Radiofrequency Ablation of Malignant Liver Tumors

Anesthesia Protocol
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Overview

Radiofrequency ablation is used to treat patients with unresectable primary and metastatic liver cancer. Radiofrequency ablation is an evolving technology using ionic agitation and frictional heat (exceeding 60°C) from a probe to cause cell death and coagulation necrosis of the tumor. RFA can be performed laparoscopically, percutaneously, or as an open procedure (laparotomy). All methods use ultrasound to guide the radiofrequency probe to the tumor site.

The complications of the surgery are hyperkalemia, hyperthermia, acidosis, myoglobinuria, grounding pad burns, and bleeding. The bleeding is more severe in cases with higher CVP (congestion of the liver and overfilling of liver sinuses with blood).

The Procedure

Pre-operative Care

- Standard pre-op exam, diagnostic studies, routine labs
- Note K+, coagulation status, liver enzymes, Hct, CXR, ECG
- Large bore IV x 2 (verify free flow in both lines when the arms are tucked)
- Arterial line (for blood sampling)
- CVP depending on patient’s co-morbidities
- Check on availability of blood (patient should be typed and crossed)

For open procedure (in addition to above)

- Thoracic epidural (verify coagulation status!)
- CVP (if needed)
- Double lumen ETT (for thoracoabdominal approach)

Patient monitoring

OR Setup

- Cooler with 6 liters NS on ice
- Several zip lock bags of ice for cooling patient (wrap in cloth before applying to patient)
- Temp probes - Foley and esophageal
- Bair hugger for cooling
RADIOFREQUENCY ABLATION OF MALIGNANT LIVER TUMORS

- Infusion pumps
- Blue, purple blood tubes and blood gas syringes, labels for blood gas and coags
- Pressure infusion device (Alton Dean, Level One, or Belmont) for open procedures
- Fiberoptic scope for placement of double lumen ETT
- Arterial and CVP transducers

Medications

- NaHCO3
- D50
- Regular insulin drip
- CaCl2 x 4
- Nitroglycerin drip for high CVP
- Lasix 40 mg x2
- Standard medications for induction and maintenance of anesthesia, analgesia

Intra Operative Care

Frequent blood draws

- Monitor K+: hyperkalemia is the result of tissue destruction, coagulation necrosis, and possibly, acidosis
  - Treat hyperkalemia with D50 + regular insulin, CaCl2
- Monitor ABG’s for metabolic acidosis (caused by lactic acid of tissue destruction), and hyperkalemia
  - Treat acidosis with HCO3 only if indicated, increase ventilation as needed, maintain euvolemia
- Monitor Hct, coags, if excessive bleeding or existing coagulation disorder

Temperature control

Monitor temp both bladder and esophageal: the radiofrequency probe often exceeds 60 degrees C°, causing tissue surrounding the tumor to heat excessively, raising patient’s core temperature. This will cause the raise of the esophageal temperature, and then the bladder.

1) Place grounding pads on large surface area of patient’s skin: to prevent burns from overheating at site
2) Place wrapped ice bags at arterial sites (carotid, axillary) on patient for temperature (esophageal or bladder?) above 38.5°C
3) Bair hugger set on cooling, (ambient temp) with maximum coverage of patient
4) Cooled IV solution, best to use NS, due to presence of K+ in LR and Plasmalyte

Postoperative Care

1) Advise PACU staff regarding the potential for internal bleeding, hyperkalemia, hyperthermia, or acidosis following the procedure due to tumor ablation and tissue injury
2) Monitor patient’s temperature, ABG’s, Hct, and K+ until normalized