The Method of B-TACE

Balloon TACE is a method that improves the delivery and distribution of embolic into a tumor. It is not magic. It is physics that follows a few simple guidelines to achieve high efficacy. These guidelines along with several tips are presented below.

Balloon-TACE (B-TACE) has been shown to achieve improved Lipiodol density in HCC nodules over TACE with a standard microcatheter (1,2). Improved Lipiodol density, in turn, has been shown to dramatically improve tumor kill. Five clinical studies, including 914 patients, are consistent in demonstrating a statistically significant improvement in complete response of **1.5 times** (3,4,5,6,7). This level of improvement in cancer treatment is rarely seen. The investigators in these studies used a specific method to achieve these results that is based on a **simple** understanding of hemodynamics as related to balloon occlusion (1,8,9). The success of this concept is simple - **fill the tumor better and outcomes will improve**.

Hepatic arteries have collaterals that are most often positioned between the microcatheter tip and tumor feeder. These collaterals are of 5 major types which include: (1) the **Isolated Artery,** which is a high-pressure terminal artery originating from another hepatic artery, (2) collaterals that supply the **Vasa Vasorum**, a lower-pressure (~40-70 mmHg) network, (3) collaterals that feed the **Peribiliary Plexus**, a lower-pressure network, (4) collaterals that supply the **Liver Capsule**, a lower-pressure network and (5) collaterals that are part of the **Interlobar Communicating Arcade** which are high pressure connections between hepatic arteries. Interlobar Communicating arteries are most common in segments 1 and 4.

Embolization itself is successful only because the arterial side of the tumor has a pressure less than 25 mmHg (10,11) and is thereby a "sump". Balloon occlusion blocks the high-pressure supply artery resulting in hemodynamics being governed by the collateral arteries and the low-pressure tumor.

Flow Redistribution requires balloon occlusion to create a low-pressure vascular territory distal to the balloon and in the vicinity of the tumor (1,8,9). This will occur if the collaterals in front of the balloon supply the Vasa Vasorum, the Liver Capsule or the Peribiliary Plexus. However, if a high-pressure artery (Isolated Artery or Interlobar Communicating Arteries) is distal to the balloon, balloon occlusion will not lower the pressure, thereby flow redistribution will not occur. In this instance, **the catheter tip must be advanced beyond the high-pressure artery** in order for flow to be focused at the tumor. In practice, the method is simple and follows a few tips provided from the literature as well as physicians that routinely use balloon occlusion and achieve high efficacy. They are:

1) The best tumor response is achieved when the balloon is **in** or **close** to the tumor feeder and pressure injection is used.
2) If flow redistribution is not seen, move the catheter closer to the tumor.
3) In rare instances, balloon occlusion will cause a situation that is not advantageous. In these instances, the embolic injection should be done with the balloon down.
4) Superselective microcatheter placement is important. It is easier if the base catheter is advanced forward into the liver. Two authors describe the "balloon anchor technique" to advance the base catheter over the microcatheter with the balloon inflated (13,12). A 4 Fr 0.038" base catheter is easier to advance distally.

Five clinical studies, including 914 patients show that balloon occlusion results in a 50% improvement in complete response on the first procedure. Given the benefit to survival seen in these studies, it is worth the effort to become familiar with this technique. As described, the hemodynamics are easily managed using the four tips outlined above. B-TACE can become a routine that promises improved patient outcomes.

Quiz: Refer to figure 1

1. **Best location to occlude?**

Answer: A or B
Why: flow redistribution will be observed and high pressure embo can be done

2. **Where will I see flow redistribution?**

Answer: A, B, & C
Why: lower pressure networks distal to the occlusion

3. **Where will I not see flow redistribution?**

Answer: D, E, & F
Why: high pressure artery distal to occlusion

4. **Where are high pressure anastomosis most common?**

Answer: Segments 1 & 4
Why: more high pressure interlobar communicating arteries

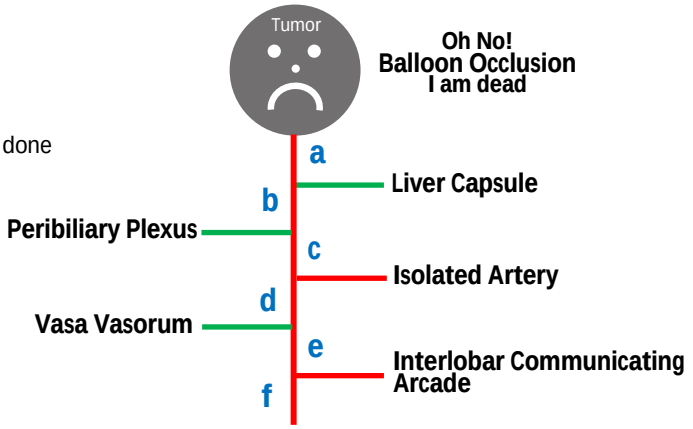

Figure 1

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