Background

Hepatocellular carcinoma (HCC) is a leading cause of cancer-related mortality globally. Treatment for HCC

Within Milan criteria
- Single tumor < 5 cm or 2 tumors not exceeding 3 cm, and
- No vascular invasion

Outside Milan criteria
- Locoregional therapy:
  - Radiofrequency ablation (RFA)
  - Transarterial chemoembolization (TACE)
  - Transarterial radioembolization (TARE)

Liver transplant for unselectable HCC

TARE
- Delivers yttrium-90 (Y-90), high energy beta particle emitting radio-isotope, directly to tumor through hepatic artery.
- Good safety profile because it provides lethal dose to tumor, minimizes toxicity to surrounding tissue.
- Rare complication: radiation pneumonitis, with an incidence of less than 1%, in patients with HCC.

Liver Imaging Reporting and Data System (LIRADS)

Hepatic angiography during pre-treatment planning – prominent arterial portal fistula (yellow arrow)

Discussion

Radiation pneumonitis
- Typical presentation
  - Symptoms: dry cough, exertional dyspnea
  - Restrictive ventilator pattern on pulmonary function testing
  - Respiratory status: range from mild hypoxia to severe respiratory failure
- Timing: onset usually 1-2 months, but as late as 6 months after treatment with Y-90.
- Imaging (CT chest): bilateral ground glass opacities and ill-defined patchy opacities with relative peripheral and hilar sparing.
- Histology findings: presence of radiographic globules or scattered microspheres is diagnostic; can be nonspecific generalized inflammation.
- Other work-up: rule out cardiac and infectious etiologies that may demonstrate ground glass opacities.
- Treatment: steroids – no standardized dose or duration.
- Risk factors: high lung shunting fraction (LSF), aggressive nature of disease (such as HCC) leading to collaterals and arteriovenous shunts.
- Case 1: presence of arterial portal fistula
- Case 2: LSF noted to be 22.67%

Reducing risk of radiation pneumonitis
- Hepatic angiography and 99mTc-MAA can be performed to estimate LSF.
- LSF
  - 10-15%: Reduce radiation dose by 20%
  - 16-20%: Avoid altogether

Lungs should not receive more than 30 Gy in a single dose or more than 50 Gy over multiple doses.

Conclusion

TARE is a useful interventional radiology technique and an alternate local therapy to treat HCC. High lung shunt fraction and dose of radiation to the lungs are linked to radiation pneumonitis. It is not only appropriate to perform pre-treatment planning with hepatic angiography and 99mTc-MAA to approximate the lung shunt fraction, but also important to time it as close as possible to a patient’s treatment session given the highly vascular nature of HCC and subsequent risk of developing new collateral blood vessels and more arteriovenous shunting. Although the incidence of radiation pneumonitis is less than 1%, it is important to identify this complication as respiratory failure can result and treatment with steroids can be initiated in the appropriate candidates.

References


Acknowledgements

Ahishak Kumar MD, Chief, Vascular and Interventional Radiology for providing image of arteriopulmonary fistula from the angiogram during TACE for case 1.