**Interventional Treatments for Colon Cancer Metastases**

**PART I: TREATMENTS FOR CRC METS TO THE LIVER**

1. **Percutaneous ethanol injection**

   Multiple Sessions usually required producing one day hospital stay. Easy to perform. Mets respond poorly. Performed in an interventional radiology suite with conscious sedation with the use of ultrasound to guide the procedure.

2. **Interstitial thermal ablation/Interstitial Laser Photocoagulation**

   Single, bare laser fibre is inserted percutaneously into a lesion which scatters light in the optical or near-infrared wavelengths within tissue and is converted into heat. The heat produces a zone of necrosis (tumor death). Major drawback is cost. Mets respond well. Intense inflammatory response oftentimes takes place after the procedure. Patient is therefore treated with narcotic and non-steroidal anti-inflammatory analgesics. Usually performed with MRI, so there is precision associated with the procedure.

3. **Cryoblation/Cryotherapy**

   Probes are used to freeze and destroy mets under general anesthesia in the operating room. Conductive material kills cells by denaturing cellular proteins and rupturing cell membranes. Mets respond well.

4. **Microwave Coagulation**

   Ultra high speed microwaves are emitted from a percutaneously placed probe. A 14-gauge needle is inserted, followed by the microwave probe. Only done in Japan but the results have been excellent.

5. **Chemoembolization**

   The liver receives approximately 25% of its blood supply from the hepatic artery with the remaining supply from the portal venus system. By embolizing (blocking) the hepatic artery, you can induce necrosis of the liver tumors while sparing normal hepatic tissue. Chemoembolization involves blocking the hepatic artery (the main artery that supplies blood to the liver) and injecting anticancer drugs between the blockage and the liver. The liver’s arteries then deliver the drugs throughout the liver. Only a small amount of the drug reaches other parts of the body. Therefore, no systemic effects are felt.
Chemoembolization involves the infusion of emulsification of iodinated oil (lipoidol) with chemotherapeutic agents (i.e. 5FU and mitomycin C for CRC). This technique has shown promising results especially in patients who have multiple lesions that may be difficult to treat. Many patients who have failed I.V. chemo may still show response to chemoembolization and sometimes in combination with other techniques such as ethanol or radiofrequency ablation. If responsive, patients may undergo 3 or 4 embolizations over a period of months or years. Complications are usually minor and response rate is very good.

6. **Radiofrequency ablation**

The use of a special probe with tiny electrodes that kill cancer cells. Sometimes the probe is inserted directly through the skin and only local anesthesia is needed. In other cases, the probe is inserted through an incision in the abdomen. This is done in the hospital with general anesthesia. Tumor necrosis is produced by thermal coagulation and protein denaturation. High frequency alternating current flows from uninsulated electrode tips into the surrounding tissue, which differs from direct heating from a probe. As a result of the change in direction of the alternating current, agitation of the tissue occurs and results in frictional heating. The tissues surrounding the electrode (rather than the electrode itself) are the primary source of heat. The result is tumor necrosis. Mets respond well with complete ablation rates in the range of approximately 90%. It is performed with ultrasound guidance and you would need to stay in the hospital for one day.

7. **Therasphere/Microspheres**

Therasphere is delivered through a catheter that is positioned in the hepatic artery, the liver’s main blood vessel. The catheter is guided into the branch of the hepatic artery that feeds the tumor and then microspheres are infused through the catheter into the tumor’s blood supply. Once in the liver, the microspheres get trapped in the small blood vessels that feed the tumor and radiation gets delivered directly to the tumor, sparing surrounding healthy tissue. It is an outpatient treatment with little to no toxicity with good response rates.

8. **Portal Vein Embolization**

When the portal vein on one side of the liver is blocked, that lobe of the liver atrophies, but the opposite lobe actually grows. When the portal vein is occluded, diversion of blood flow to the opposite side of the liver triggers hypertrophy. Liver regeneration begins within hours throughout the nonembolized liver, while tumor death leads to atrophy of the embolized lobe. PVE increases the volume and function of the
liver remnant and it allows the future liver remnant to adjust to portal pressure changes several weeks before becoming a candidate for surgery.

9. **Brachytherapy**

Another new technique for inoperable liver cancer is a type of brachytherapy that delivers radioactive yttrium-90 directly to the liver via millions of glass beads that measure 25 to 25 microns in diameter. The beads are trapped in the tumor, where they release beta rays directly at the tumor.

**PART II: COLON CANCER RADIATION THERAPY**

1. **Tomotherapy**

Tomotherapy combines an advanced form of Intensity Modulated Radiation Therapy (IMRT) with an on-board CT scanner that precisely allows your CTCA care team to focus the radiation beams on your tumor. It sculpts small, powerful and precise radiation beams to hit hard-to-reach tumors, targets tumors using build-in CT scanning to conform to the shape and position of the tumor right before your treatment begins, and reduces radiation exposure to healthy surrounding tissue. It delivers powerful radiation therapy from 360-degrees.

2. **Microspheres/Theraspheres**

Therasphere is delivered through a catheter that is positioned in the hepatic artery, the liver’s main blood vessel. The catheter is guided into the branch of the hepatic artery that feeds the tumor and then microspheres are infused through the catheter into the tumor’s blood supply. Once in the liver, the microspheres get trapped in the small blood vessels that feed the tumor and radiation gets delivered directly to the tumor, sparing surrounding healthy tissue. It is an outpatient treatment with little to no toxicity.

3. **High Dose Rate (HDR) Brachytherapy**

(Rectal Cancer Only) Catheters are implanted into your tumor, and this thin plastic tube is used to deliver a powerful, tightly focused dose of radiation to your tumor. Usually given as an extra boost of radiation to a rectal tumor, or as part of a sphincter sparing treatment plan.
4. **Intensity Modulated Radiation Therapy (IMRT)**

IMRT is the most advanced radiation available to destroy cancer cells without damaging normal tissue. IMRT uses varying beam intensities to send radiation to the tumor site from the most favourable paths. It allows higher doses of radiation to be delivered to the tumor while minimizing damage to surrounding vital organs.

5. **Proton therapy**

Precision delivery of radiation therapy within millimeter accuracy thereby sparing healthy tissue around the tumour. Proton therapy is a type of radiation that uses positively charged particles to treat the tumor. The beam is directed to a prescribed depth in tissue to treat the crc met to the liver and avoid surrounding liver tissue, as much as possible. Proton therapy may allow higher doses to be delivered to the tumour without complications. MD Anderson has opened its Proton Therapy Center and is only one of three such hospital based facilities in the U.S.

6. **Stereotactic Radiation Therapy (SRT)**

A type of external radiation therapy that uses special equipment to position the patient and precisely deliver radiation to a tumor. The total dose of radiation is divided into several smaller doses given over several days and is under experimental use for the treatment of primary and secondary liver tumors.

Sources:


*Baldwin, J., New Treatments Target Metastatic Tumours in Liver, Journal of the National Cancer Institute; 2002, 94(3): 164-165*


[www.cancercenter.com/colon-cancer/treatments.cfm](http://www.cancercenter.com/colon-cancer/treatments.cfm)

[www.mdanderson.org/diseases/colon-cancer/display](http://www.mdanderson.org/diseases/colon-cancer/display)