

RADIOFREQUENCY ABLATION



**ELIZABETH DAVID MD FRCPC
VASCULAR AND INTERVENTIONAL
RADIOLOGIST
SUNNYBROOK HEALTH SCIENCES
CENTRE**

GIST – GASTROINTESTINAL STROMAL TUMORS



Stromal or mesenchymal neoplasms affecting the GI tract can be divided into 2 large groups. The most common groups consists of tumors collectively referred to as GISTs. They are most commonly found in the stomach and proximal small bowel but can be found in any portion of the GI tract and even extra GI locations like the omentum, peritoneum and mesentery.

GIST was first coined to describe an unusual type of nonepithelial tumor of the GI tract that lacked the traditional features of smooth muscles or nerve cells. They are now thought to arise from a precursor cell and are distinct from leiomyomas or leiomyosarcomas.

GIST



- Precursor cells express a transmembrane receptor tyrosine kinase encoded by the KIT gene. Almost all GISTs express mutations in this gene.
- GISTs smaller than 2 cm are generally considered very low risk of recurrence. However, no GIST can truly be labeled benign. Follow up necessary for all.
- Histologically then have 3 patterns; spindle cell (most common), epitheloid cells or a mixture.
- Identifying the KIT encoded receptor is key to making the diagnosis in 90% of patients
- The small number of patients who are negative for the receptor instead express mutations in a related receptor (PDGFR alpha).
- This diagnosis is important due to treatment with tyrosine kinase inhibitor imatinib (Gleevec).

GIST



- For localized primary GIST, surgical resection is the mainstay of therapy.
- CT is the modality of choice for diagnosing and for monitoring and detecting recurrence.
- PET is also becoming increasingly used; access can be limited (some lesions also do not take up enough glucose). CT gives superior anatomic information.
- MR is used usually for liver metastases or rectal GIST

GIST



- GISTs are most common in the stomach (40-60%)
- Small bowel 25-30%
- Duodenum 5%
- Colorectal 5%
- Esophagus <1%
- ExtraGI stromal tumors (EGISTs) can occur in retroperitoneum, mesentery and omentum.
- They can spread to liver and peritoneum (most common), rarely to lymph nodes and very rarely to lung.

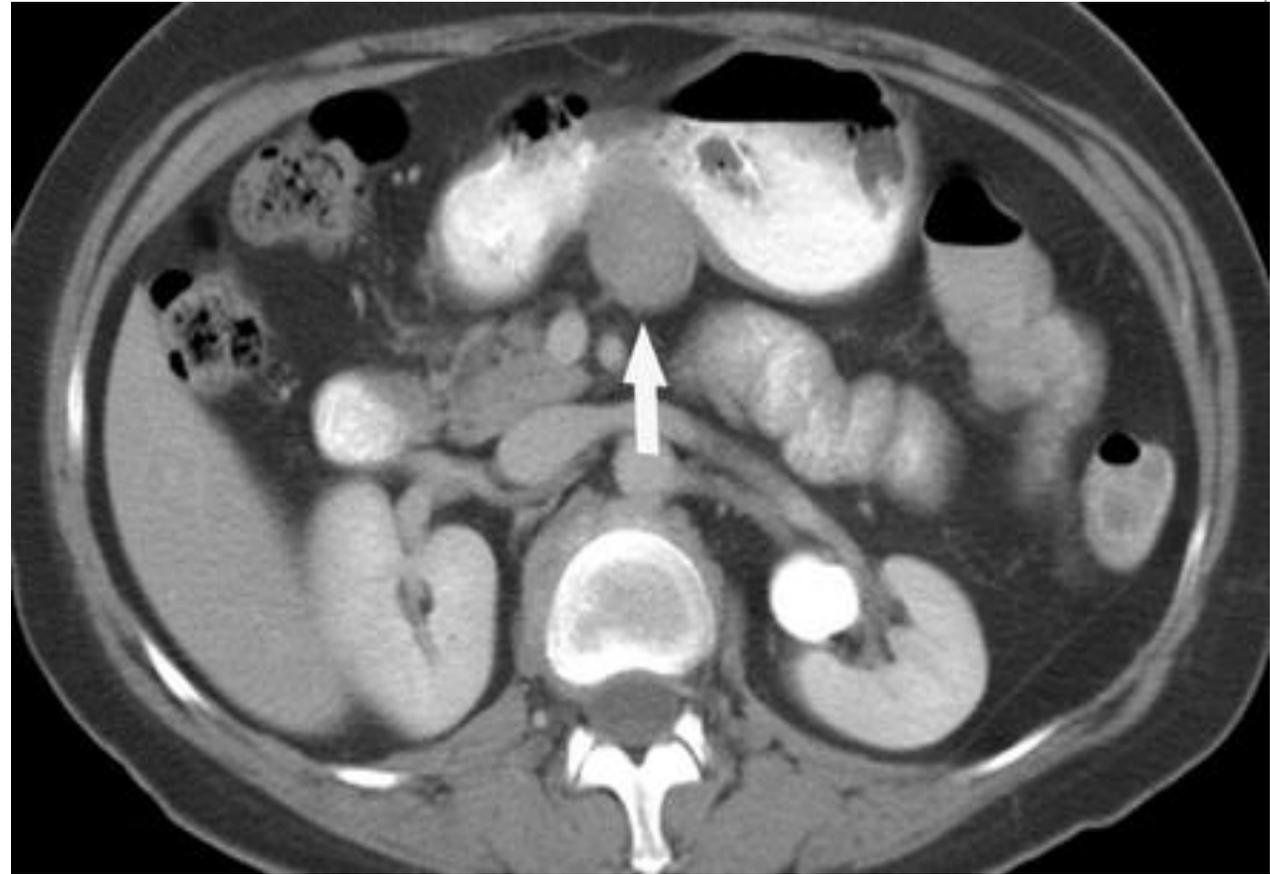
GIST



- Biological behavior of GIST is variable.
- Tumor characteristics on CT may not only suggest the diagnosis of GIST but may also help predict recurrence risk.
- Larger than 5 cm, lobulated, heterogeneously enhancing with mesenteric fat infiltration, ulceration, lymphadenopathy or an exophytic growth pattern are more likely to spread or metastasize.
- GISTs with less metastatic potential tend to enhance in a homogenous pattern and show an endoluminal growth pattern.



Resectable GIST

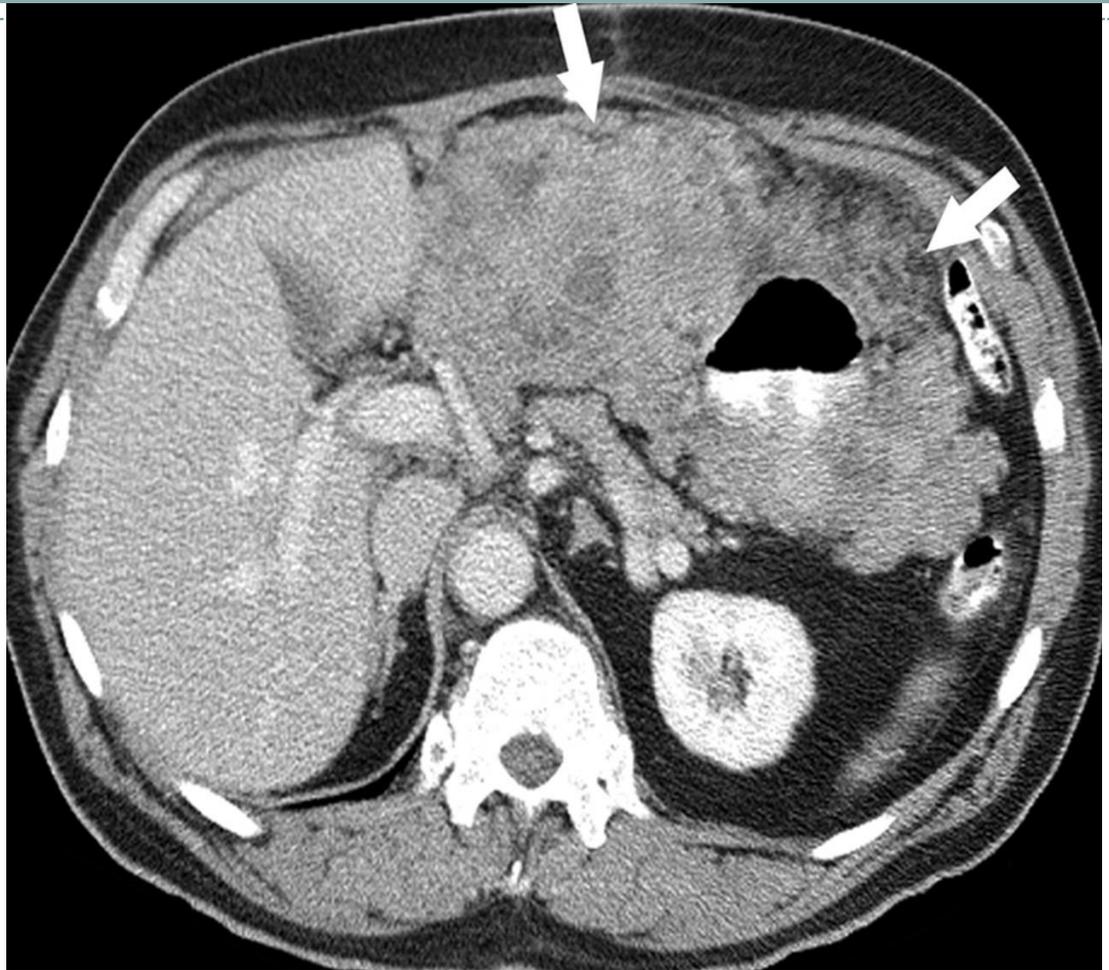


Primary GIST – treated with subtotal gastrectomy and surveillance



Aggressive appearance

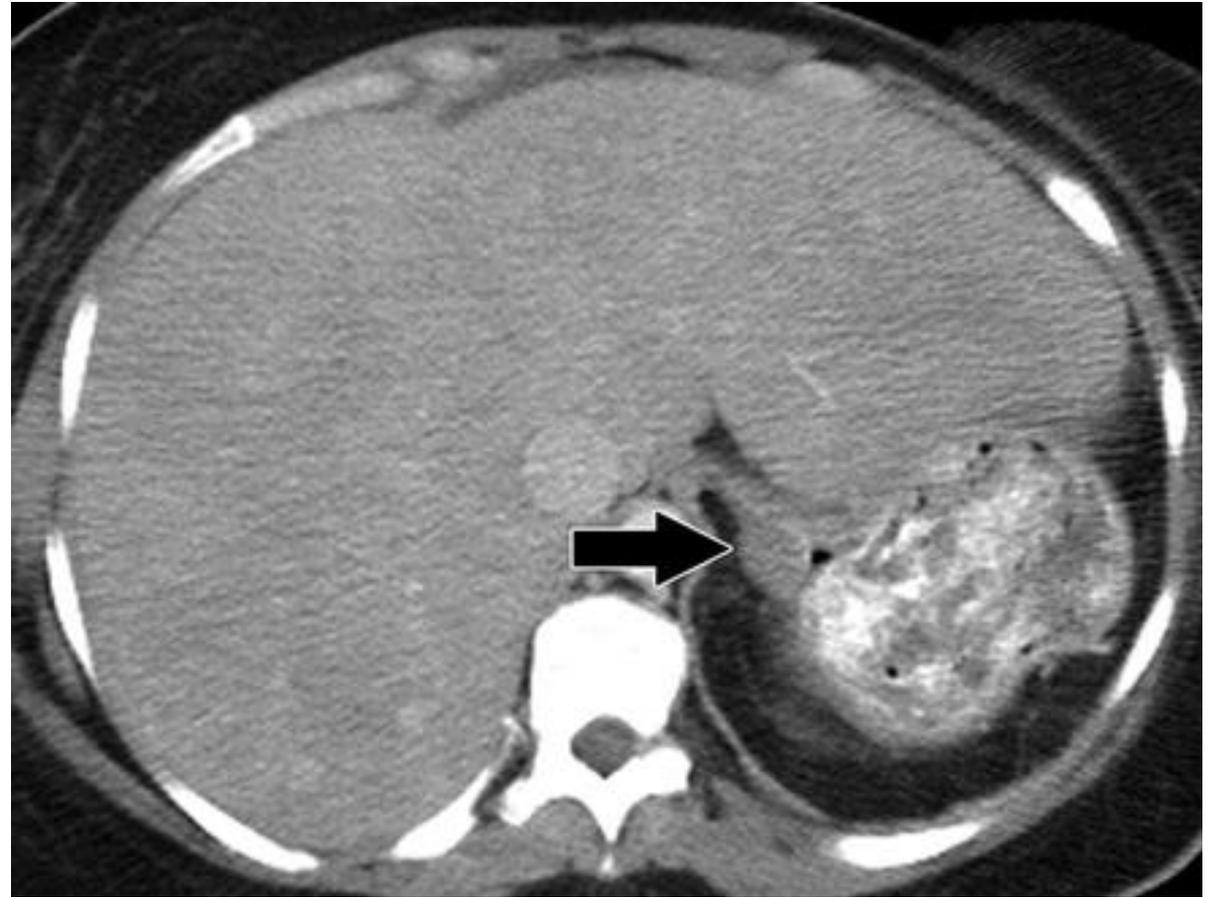
Mass encases stomach



Peritoneal spread - unresectable



GIST – Under 2 cm



**1.5 cm GIST treated with
surveillance**



Small bowel GIST



Exophytic mass from distal small bowel



Nearly 50% of patients with GIST will present with spread or metastasis. Most involve the liver and peritoneum.

CT characteristics of the metastases are similar to the primary lesion; vascular masses that can be heterogeneous.



Metastatic GIST to the liver



Small bowel GIST
presenting with
metastases after
resection.



**Spread to the peritoneum and soft
tissue**

Treatment



- Surveillance (lesions under 2 cm)
- Surgery – for resectable lesions
- Medication (tyrosine kinase inhibitors - Imatinib) – for lesions that may shrink and become resectable or for control of primary or metastatic lesion

Tumors can be put in categories after work up :
resectable; unresectable, metastatic or recurrent,
refractory (not improved with medical treatment)

Metastatic and Recurrent GIST - Treatment



- Tyrosine Kinase Inhibitors
- Surgery to remove tumors that have been treated with drugs and are shrinking, stable or slightly increased.
- GIST refractory to drugs – few clinical trials using different drugs.

ROLE OF RFA IN GIST



- Usually adjuvant treatment used to manage hepatic metastases
- Often used with tyrosine kinase inhibitors
- May be an option in liver metastases under 4 cm that are stable or slightly growing despite medication

What is RFA



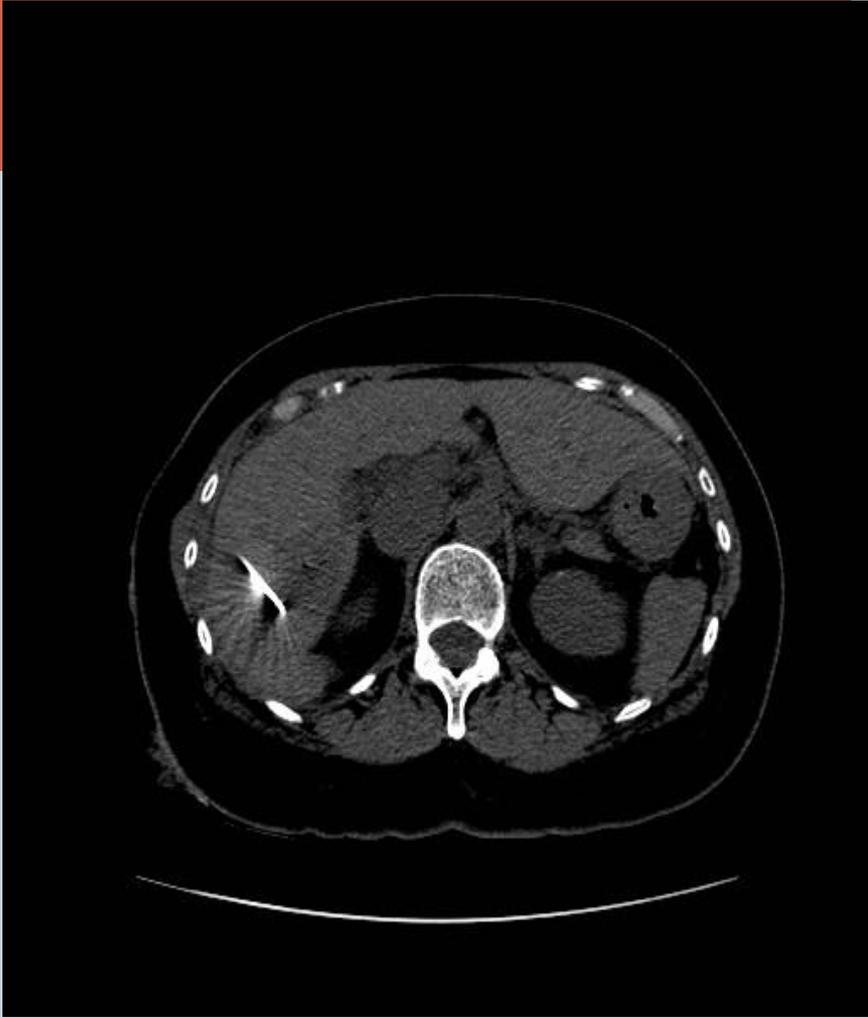
- The patient is made into an electrical circuit but placing a grounding pad on the right leg. The energy at the tip of the needle causes the cells to bump into each other and release frictional heat which cooks the tumor. Above 60 C we get coagulative necrosis. The proteins in the tumor denature and it is destroyed.
- We try and get a large enough margin to kill all of the tumor cells but sometimes there is marginal recurrence and additional treatments may be required.
- It is simply a locally ablative technique. There are other local techniques we use to destroy tumors, microwave, cryotherapy (freezing tumor) and high intensity focused ultrasound.
- RFA has been proven to be safe and effective and in certain types of tumors have survival rates similar to surgery (for colorectal liver metastases and hepatocellular carcinoma under 4 cm).
- This treatment is ideal for patients who are not good surgical candidates.

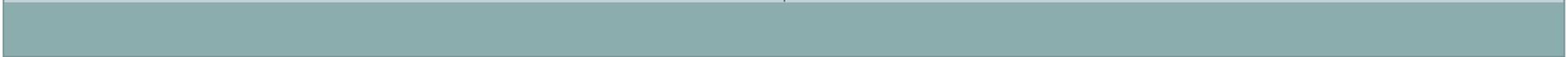
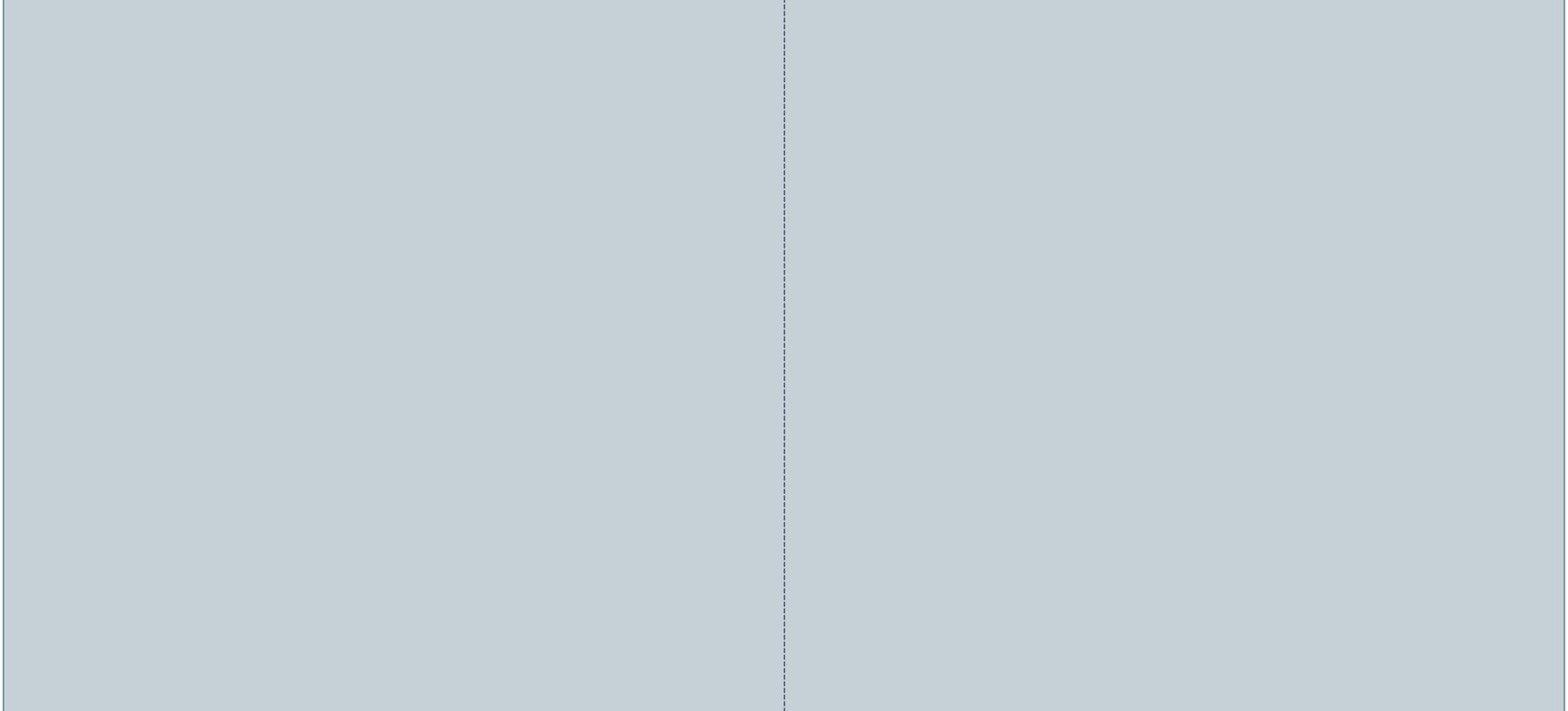
ROLE OF RFA IN GIST



- This has not been studied extensively simply because GIST is not a common tumor and the mainstay therapy is surgical resection or medication.
- RFA in addition to tyrosine kinase inhibitor therapy for patients with liver metastases was evaluated in 17 patients in France (Cardiovascular Intervention Radiology April 2013). It was used on patients who had liver metastases that were progressing or stable despite TKI therapy.
- 27 tumors were treated; all were completely ablated with no recurrence in a follow up time of 49 months. No major complication.
- The cohort that had the best result was the one in which RFA was performed on lesions that were stable or progressing slightly and TKI therapy was maintained. In this group 75% had a 2 year progression free survival. If TKI therapy was discontinued this dropped to only 29% progression free disease at 2 years. Also if lesions were progressing rapidly despite TKI therapy (refractory); only 20% of these had a progression free survival at 2 years.
- So RFA is definitely an adjunct to medical therapy.

RFA of solitary liver metastases from resected GIST – stable on TKI therapy



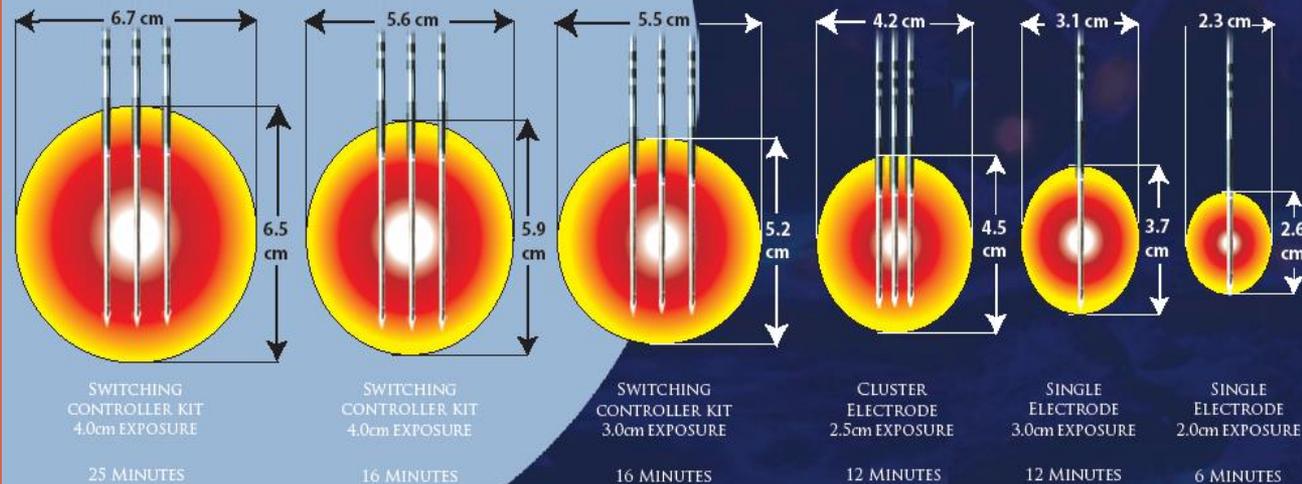




RFA probe selected based on size of lesion

RFA can also be done in the lung and kidney

COOL-TIP™ ELECTRODE/LESION SIZE CHART



Valleylab Cool-tip™ Switching Controller Tissue Verification Testing Protocol
Ablation size is dependant upon tissue vascularization, type, temperature, and impedance.
Lesion size in healthy ex vivo bovine 20°C liver.

Example of different RFA needles

Thank you





- References:
- GIST: Radiologic Features with Pathologic Correlation, Radiographics 2003; 23: 283-304
- GIST: Role of CT in Diagnosis and in Response, Radiographics 2006; 26:481-495