efficient diagnostic tool have an understanding of the issues and limitations inherent in it.