

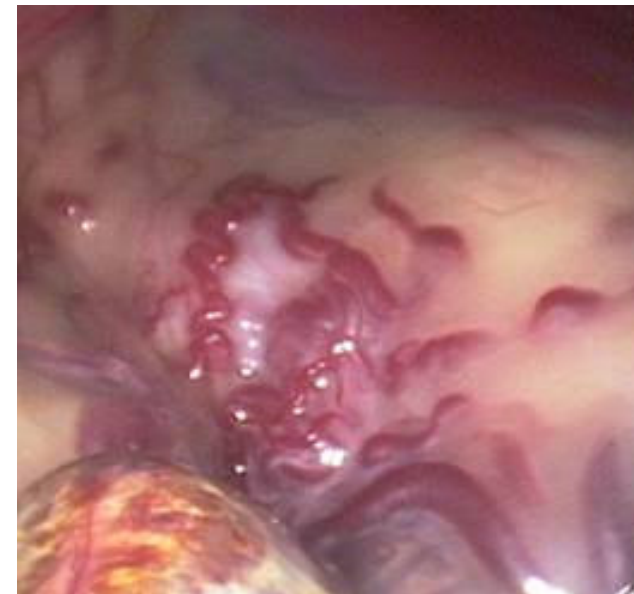


Portosystemic Shunts in Dogs and Cats

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Portosystemic shu

- Congenital
 - Single
- Acquired
 - Portal hypertension
 - Multiple
 - Kidney





Portosystemic shunt anatomy

- Extrahepatic
 - Small breed dogs
- Intrahepatic
 - Large breed dogs



Portosystemic shunt anatomy

- Porto-Caval
- Porto-Azygos



Hepatic Encephalopathy

- Enterohepatic cycle
 - GallBladder
 - Bile duct
 - Duodenum
 - Ileum
 - Portal vein
 - Liver



Hepatic Encephalopathy

- Ammonia
- Mercaptans
 - Methionine
- Short chain fatty acids
- Bile salts?
- GABA and Glutamate receptors
- Benzodiazepin like substances
- Aromatic amino acids
- False neurotransmitters



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- Ammonia
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Hepatic Encephalopathy

- Aromatic amino-acids
 - Phenylalanine
 - Phenylethanolamine: False neurotransmitter
 - Tyrosine
 - Octopamine: False neurotransmitter
 - Tryptophan



Hepatic Encephalopathy

- Altered neurotransmitter synthesis
 - Serotonin
 - Catecholamine



Clinical Signs

- Highly variable
- No pathognomonic signs
- Small size



Clinical Signs

- Gastrointestinal disorders
 - Diarrhea
 - Ptyalism: Cat



Clinical Signs

- Neurologic disorders
 - Ataxia
 - Cortical blindness
 - Head pressing
 - Seizures



Clinical Signs

- Urinary stones
 - Chronic UTI
 - Ammonium urate stones



Clinical Signs

- Slow recovery from anesthesia



Diagnosis

- Small size animal
- Clinical signs
- Worse after eating
 - High protein meal



Diagnosis

- Complete blood count
 - Microcytic normochromic anemia
 - Leukocytosis
 - Eosinophils



Diagnosis

- Biochemistry
 - Hypoglycemic
 - Hypoalbuminemia
 - Decreased BUN
 - Low cholesterol
 - Mild elevation liver enzymes

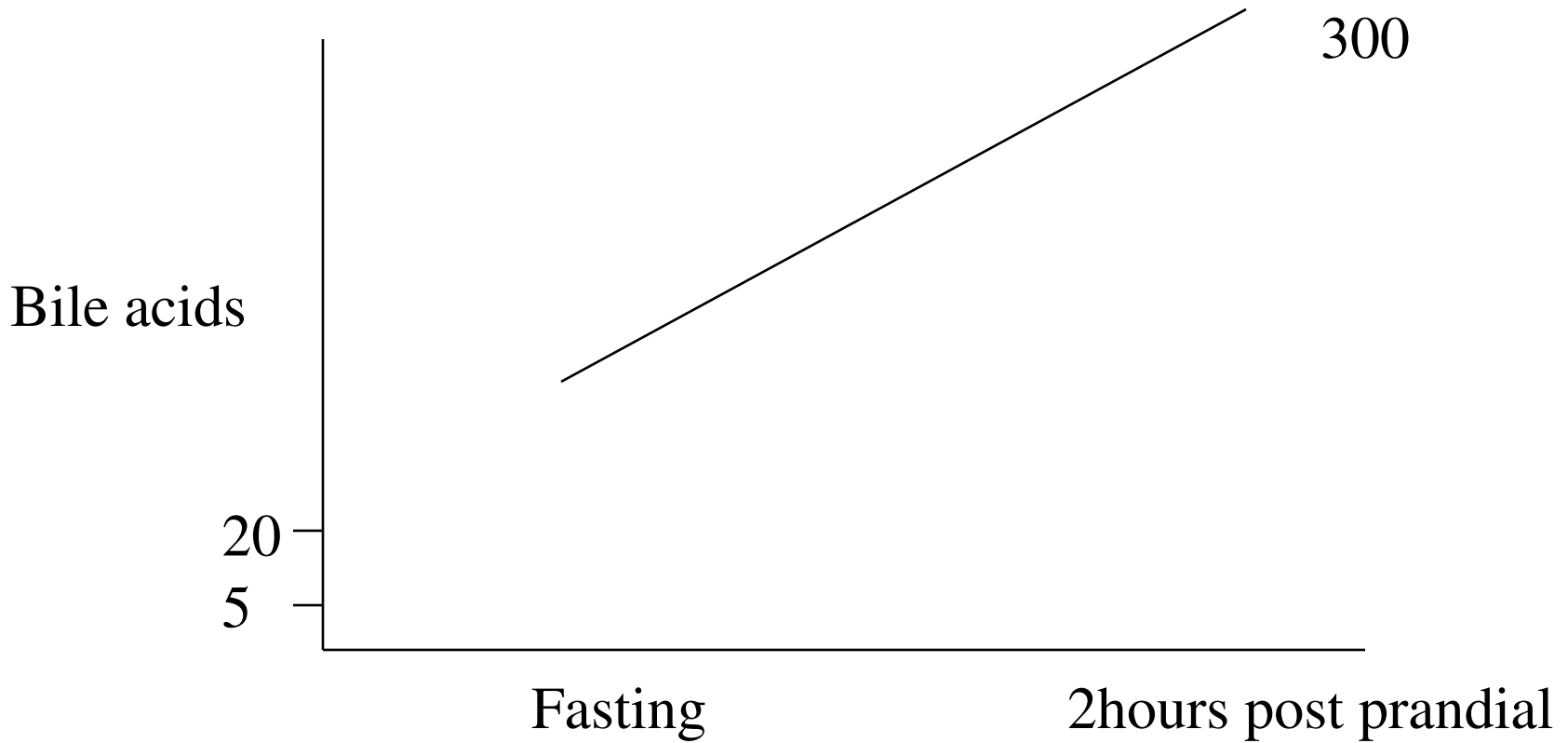


Diagnosis

- Biochemistry
 - Bile acids
 - Pre and Postprandial test
 - Fasting
 - High protein diet
 - 2 hours later



Diagnosis





Diagnosis

- Microvascular dysplasia
 - Hypoplastic portal vein
- Portosystemic shunt



Diagnosis

- Abdominal radiograph
 - Small liver
 - Enlarged kidneys



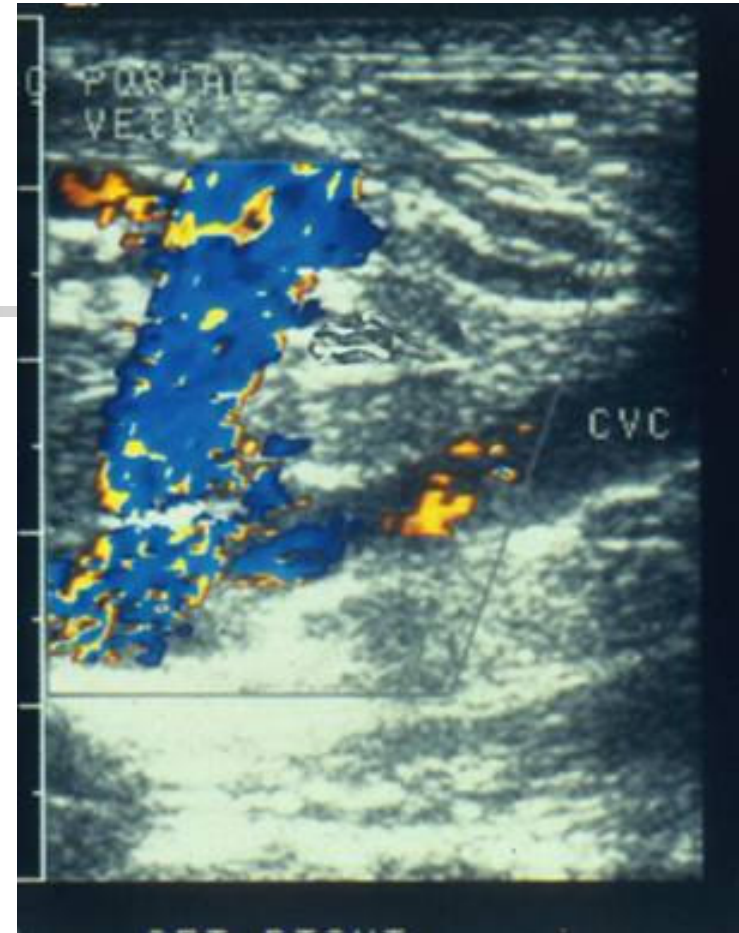
Diagnosis

- Angiography
 - Portovenogram
 - Localization of shunt
 - T 13



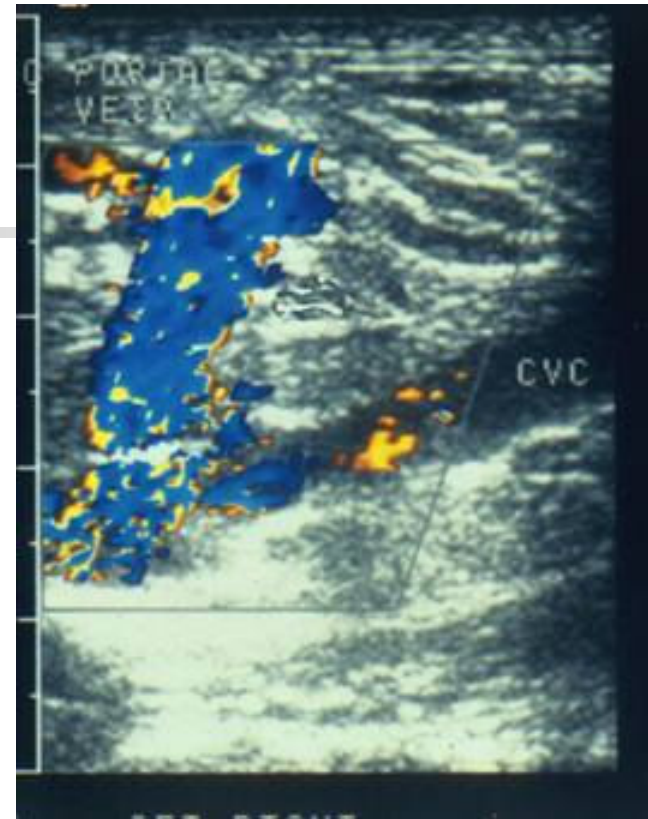
Diagnosis

- Abdominal Ultrasound
 - Liver size
 - Portal vein
 - Abnormal branches



Diagnosis

- Abdominal Ultrasound
 - Sensitivity: 84.6%
 - Specificity: 57.1%
 - Positive predictive value: 95.7%
 - Negative predictive value: 33.3%





Diagnosis

- Abdominal Ultrasound
 - Urinary tract
 - Ammonium urate uroliths



Diagnosis

- Portosystemic shunt
 - Clinical Signs
 - Blood work
 - Bile acids
 - **Small liver**
 - Radiographs
 - Ultrasound
- Hypoplastic portal vein
 - Clinical Signs
 - Blood work
 - Bile acids
 - **Normal liver**
 - Radiographs
 - Ultrasound



Diagnosis

- Abdominal Ultrasound
 - Extrahepatic shunt
 - Sensitivity: 80.5%
 - Specificity: 66.7%
 - Negative predictive value: 33%
 - Positive predictive value: 94.3%
 - Intrahepatic
 - Sensitivity: 100%
 - Positive predictive value; 91.7%

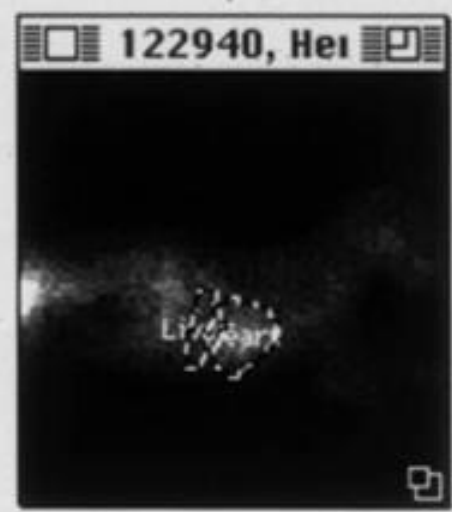


Diagnosis

- Transcolonic portal scintigraphy
 - ⁹⁹Techneium Screening test
 - Non invasive
 - Sedation
 - Descending colon

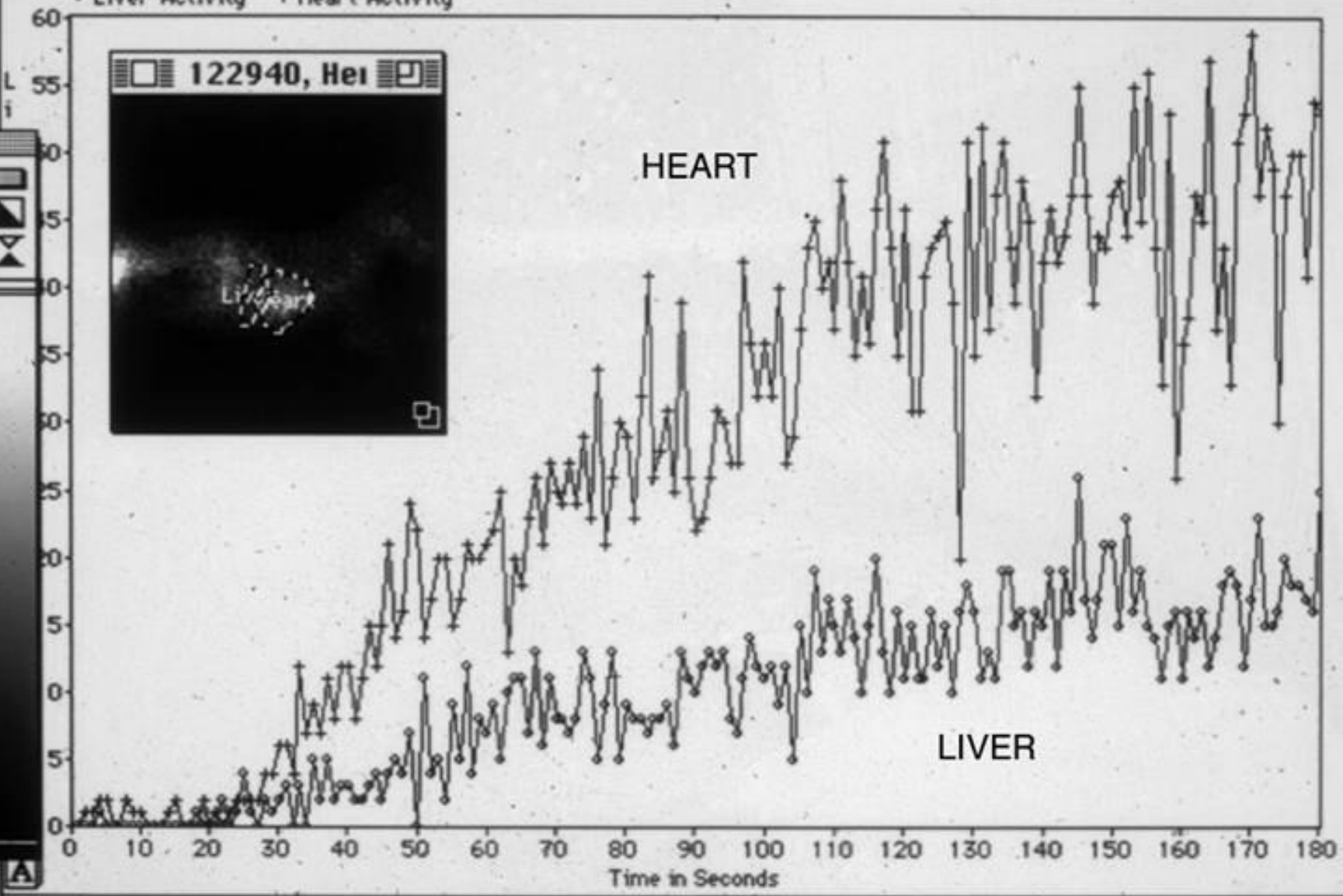
Activity in 122940, HERNANDEZ.FLOW

o Liver Activity + Heart Activity



HEART

LIVER



A

Drag out a zoom region



Diagnosis

- Transcolonic portal scintigraphy
 - Shunt fraction
 - <10% normal
 - >50% shunt
 - Importance of shunt?
 - No localization

Diagnosis

- Angiography
 - Portovenogram
 - Mini laparotomy
 - Jejunal vein



Treatment: Surgery





Treatment

- Medical vs Surgical ?
 - Short-term
 - Long-term
 - Control clinical signs
 - Liver atrophy and failure



Treatment: **Medical**

- Acute hepatic encephalopathy
 - Benzodiazepine, barbiturate
 - Fluid therapy
 - Betadine enema



Treatment: **Medical**

- Chronic hepatic encephalopathy
 - Reduce protein
 - L/D diet
 - K/D diet
 - Neomycin and or amoxycillin
 - Lactulose



Treatment: Surgery

- Laparotomy
- Liver biopsy



Treatment: Surgery

- Extrahepatic shunt
 - Caudal vena cava
 - Turbulences
 - Left omental bursa
 - Azygos vein

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



Treatment: Surgery

- Localization
 - Caudal vena cava
 - Renal vein
 - Liver
 - Celiac artery

QuickTime™ and a
Sorenson Video decompressor
are needed to see this picture.

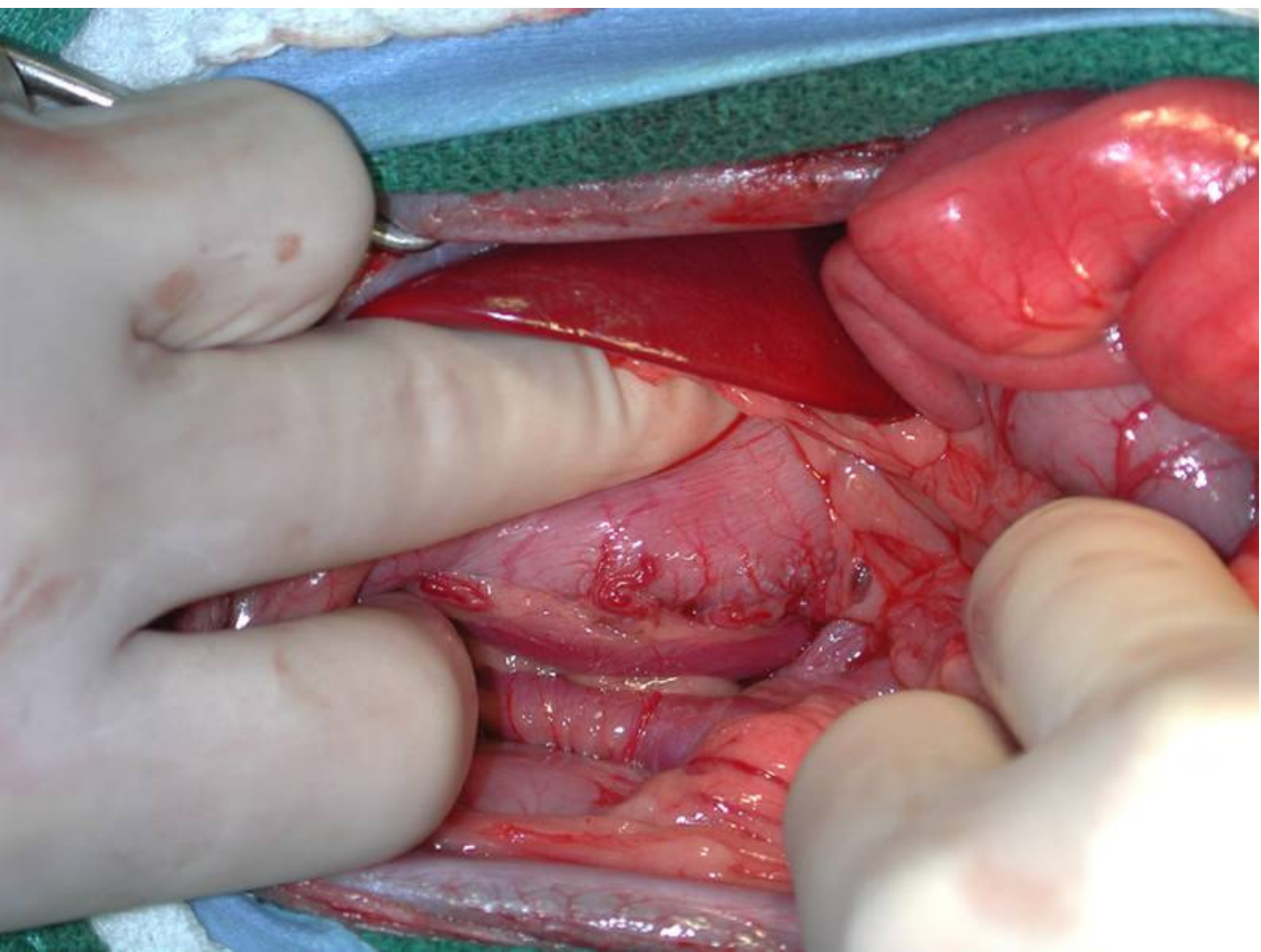
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Treatment: Surgery

- Extrahepatic shunt
 - Caudal vena cava
 - Turbulences
 - Left omental bursa
 - Azygos vein

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Treatment: Surgery

- Intrahepatic shunt
 - Cranial to liver
 - Left hepatic vein
 - Turbulences
 - Incise diaphragm: Breznock JAVMA 1983
 - Soft spot in liver lobe
 - Portal vein branches
 - Catheter in portal vein



Treatment: Surgery

- Ligature
- Portal pressure



Treatment: Surgery

- Ligature
- Ameroid ring
- Cellophane banding



Treatment

- Surgical partial occlusion Hottinger
Vet surg 1995
 - Long term follow up: 65 dogs
 - 100% normal with complete occlusion
 - 11% normal with partial occlusion
 - Second surgery



Treatment

- Portal hypertension
 - Acute
 - Chronic
- Slow gradual occlusion
- Liver accommodate



Treatment: Ameroid ring

- Hygroscopic compressed casein in stainless steel
- 3.5 and 5.0 mm



Treatment: Ameroid ring

- Rapid expansion: 14 days
- Slow expansion: 2 months



Treatment: Ameroid ring

- 80% occluded in a month
- Completely occluded at 60 days
- Vena cava
- Minimal dissection
- < 50% occlusion





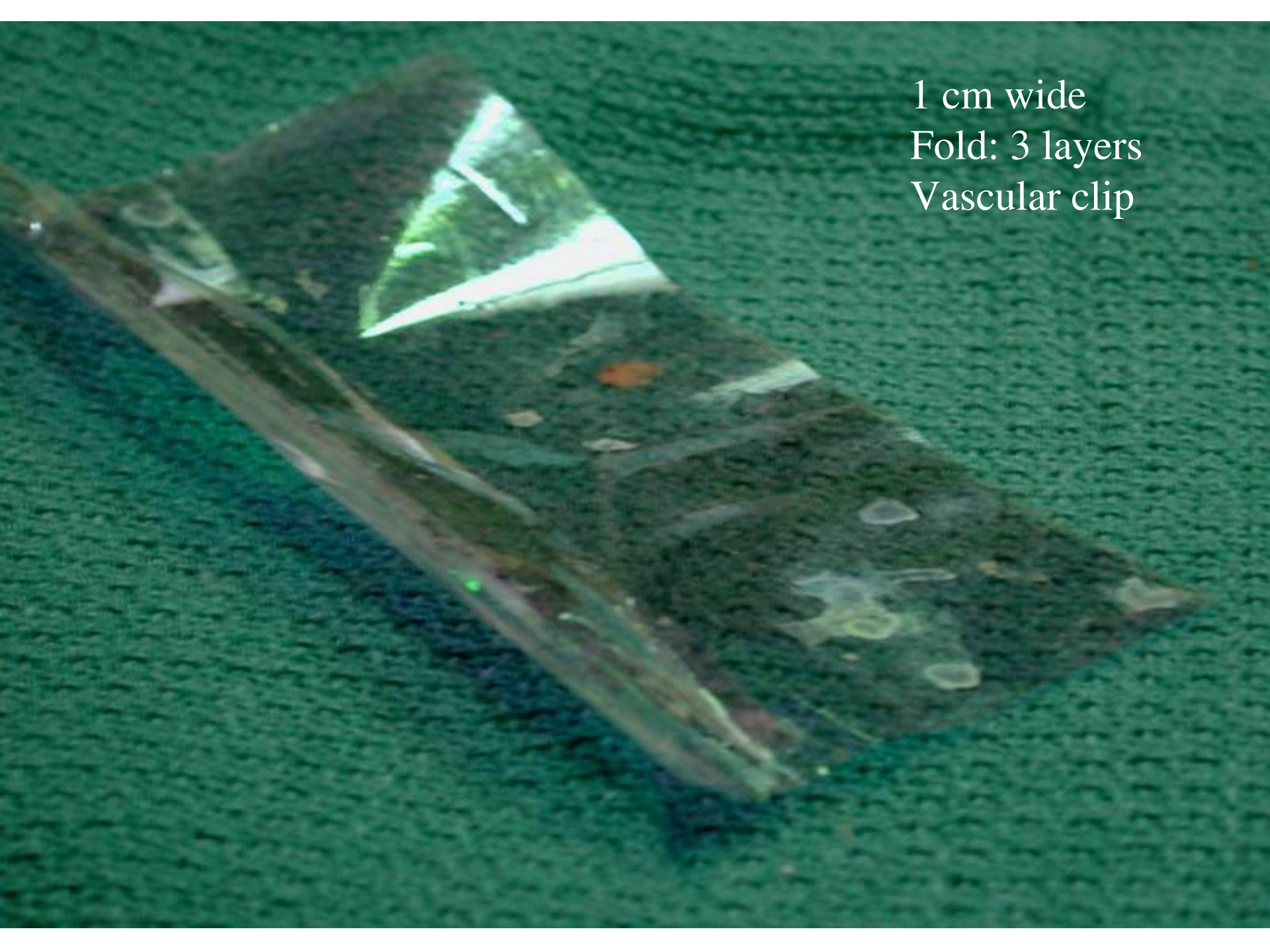
Treatment: Ameroid ring

- Reduction surgical time
- Less complication
- Long term follow up
 - Bile acid
 - Normal with ameroid: 3.6 months
 - Mild elevation with suture: 24.3 months

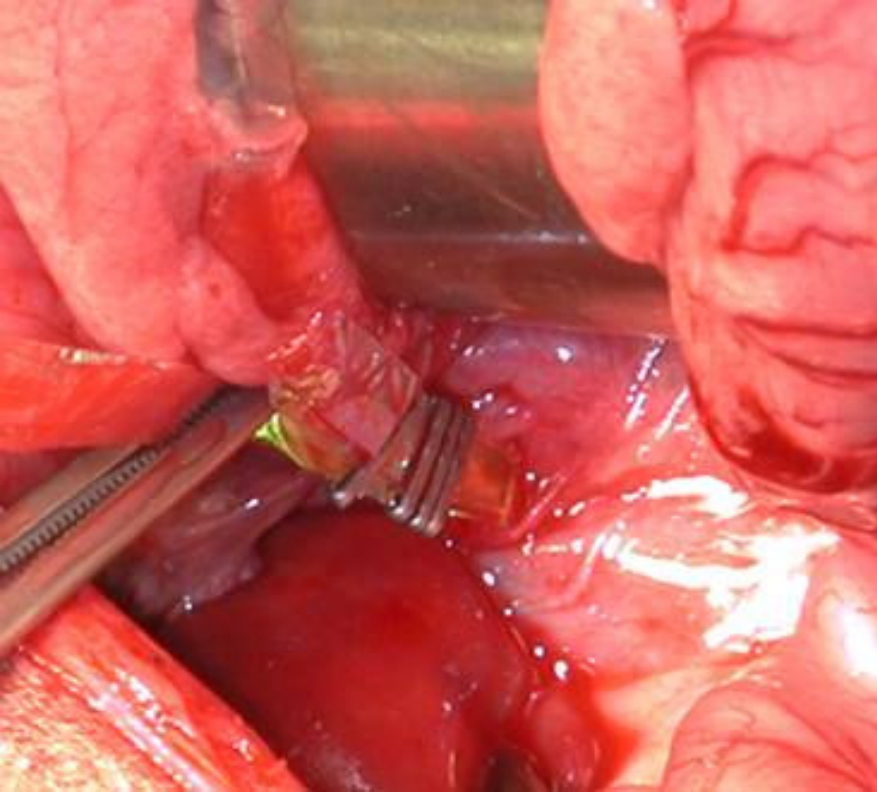
Treatment: Ameroid ring

- Acquired shunt
- Heavy
- Big
- Too fast?

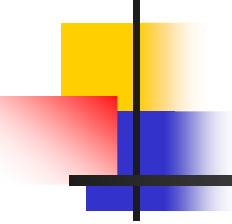




1 cm wide
Fold: 3 layers
Vascular clip

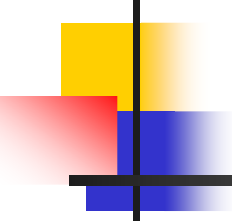


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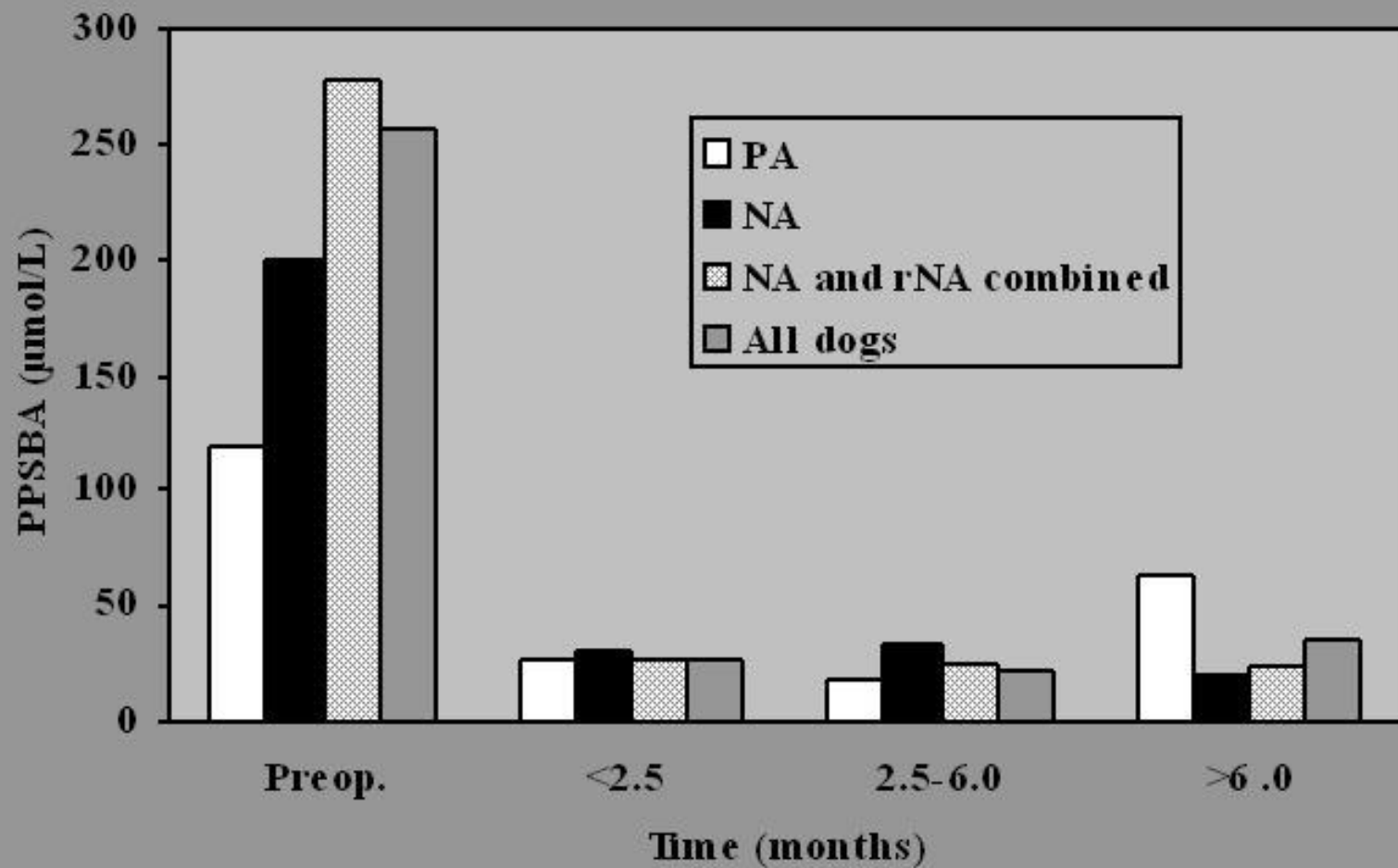
Treatment: Cellophane

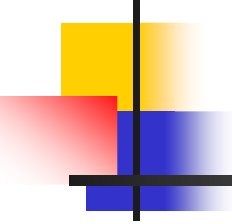
- No occlusion
- No need to measure portal pressure
- No risk of portal hypertension
 - Very light
 - Easy to place



Treatment: Cellophane

- Extrahepatic shunt
- Intrahepatic shunt
- 3 mm band of cellophane 3 layers
- 2.5 mm ID closed in 8 weeks
- 3 mm ID 12 to 16 weeks for occlusion





Treatment: Cellophane

- Femoral vein
- Ameroide
 - Complete attenuation in 14 days
- Cellophane
 - Not complete attenuation in 6 weeks



Treatment: Surgery

- Intrahepatic shunt
 - Extravascular technique
 - Ligature: Cranial to liver
 - Mattress suture + Pledget
 - Graft
 - Jugular vein: kyler Vet surg 2001
 - Splenic vein
 - Intravascular techniques
 - Inflow occlusion



Treatment: Post-operative

- Fluid therapy
 - 2.5% dextrose
- Food
 - 24 hours after surgery



Treatment: Complications

- Portal hypertension
 - Abdominal pain
 - Diarrhea
 - Septic shock
 - Death
- Coagulation disorders



Treatment: Complications

- Ascites
- Portal vein thrombosis
 - Intrahepatic shunt
- Seizures
 - Difficult to control



Treatment: Follow up

- Medical treatment
 - Partial ligation
- Low protein diet
- Amoxicillin
- Neomycin
- Lactulose



Treatment: Follow up

- Bile acids
- Shunt fraction
- Clinical signs
 - Challenge



Treatment: Follow up

- Low protein diet
 - 3 to 4 months
- Amoxicillin
- Neomycin
 - 2 months
- Lactulose
 - 1 month



Portosystemic shunt

- Improve quality of life
- Improve survival long term
- Easier surgery
- Bile acids
 - Not always back to normal
 - Clinical signs