Fundamental Principles of Descriptive Anatomic Pathology

"How to Describe and Interpret What You See"

Gross Pathology

Paul C. Stromberg DVM, PhD
Diplomate, ACVP
The Ohio State University
Stromberg.1@osu.edu

Ancient Egyptian (Gross lesions)

Greek (Descriptive Pathology)

The Rosetta Stone

I pass, like night, from land to land;
I have strange power of speech;
That moment that his face I see,
I know the man that must hear me:
To him my tale I teach.

Samuel Taylor Coleridge

Ancient Egyptian

Greek

The Rosetta Stone

Here’s what we’re gonna’ do

Learn what is important to note about gross lesions & how to describe it.

Learn how to interpret what you observed and translate it into the language of pathology. Decoding The “Rosetta Stone”

Learn how/why pathologists make errors in diagnosis and how to manage the risk.

Collectively work through a group of projected gross images applying what we have learned. Later in the Week

2 Mock gross path exams to apply what you have learned and review and grade them collectively with faculty.

Examine how microscopic lesions create the macroscopic images we observe in selected organs.

The Game Plan

Later in the Week

“Here’s what you should have from me”

Power Point Presentations as PDFs
1. Fundamental Principles of Descriptive Anatomic Pathology Lecture
2. Cognitive Errors in Veterinary Diagnostic Pathology Lecture
3. Microscopic Basis for Macroscopic Pathology Lecture

Text Files as PDFs
1. Descriptive Anatomic Pathology text handout
2. Cognitive Errors text handout
3. Gross Pathology Test Booklets 1 & 2
4. Problems in Gross Interpretation work sheet
5. Macro-Microscopic Correlations text handout
Descriptive pathology is a combination of observation, characterization, and interpretation of abnormal anatomic findings in tissues and organs. The proportions of each component vary according to the purpose of your reporting format:

1) Journal and textbooks
2) Autopsy Reports
3) Tax Path (toxicologyReports)
4) Surgical Biopsy Reports
5) Certification Examinations

Gross Pathology focuses on lesions in tissues, organs, or whole animal visible with the naked eye.

Gross Pathology. “Why do it?”

1. Rapid determination of potential problems
   Often sufficiently distinct for presumptive Dx of a pathologic process

2. Occasionally, highly suggestive of specific diseases = “Pathognomic lesions”

3. Patterns may suggest mechanisms & pathogenesis

4. Related agents may cause similar lesions (useful concept in comparative pathology)

5. Guide or “Road map” for what to culture or examine further (microscopically)

“Autopsy vs. Necropsy

Postmortem Examination of patient = “After death”.
Necropsy = “Death examination”; commonly used for animals.
Autopsy = “Self examination”;
believed by some to be confined to post mortem evaluation of humans
but… the context of the Latin is: “Examine for yourself”

Postmortem Examination of patient = “After death”.
Necropsy = “Death examination”; commonly used for animals.
Autopsy = “Self examination”;
believed by some to be confined to post mortem evaluation of humans
but… the context of the Latin is: “Examine for yourself”

Most veterinarians in North America must do their own necropsy.

Dr. Harvey Cushing: Vesalius, 1543
Dr. Shelf: De Causes Morborum Morphas, 1761

“What should we cut in?”
Autopsy

The post mortem examination is an **ephemeral event**.

"When it’s over, it’s over"!

All that’s left is what you write down

**Good reports** provide a permanent, legal record of the anatomic lesions.

**Poor reports** are 1° limitation to retrospective studies; increasingly also to legal cases.

In human medicine, bodies are occasionally exhumed and “re-autopsied”

That’s rarely an option for us.

Hamadryas baboon, Ethiopia

**Description vs Interpretation**

Gross pathology begins with a complete **description** of what you observed.

Your experience and skill is manifested by your **interpretation** of what you think the described lesions mean.

However, leave a record of what you saw, not just what you “thought” you saw so that others can decipher it for themselves.

**Gross observations** (The Facts) are **objective** and should never change.

**Interpretations** (Your Opinions) are **subjective**, open to discussion and can be altered.

**Interpretation** is always a guess but it can be a very good guess.

“Always justify your interpretation by **accurate descriptions**”!

(“Describe first, then interpret”)
Description (The “Facts”):
The lung was diffuse dark red to plum colored, heavy, wet and foamy fluid freely ran from the cut surface. It felt firmer than normal and not crepitant

Interpretation (Your “Opinion”):
Diffuse pulmonary congestion and edema
Diffuse acute interstitial pneumonia
Diffuse atelectasis

The Value of a Good Gross Description

1) Permanent (only) record of findings.
   Unlike histopathology which is archived, retrievable and can be peer reviewed, the only residual from your gross observation is what you record. Important that your observations are accurate and objective

2) Reduces the likelihood of an error in interpretation. By slowing the interpretation process, it opens your mind and reduces the likelihood you will make an error in judgment when you finally interpret your observations

The Elements of the Gross Description

Distribution - A spatial arrangement pattern
Demarcation - Distinct or indistinct
Contour - Raised, depressed or flat
Shape - “Does the lesion have a shape?”
Color - “Well, what color is it?”
Size - Absolute vs relative
Texture - Cut surface; amorphous or solid
Consistency - Fluid, soft, firm, hard, gritty
Special Features – odor, sound, Extent - % of the organ affected
Chronicity and Severity

**Know what the observed lesions mean in terms of pathologic processes**
Chronicity

Subjective assessment; difficult to be precise.
What is a “real time” definition of chronic?
Acute – secs – hrs?
Subacute – hours to days?
Acute and Chronic
   a mixture; may imply ongoing damage
Chronic – days to weeks or longer?

Gross Hallmarks of Chronicity

Proliferation of cells
Deposition of stroma or matrix; Fibrosis, Hyperostosis
↓ Size - large changes in organ size; Hypertrophy Atrophy
All of these attributes imply the passage of time but are not precise or quantifiable

This looks pretty “chronic”, right?

Chronicity

You can see fibrovascular proliferation or granulation tissue microscopically as early as 3-5 days after the damage.
So if you can see it grossly, the lesion must be at least 1-2 wks. Is that “Chronic”?

The Logic Test
Ask the question "Is the lesion... seconds, minutes, hours, days, weeks, months or years old"?
and arrive at a logical range for the age of the lesion.
Severity

**Subjective assessment**
A sliding scale, relative, variable among individuals; 5 Pt scale common

- Minimal
- Mild
- Moderate
- Marked
- Severe

- "Not Bad"
- ?
- "Bad"

Step One

"Is what you see normal or abnormal?"

- Normal
  - "You're done!"
- Abnormal
  - Histopathology
  - Microbiology
  - Sample what you described
  - "What's the abnormal part?"
  - Describe that
Sometimes the lesion is obvious!

Sometimes it's not so obvious.

Sometimes the lesion is simple.
Sometimes it’s complicated

**Distribution**

The spatial arrangement of the lesions in the organ or tissue

*Important because distribution may reflect pathogenesis

[Image: The Giza pyramid complex]

**Random**

The lesion occurs without reference to architectural arrangement

A distribution seemingly determined by chance

[Image: Two dice]
Haphazard; not consistently associated with certain structures in the organ or tissue; easy to see; not specific with respect to cause or pathogenesis.

**Many pathologic processes often appear to occur randomly.

K9 pancreas w/ random Multifocal/non-uniform white foci

Feline lung w/ multifocal random dark red masses (*Paragonimus kellicotti*)
Symmetrical

A pattern with some suggestion of organization or architectural form; May have a geometric shape. **Nonrandom.**

Bilateral symmetry

Symmetrical

Occurs when a pathologic process highlights an anatomic or physiologic subunit of the organ or tissue.

Often defined by vascular beds, lobules, ducts, airways, tubules.

Symmetrical

**Bilateral lesions** may have similar physiological sensitivity to a metabolic disorder of redundant tissue on both sides of the midline. Also implies the mechanism acted systemically, not locally.

Suppurative bronchiolitis w/bronchiectasis

Ovine focal symmetrical encephalomacia
Diffuse ‘symmetrical’ pale linear streaks in the deep cortex
Multifocal random tiny red foci in the cortex

Bilaterally symmetrical thyroid enlargement
(The lesion also ‘diffusely’ affects each gland)

Bilateral symmetrical laminar cortical necrosis

Wood's light

Goat kid

Goat
Focal

A single defined lesion on a background which is either normal or itself abnormal but different than the focus

This lesion also seems to be random

Focal

An easy pattern to see but with little interpretative power with respect to pathogenesis

Solitary masses, abscesses, neoplasms

Notice 'asymmetry' of the cerebral hemispheres

K9 w/ solitary well demarcated gelatinous plum-colored mass
Multifocal

More than a single discrete lesion on a background.

Highly variable; several to many lesions. May require further characterization; i.e. “multifocal widespread” to distinguish it from just 2-3 foci.

K9 brain w/ multifocal non-uniform red foci

K9 Sm Int w/ Multifocal white raised triangular shaped masses in the GI

The triangular shapes define vascular beds
Feline kidneys with random bilateral multifocal cysts

"Multifocality often implies an embolic shower"

Septicemia, tumor metastasis, aspiration

Multifocal metastatic carcinomas

Primary Lung CA

Centrifugal digital metastases of a feline pulmonary carcinoma
Multifocal to Coalescing

Several to many focal lesions that appear to be growing together or fusing

This may reflect an active process that is expanding or is not otherwise contained or limited by host defense mechanisms.

Embolic shower of tumor emboli or pyogranulomas

Some nodules are "umbilicated" a feature of carcinomas

*May imply chronicity or multiple waves of embolism

K9 lung w/ metastatic Thyroid carcinoma

Feline lung with multifocal To coalescing widespread white nodules

Sometimes you don't need explanations. It is what it is.

For me, a pathognomonic lesion in East Texas - only seen only once in the last 30 years in central Ohio.
Miliary

A special case of multifocal in which there are numerous tiny foci present

“Too numerous to count”

Stems from “miliarius” (L. = millet seed) or “millenium” for thousands
May reflect a recent embolic shower.

Because the lesions are tiny, the implication is the event is new or recent

Miliary

Cells
Inflammation
Neoplasia
Acute necrosis

Petecchia
Platelet defect
DIC
Vascular damage
6 mo foal liver w/ Miliary tiny white "foci"

Foal with miliary coalescing well demarcated white nodules

K9 brain w/ "miliary" Bright and dark foci

Formalin fixed blood

Unfixed blood
**Segmental**

A well defined portion or discrete “segment” of the organ is abnormal.

Most easily seen as a linear portion in a tubular organ or the tip of extremities.

Bovine

“Segmental” well demarcated discoloration of the distal foot.

K9 am int w/ “Multifocal” “segmental” hemorrhage & infarction — *Dirofilaria*
Sometimes a distinct Geometric shape may be said to be "segmental". This distribution may imply a pathologic process restricted to an anatomic subunit of architecture.

**Lobules, ducts, tubules, vascular beds**

"Segmental" lesions can define a vascular bed.
Diffuse

Everything in the frame of reference is the same, abnormal or affected

Diffuse

Generally implies greater severity or extent and therefore has more significance than focal or multifocal lesions

May be more chronic, but not necessarily; rate of process determines speed of spread

Interstitial pneumonia
Pulmonary edema
Atelectasis

The “Paradox” of Descriptive Pathology

“The most severe (extensive) lesion may be easiest to overlook because there is no normal for comparison”
“Diffuse” Parathyroid gland enlargement

Bovine brain.
“Is it normal or abnormal? What’s abnormal?”

“Raspberry Jam” Spleen
The “Enlarged Spleen Law”
“The degree to which the lesion is defined or set off from the adjacent normal tissue”

Demarcation

Well demarcated

the boundary between normal and abnormal is abrupt, discrete and easily observed.

Implication: The lesion represents different tissue or is well contained or separated from the normal.

Tumors, abscesses with capsules, pus, a rim or zone of necrosis.
Demarcation

**Poorly Demarcated**

The boundary between normal and abnormal is **blurred**, not easily seen; **indistinct**
Implication: The lesion and adjacent tissue may be similar or the process is poorly contained or gradually infiltrates.

Areas of hyperplasia, non-necrotizing inflammation (lymphocytic), infiltrating neoplasia.
Contour

“The degree to which the lesion is elevated or depressed with respect to the adjacent tissue”

Raised

Implies that something is added to the organ or tissue to cause expansion or elevation.

Raised

Fluid – Plasma, blood, transudates, exudates, effusions, edema, urine
Gas – Emphysema
Cells – Normal (= Hyperplasia)
   Abnormal (= Neoplasia)
Exudate (= Inflammation)
Stroma – Extracellular matrix, fibrosis, granulation tissue, cartilage, bone, Mineral
Non-host material – Parasites
   *Use other modalities to differentiate

Mt Augustine, Cook inlet, Alaska
Pig kidney w/ cyst

"Raised" above the adjacent renal tissue

Pig w/ segmental serosal bubbles

EQ stomach w/ poorly demarcated "raised" nodules on the glandular mucosa.
F344 Rat w/ a large mass in the Rt inguinal area

K9 mandible w/ Hyperostosis - *Hepatozoon canis*

“Raised” new bone is added to the mandibular cortex

Rat liver w/ multifocal “raised” nodules
Depressed

Implies that something is removed or lost

Atelectasis

Depressed

Most often this means necrosis or atrophy; Possibly segmental Hypoplasia.

Depressions in elevations may ~ necrosis in an actively growing process causing A "crater-like" appearance i.e. umbilicated carcinomas

Meteor Crater, Arizona

Depressed

*Some organs are physiologically dynamic and may have depressions.

Air is the most common thing removed from the lung = atelectasis; could be diffuse, lobar or lobular
Cat kidney w/ large "segmental" area of the cortex missing.

K9 liver w/ well demarcated "crater-like" depression ~ HSA

K9 liver w/ metastatic HSA. Multifocal well demarcated dark "crater-like" depressions.
Bov abomasum focal ulcer with red rim of reaction.

The lesion is neither raised nor depressed with respect to the adjacent tissue.

Implies a recent event which has not had time to progress or the pathologic process does not cause expansion or necrosis.

West Texas panhandle near Alpine is pretty "Flat."

Pig with multifocal dark spots on the lung and liver.
There is "raised" hyperostosis and "depressed" areas of osteonecrosis.

"Beyond contour, what geometric figure does the lesion resemble?"

Remember, shape may also reflect the attribute of "Segmental Distribution" and may inform us where the lesion is located.
Because vascular beds are often laid out in geometric patterns such as circles, rectangles, triangles, wedges, spheroids, such a shape may suggest a lesion revealing a pathologic process affecting a vascular bed.

Also lobules, septae, hepatic portal triads may create an organized appearance or distinct pattern when filled with a pathologic process.
K9 w/ well demarcated square dark red lesion in the occipital cortex

Hemorrhagic infarction in a "segment" of the occipital cortex

Corroded vessels = "Corroborative Testimony"

Color

Normal color of an organ or tissue is determined by:

1. Innate color of cells and stroma which is often white
2. Special pigments like myoglobin, steroids, bile, melanin
3. Amount of blood (hemoglobin) in the vascular bed

Your eye perceives the net of these

*One of the most obvious attributes to "see" especially when there is high contrast with normal.

Color

Dark tissue = high pigment/tissue ratio
   Skeletal muscle, spleen, liver

Light tissue = low pigment/tissue ratio or high fat content
   Smooth muscle, lung, brain, some glands
Red – Reddish Black

Usually means **blood or hemoglobin**. The implication is either **congestion or hemorrhage**.

Differentiation between congestion and hemorrhage requires additional attributes:

- i.e. congestion is usually lighter, wider spread and tends to be poorly demarcated.
- **Real hemorrhage** is almost black.

---

**Cat lung w/ congestion**

Edema – mediastinal L1A

**Cat brain w/ miliary red foci**
White-Gray or Yellow

Often ~ lack of blood or loss of cell pigment
Necrosis is often pale because of the lack of blood or leakage of cytoplasm

Coagulation necrosis = necrosis with preservation of architecture and is often an acute event, therefore the foci are often flat

Fibrosis = white but scar tissue fills in areas of necrosis and contracts
Exerting tension on adjacent tissue so often its depressed, irregular or stellate
White-Gray or Yellow

Exudate = often white to yellow but amorphous; check texture of cut surface
Hyperplasia = light to white; Granulation tissue is pink early, whiter as it matures into scar tissue
Neoplasia = often white to yellow but solid, viable tissue; check texture of cut surface

{"More about "texture" later}
Yellow

Meconium in tissues may be yellow
Bilirubin stained tissues (=icterus) may stain tissues yellow

Yellow discoloration in the CNS may indicate malacia (pan necrosis)
K9 w/ chronic hepatitis
Bilirubin = 11mg/dl

Bov w/ diffuse yellow discoloration

1) Asymmetrical cerebrum
2) edema
3) swelling
4) discoloration
5) hemorrhage
White matter edema – metastatic HSA

Green

Often bile or bile pigments. Bile staining of tissues post mortem = Pseudomelanosis
Sometimes simple coagulation necrosis is green. ???
Sometimes eosinophilic inflammation can impart a greenish discoloration
Aspiration pneumonia w/ plant material
Pigmented fungi, chlorophyll containing plant material, saprophytic bacteria

EQ toxic hepatopathy; Atrophy, fibrosis, bilary carcinoma – aflatoxin
Foal kidney w/ Kernicterus & cholemic nephrosis

Bov w/ gangrenous mastitis

Bov udder w/ Coliform mastitis
Bov tibia w/ infarction
≈ Lymphoma

Chicken w/
Deep pectoral myopathy

Swan w/ Aspergillosis
Green - Black

**Pseudomelanosis** = artificial staining of tissues, usually post mortem, by bile or H$_2$S pigments from the GI. *Usually limited penetration into an organ or tissue adjacent to the liver or bowel; serosa or slightly deeper; poorly demarcated*

Aspiration pneumonia w/ saprophytic bacteria, pigmented fungi

K9 kidney w/ "Pseudomelanosis" - bile staining

Rabbit spleen w/ "Pseudomelanosis" - bile staining ( incidental). Multifocal widespread small white nodules = Toxoplasmosis
Bov lung w/ Aspiration pneumonia

**Black-Brown**

Black to brown usually = melanin
- **Melanosis** – usually *flat*; not enough melanin deposited to create contour
- **Melanoma** – usually *raised*; proliferating melanocytes add something and create contour

*Remember real intense hemorrhage can be almost “blue-black” in color
- **Hemosiderin** may impart a brown discoloration

**Do not forget about Pigmented fungi**

Bov w/ Adrenal melanosis
Bov w/ Meningeal melanosis

EQ w/ cutaneous melanoma

Well demarcated

Lung w/ hemorrhage & hemosiderosis ~ CHWD
EQ maduromycotic
Mycetoma
Curvularia geniculata

EQ phaeohyphomycosis
Drechslera spicifera

Fine Arts 101 Rule

“Processes producing a dark color can mask processes producing a light color”

“Hemorrhage trumps necrosis”

(If there is hemorrhage or congestion, that can mask necrosis, suppurative exudate, fat or hyperplasia/neoplasia)
K9 kidney w/ miliary red foci confined to the cortex
Canine herpesvirus

K9 Thyroid Carcinoma w/ hemorrhage

K9 Thyroid Carcinoma w/o hemorrhage

EQ spinal cord w/ malacia and hemorrhage
Sarcocystis neurona
Size - “It Matters”

Size of Lesions

“How big is the lesion or abnormal area?”
Always estimate or measure the lesion. It may impact the clinical significance.

What are the dimensions of the nodules, masses, foci, depressions etc?

Implication: “small” lesions are more recent than “large” ones and may not be as significant.

K9 w/ “umbilicated” pulmonary adenocarcinoma
Uniformity of Multiple Lesions

**Uniform Size**
- Lesions are all about the same size.

*Implication:*
Pathologic events have occurred over short time or at the same time and are progressing at roughly the same rate.

**Uniformity of Multiple Lesions**

Often uniform sized lesions are small and thus may be recent

**Non-uniform Size**
- Lesions are of different sizes.

*Implication:*
Pathologic events are separated in time or have different rates of progression.
Uniformity of Multiple Lesions

Smaller lesions are more recent; larger lesions are older; may mean recurring pathologic processes such as multiple waves of metastasis.

K9 w/ metastatic Chondrosarcoma
Not umbilicated

K9 spleen w/ multifocal non-uniform white nodules; some umbilicated

Size – Whole Organs

“Size still matters”

Poultry Slaughter plant in San Antonio
Everything in Texas is BIG
Unlike discrete lesions, whole organ size is often subjective and difficult to accurately “see” because of the lack of contrast. Best judged in relation to a fixed standard. A subjective opinion!!! Small increases/decreases in hearts, livers, adrenal glands may not be perceptible.

“Always give more weight to objective evaluations than to subjective evaluations.”

The organ is larger than normal. Remember “The Paradox” Look for “Corroborative Testimony.”

Implication: Like elevated contour, “Something is added.” Think hyperplasia, edema, neoplasia, congestion, inflammation. Use other lesion attributes to differentiate.

Organs with capsules often “bulge” on cut surface when something is added because of the ↑ pressure inside capsule.
Turkey poult w/ enlarged heart ~ furazolidone induced cardiomyopathy

K9 prostate

Its asymmetrical, suggesting it's abnormal but is it enlarged or not?

"Heads up, guys. This matters!"

K9 w/ Benign Prostatic Hyperplasia

Hyperplastic glandular tissue "bulging" from the cut surface
The organ is smaller than normal.

Implication: Like depressed contour
“Something is removed/lost”
Think hypoplasia, atrophy, necrosis.
The organ may have a collapsed appearance or be completely absent.

*Remember:* Diffuse lesions may be difficult to “appreciate” because there is no normal for comparison.
"It's not atelectasis...there are no wrinkles but it's definitely smaller than normal, right?

K9 liver. Diffusely small, irregular, nodular and yellow

K9 w/ pancreatic hypoplasia
Size – Paired Organs

Which kidney is the abnormal one? SOMEBODY'S not normal! You have to use other lesion attributes as "Corroborative testimony" to support your conclusion.

(Fundamentally different pathologic processes will be inferred.)

Must use additional lesion attributes to properly interpret such as color, shape, symmetry, contour.

*Kidneys, lungs, endocrine, reproductive, cerebral hemispheres

“Who’s abnormal?”

F344 Rat testes

("Sorry Guys, but size STILL matters")
F344 Rat thyroid glands

“Who’s abnormal?”

Feline chronic renal disease

“OK, so *sometimes* size doesn’t matter”

Some organs and tissues change size for non-pathologic reasons

Serengeti Nat’l Park, Tanzania 2014
### Size – Dynamic Organs

Some organs and tissues are **physiologically dynamic** i.e. they change size and shape for functional reasons or in response to physiological, mechanical, immunological demands as well as pathologic reasons.

Myocardial hypertrophy, GI muscular hypertrophy, lymphoid/myeloid/erythroid hyperplasia

<table>
<thead>
<tr>
<th>Size</th>
<th>Dynamic Time Scale</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly</td>
<td>sec - min: lungs, bladder</td>
<td></td>
</tr>
<tr>
<td>Moderately</td>
<td>min - hours: spleen, GI,</td>
<td></td>
</tr>
<tr>
<td>Slowly</td>
<td>days - months: GI, heart,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>liver, kidneys, LN’s, endocrine glands</td>
<td>~ hyperplasia/hypertrophy</td>
</tr>
</tbody>
</table>

**EQ neonate w/ diffuse fibrinous pleuritis and atelectasis ~ pleural effusion**

Wrinkled pleura
K9 spleen (contracted) w/ Hematoma/infarcts

Equine esophagus
"Is it normal or abnormal?"

Rabbit
"What's Your Dx?"
What does the cut surface look like?  

Ms. Stromberg's gold flatware butter knife.  

Amorphous  
Semisolid, unorganized; no architecture; can't hold its shape; not cohesive  
“You can spread it with a butter knife”  

Implication: Dead tissue, exudates, pus, necrosis
Lamb w/ suppurative meningomyelitis
- ascending bacterial infection from tail dock

Bov caudal vena cava w/ septic thrombus and CPC

“Nutmeg” Liver

Solid Tissue

Has apparent structure; holds together or maintains shape; cohesive

“Not spreadable with a butter knife”

Implication: viable tissue, living cells, stroma

Hyperplasia, neoplasia, extracellular matrix or stromal deposition
The Texture Caveat

“Sometimes granulomatous inflammation looks like neoplasia”

Non-caseating granulomatous inflammation composed of epithelioid macrophages often has a firm “nonspreadable” texture to the surface and can mimic a neoplasia.
Consistency

“How does it feel”?

Gas – air trapped in the tissue = emphysema

Fluid – tissue looks/feels wet or squishy like a water balloon. Edema, blood, transudates, fluid-rich exudate, effusions, urine

Soft – tissue is “fluid rich/cell poor”. Exudates, necrosis, lipidosis

Firm – tissue is “fluid poor/cell rich”. Exudates, hyperplasia, neoplasia, scar tissue or fibrosis

Hard or “gritty” – tissue is mineralized matrix; cartilage or bone
Bov lung (X-sec) w/ Acute bovine pulmonary edema and emphysem

EQ ventral abdominal skin w/ SQ edema ~ thoracic LSA

Rhodococcus abscess

Well demarcated

EQ brain w/ Rhodococcus abscess

Soft: "You can spread it"
Alpaca kidney w/ Renal infarcts

K9 Gall Bladder w/ mucocoeal

"It feels firm"

K9 w/ Well-differentiated maxillofacial fibrosarcoma
Cat heart w/ Epicardial mineralization

It feels “gritty” or gravel-like

Equine Enterolith

Canine Cystic calculi

Caprine urethral calculi

Bovine cystic calculi

Fluids – “You can pour it”

Serous = Clear, extracellular fluid, water, urine, transudates

Serosanguineous – ECF w/ hemoglobin

Sero fibrinous = slightly cloudy with fibrin strands

Chylous = Milky white; lymph

Purulent = contains pus
K9 skin w/ Apocrine gland cyst

Foal w/ ruptured urinary bladder and uroabdomen

Bov ascites ~ Oak bud nephrosis
Bov w/ pleural effusion & pulmonary edema ~ Cowdria ruminantium

Feline (formalin fixed) Pyogranulomatous periventriculitis and hydrocephalus ~ FIP

Jell-O like Consistency of the CSF is ~ high protein content

K9 chylous ascites ~ lymphangiectasia and PLE

10 chylous ascites ~ lymphangiectasia and PLE
K9 Sm Int w/ dilated villous lacteals – lymphangiectasia

"White Shag Carpet"

Bov w/ chronic fibrinonecrotic Epi and pericarditis – Hardware Disease

Feline uterus w/ pyometra

"The corroborative testimony"
Special Features

“Is the organ heavier or lighter than normal”? Similar to size. It implies that something is added or removed and can be an Excellent basis to Dx hyperplasia, hypertrophy, hypoplasia or atrophy. “Subjective!

Weight – Whole Organs

Organ weights are excellent for uniform species such as rats, mice or standard breeds such as laboratory beagles. Routinely done on livers, hearts, adrenals, kidneys, brain in toxicology studies.

Generally not practical in diagnostic veterinary pathology because of species/breed variability.

Feline hearts – cardiomyopathy

Normal HW/BW in cats = 4.8
15-17 gms
HCM cats = 6.4
>20 gms

Laminated atrial thrombus in HCM
Weight

Most useful as a subjective measure in lungs.

The most common “something added” is fluid (congestion, edema).
The most common “something removed” is air (atelectasis).

“The Bucket Test”

If the lung sinks in water, something heavier or denser than water was added and/or air was removed.

Common

Pneumonia
Fetal atelectasis

“What does it sound like?”

Crepitant — the sound of popping air = Emphysema — normal lung, gas producing bacteria, autolysis
Sloshing — the sound of fluid splashing = edema, ascites, pleural effusion, diarrhea
Mucoid enteropathy in rabbits
Hard — sounds like a rock when banged on a hard surface bone, mineralized matrix
"How Does it Smell?"

- Blood in the stomach smells like apple cider
- Uremia smells like ammonia
- Paroviral enteritis
- Bovine endometritis
- Aspiration Pneumonia

"How Does it Taste?"

The Hippocratic physicians in ancient Greece routinely tasted "Blood, Sweat & Tears", urine, nasal mucus, sputum and ear wax.

Extent

"How much of the organ is affected"?

Extent of the Antarctic ice cap in summer and winter.
Extent

Estimate extent of the organ affected as a % and thus how much of the organ may be functionally compromised.

It serves as a measure of the severity of the process you observed and therefore the potential clinical significance of the gross lesions.

Most important in kidneys and lungs where we have estimates of the functional reserve.

Foal w/ diffuse interstitial pneumonia
100% of the Lt Lung is affected
Blood Loss

Measure amount of blood in body cavities
1 cc of blood = 1 gm
Circulating blood vol ~ 8% of BW
1. B.W in kg
2. Collect/measure blood in body cavities
3. Calculate % of blood vol
4. Critical amt = 40% of blood vol lost acutely

Example
10 kg dog. 8% of B.W = blood vol
Est blood vol = 0.8 kg or 800 cc
40% of 800 cc = 320 cc is critical amt of hemorrhage
If you collected > 320 cc of blood from a body cavity, that is enough to have caused hypovolemic shock

Approach to Gross Description and Interpretation

("Was I too close?")
Step One

“Is what you see normal or abnormal?”

Normal

Name a Specific Disease

“Abnormal”

History

Signalment

“Corroborative Testimony”

Framing

“Interpret a Pathologic Process (Morphologic Dx)”

“Describe that”

You’re done!

“Abnormal part?”

Step Two

“Describe the abnormal part!”

Using the attributes listed previously

Not all attributes will be relevant for every lesion; most can be described with respect to distribution, contour, color, size, consistency and extent

“Adhere to the “KISS Principle”

KISS

1-2 sentences is enough

Step Three

“Interpret a pathologic process”

The fun part. Remember its always a guess.

Morphologic Dx, A phrase or sentence that summarizes your observations into an inferred pathologic process.

“Look for corroborative testimony”
“Corroborative Testimony”

Evidence or data from a separate, independent source that verifies or supports the conclusion.

In the context of gross pathology, it is a different aspect of the lesion or case that reinforces your interpretation.

Including signalment, history & clinical data if available

**Description:**
The A-V 25% of the lung is dark red and firm to the touch

**Interpretation:**
Bronchopneumonia

**Corroborative Testimony**
On cut surface there are numerous symmetrical 1-2mm white foci interpreted to be small airways plugged w/ purulent exudate

Consistent w/ suppurative bronchopneumonia

*The corroborative testimony*
Descriptive Pathology for Autopsy Reports

Purpose of the Autopsy Report

**Explain the cause of death**, establish or confirm the presence or absence of a disease.

Create a permanent record of the ephemeral events found at autopsy. *Retrospective medicine*

Descriptive Gross Pathology for Autopsy Reports

The autopsy is an ephemeral event. The only record of the findings is what you record during a short period. **A descriptive exercise.**

Gross observations should dominate the autopsy report. *Paint a picture with words* then apply the *Carpenter Test*…

“Can you see what you wrote?”

Descriptive Gross Pathology for Autopsy Reports

First and foremost gross pathology in the autopsy report is a descriptive exercise that forms a rational basis for the interpretation of the observations. Interpretation is secondary to accurate documentation of the lesions.

*Describe first, then interpret*

Description slows the process and opens the mind, making cognitive error less likely and….

you have time for this in the autopsy arena
Descriptive Gross Pathology for Autopsy Reports

Knowledge of the gross appearance “frames” the case and is extremely useful when reading the microscopic. Together, the 2 make a powerful tool to get the correct Dx and interpretation and leave a useful record.

“Necropsies-in-a-jar” – clinician performed w/ poor documentation of the gross.
The power of autopsy is the combination of both gross and histopathology:
if there is no gross, interpretative power is lost.

Descriptive Pathology for Certification Examinations

Purpose of the Gross Pathology Section
To test the candidates ability to diagnosis a disease or condition from the gross appearance and the species:
It may include Mx, name a specific disease, a DDx and related questions. Detailed description is not asked or desired. Fill in the blank. In 2017 Multiple choice

It’s interpretative, NOT descriptive.

“Just decipher what you see and tell us what it means.”

Descriptive Pathology is…. “Painting with Words”

The style of writing should be suited to the purpose and needs of the reporting format.