ON REMOVING LIVER TUMORS:
A massive size that improves prognosis, usually

Synopsis-- Anatomy and the Disease

The liver has more size than it needs to be an effective filter for the body; this fact makes removing large portions of the liver reasonable. The surgical act of removing large portions of the liver can be either simple as "pie" or as risky as any abdominal surgery can get. It's all about location, location, location. A quality ultrasound study or CT scan is instrumental in assisting the prediction of surgical ease vs. challenge and thus the risk of attempting removal of a liver lobe/tumor.

The most common scenario for a treatment realistically involving surgery is the solitary, large (often "massive") hepatocellular carcinoma in dogs and less commonly the cholangiocellular adenoma in cats. Both are seen in older animals, often found incidentally on exam or when chasing elevated liver enzymes and both behave relatively benignly with surgery often curative. Both can also be multilobular and non-surgical. Other, less common, primary malignant liver tumors, and more frequent metastatic liver tumors are rarely amenable to surgical treatment with good prognoses. Imaging studies and biochemical parameters help narrow this differential field.

Surgical Overview:

Surgical prognosis is colored by several disease and patient variables. Tumors of the left, caudate, papillary and quadrate lobes and tumors at the apex of any lobe are more accessible. Deep chested and V-chested dogs have very inaccessible livers, often requiring more advanced surgical approaches for access. Geriatric, debilitated, anemic animals with coagulation abnormalities face challenges in recovery from, for example: persistent, oozing blood loss at resection site; profound inflammatory "cleanup" at resection site; anesthetic/analgesic drug clearance; hemodynamic shifts from blood loss and replacement.

Liver parenchyma is friable with minimal connective tissues; the majority of tissue dissection/resection is via blunt disruption and aggressive vascular ligation followed by manual pressure and hemostatic aids.

Anesthesia is rarely safely stationed on autopilot for liver tumor resections. During liver manipulation, the hilus is often tractioned and compressed causing sporadically interrupted venous return to the heart and resultant hypotensive episodes. Occlusion of blood flow to a large lobe/tumor will cause sudden vascular shifts, triggering baroreceptors and causing bradycardia. Drug choices, anesthetic depth maintenance, fluid therapy options must all take into account the need to deliver specific therapies for immediate needs, and deliver enough but not too much. Drug choices are ideally those with minimal cardiovascular insult. Fluid therapy choices should plan for the worst (massive hemorrhage) and administer targeted volumes of specific fluids as the needs present.

The **indications & rationale** for surgical treatment:

- Elective tumor removal when clinical insult and tumor size/change in size is significant relative to life expectancy.
- Interoperative risks rise with tumor size, so surgical removal ideal when still reasonable sized.
- Healthier patients tolerate major surgery/anesthesia better, so delay tumor removal until improved (if appropriate).

- A solitary liver tumor, regardless of size, can have good surgical prognosis.

Other options for treatment (besides surgery) are:

- Benign neglect
- Monitoring with imaging to gauge change in size over time, and clinical significance.

Supportive/ancillary options with surgical treatment are:

- Preoperative treatment of anemia, coagulopathy.
- Postoperative support for blood loss, pain, anorexia.

The **perioperative experience** for pet and owner includes:

- If elective, routine hospital admission for anesthesia and surgery. No preparations other than NPO.
- Given surgical risks, owner should be engaged in discussions and decision making preoperatively about postoperative critical care support options and logistics should they be recommended.
- If uncomplicated surgery, outpatient surgery with expectation for very quiet 2wk recovery at home with large abdominal incision.
- Urgent/emergent care plan should be discussed if need arises during recovery period.
- If complicated surgery requiring additional critical care support, patient may need to be transported for transfusion, pain management, nutritional support as indicated.

Expectations for outcome are:

- If uncomplicated, liver lobe/tumor removal can result in return to normal quality of life and cure.
- Histopathology is instrumental in shaping prognosis.

Complications that may arise with this procedure are:

- Intraoperative and postoperative bleeding that may require ongoing support, to include blood transfusion. Rarely is re-operation indicated.
- Intraoperative or postoperative death.
- Inoperable mass
- Incisional infection

Postoperative **outcomes may be poor** due to the above complications, and/or:

- Local or distant tumor recurrence

What a **surgeon needs** prior to surgery:

- Ultrasound or CT report
- Cytology or biopsy data, if any
- Skin near the surgery site CLEAR of infection (papules, pustules, crusts, collarettes, etc.) If urgent surgery, owner must be alerted to *increased risk* of incisional, deep and/or implant infections.

General considerations and complications *for all surgery/anesthesia procedures are:*

- *Difficult and/or painful anesthetic recovery (variable; may require additional medications or re-hospitalization)*

- *Incisional infections (rare, minor; usually require oral antibiotics)*
- *Incisional dehiscence (rare, minor or major; may require surgical revision)*
- *Adverse anesthetic event (rare, major; may result in serious impairment or death)*

Proper owner expectations are important to a successful experience and patient outcomes. Please discuss this information with your clients while assisting them with decision-making for **liver tumor removal**.

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