The Direxion™ HI-FLO™ Torqueable Microcatheter in the Preprocedural Planning of Y-90 Radioembolization for HCC

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Yttrium-90 transarterial radioembolization (Y-90 RE) is emerging as a promising treatment modality for managing patients with unresectable primary and secondary hepatic lesions. In patients with hepatocellular carcinoma (HCC), Y-90 RE represents a valid treatment option in selected cases of advanced-stage disease with portal vein neoplastic thrombosis or when other locoregional approaches are contraindicated or fail to achieve tumor response.[1]

Meticulous preprocedural planning with digital subtraction angiography (DSA) and technetium^{99m}–labeled macroaggregated albumin (^{99m}Tc-MAA) scintigraphy is essential to avoid nontarget embolization and to ensure adequate delivery of microspheres to all the tumors. Therefore, DSA diagnostic work-up requires precise definition of all the feeding arteries, identification and potential embolization of parasitized collaterals, and visualization of extrahepatic vessels arising from the hepatic circulation.[2] In this scenario, the performance of the high-flow coaxial microcatheters used during DSA becomes extremely important.

CASE PRESENTATION

A 55-year-old man with a history of hepatitis C and cirrhosis (ECOG Performance Status 0, Child-Pugh class A) presented with multifocal, infiltrative-type, slightly hypervascular hepatocellular carcinoma (HCC) (Figure 1),

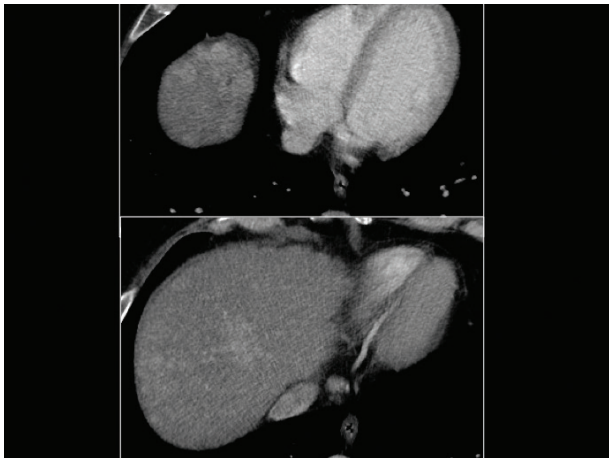

Figure 1. The multifocal, infiltrative-type HCC.

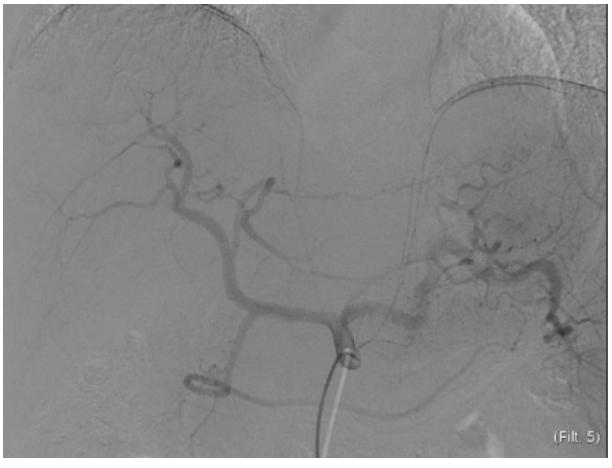

Figure 2. A celiac angiogram obtained with a 5-F (1.67-mm) Cobra catheter.

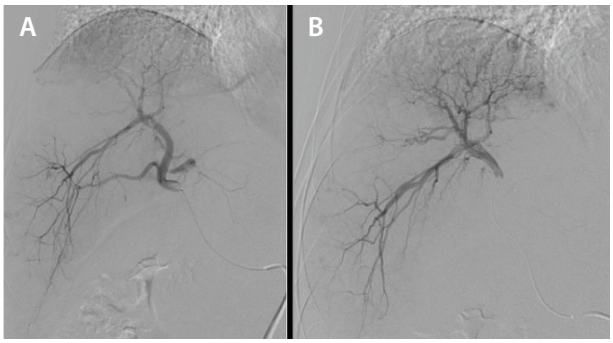

Figure 3. The initial angiogram did not have clear depiction of the lesions (A). When the microcatheter was advanced into the main branch of the hepatic artery, the hypervascular nodules were clearly shown (B).

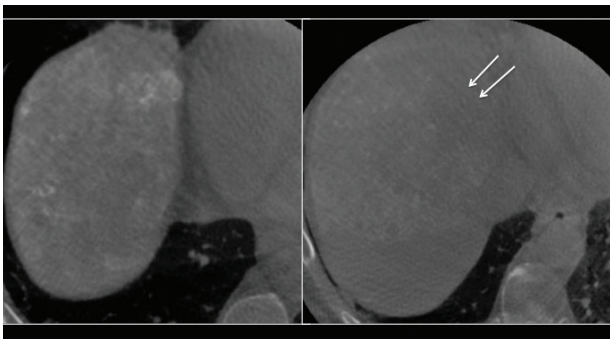

Figure 4. A C-arm CT scan showing a lack of opacification of the caudal-medial portion of the lesions (arrows).

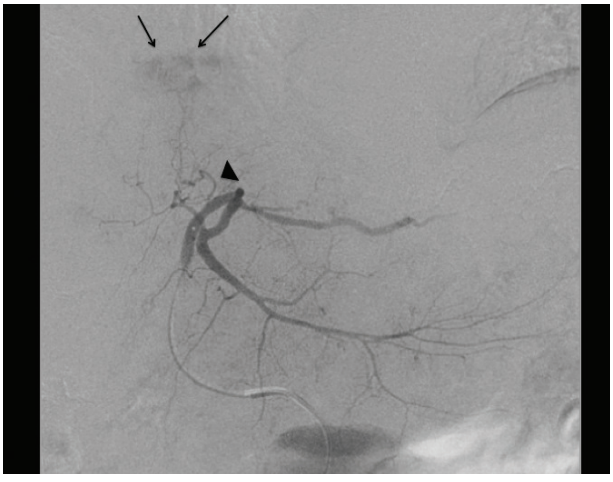

Figure 5. A small arterial feeder (arrowhead) shown on an angiogram of the left hepatic artery (arrows).

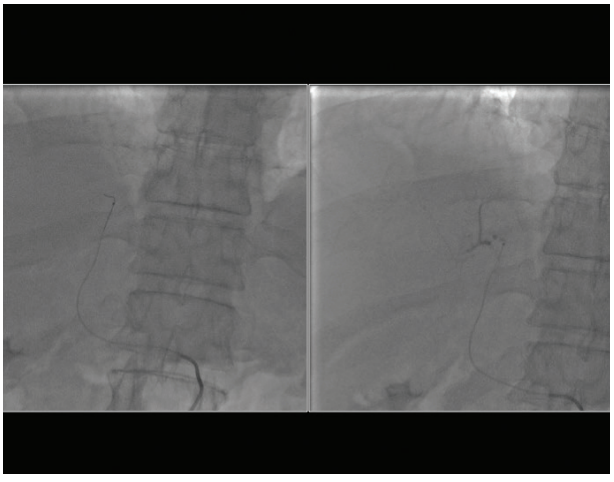

Figure 6. The small arterial feeder was catheterized with a J-tip Direxion™ HI-FLO™ Microcather.

without macrovascular invasion or extrahepatic tumor spread. After multidisciplinary tumor board discussion, the patient was selected for Y-90 RE, and preprocedural diagnostic work-up was scheduled.

A 5-F (1.67-mm) vascular sheath was placed through the right common femoral artery, and a celiac angiogram was obtained with a 5-F (1.67-mm) Cobra catheter (Figure 2). A 2.8-F (0.93-mm) J-shape Direxion™ HI-FLO™ Microcatheter was placed in the right hepatic artery, and initial angiography was performed with 10 mL of iodized contrast media injected at a flow rate of 2 mL/sec with 750 psi (5,171 kPa), without clear depiction of the lesions (Figure 3A). The microcatheter was then slightly advanced into the main branch of the right hepatic artery, and angiography was repeated with 10 mL iodized contrast media, injected at a flow rate of 3 mL/sec with 900 psi (6,205 kPa), and clearly demonstrated the hypervascular nodules (Figure 3B).

With similar injection parameters, a C-arm CT scan was obtained (Figure 4), which showed the lack of opacification of the caudal-medial portion of the lesions (Figure 4, arrows).

A small arterial feeder (Figure 5, arrowhead) of this portion was depicted on angiography of the left hepatic artery (Figure 5, arrows). To enable flow redistribution,[3] this small feeder was easily catheterized, taking advantage of the J-shape tip of the microcatheter (Figure 6). Embolization was successfully performed with a 3-mm X 6-cm (60-mm) Interlock™ Detachable Coil (Figure 7).

Finally, the microcatheter was positioned in the feeding branch of the right hepatic artery (Figure 8) and, after ^{99m}Tc MAA injection, SPECT-CT scans were obtained, showing homogeneous intratumoral MAA accumulation with no evidence of extrahepatic shunting (Figure 9).

Two weeks later, Y-90 RE was performed.

DISCUSSION

Accurate angiographic planning is essential for Y-90 RE safety and efficacy.[2] In this case, diagnostic work-up was initially complicated by the relatively low arterial vascularization of the lesions. The Direxion™ HI-FLO™ Microcatheter allowed contrast media injection at high

Figure 7. Successful embolization with an Interlock™ Detachable Coil.

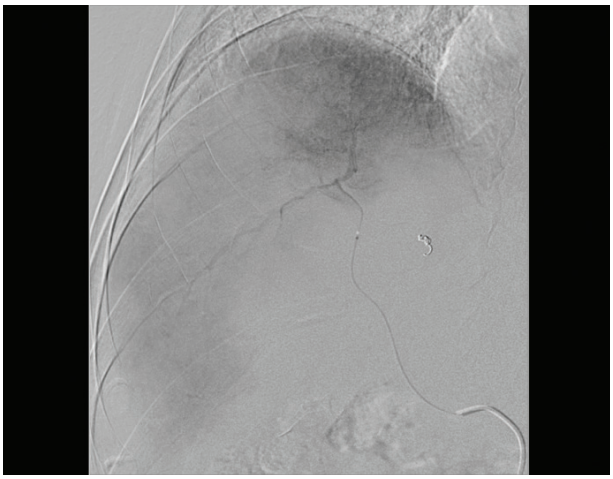

Figure 8. The microcatheter positioned in the feeding branch of the right hepatic artery.

pressures and flow rates, thus favoring depiction of these infiltrative and moderately hypervascular lesions.

Moreover, the unique nitinol shaft configuration ensures great torqueability, while maintaining trackability and flexibility. In fact, the selective catheterization of the tiny vessel arising from the left hepatic artery wound up being simpler than expected, despite the use of a 2.8-F (0.93-mm) catheter inside a very small vessel lumen. The morphology of the nitinol hypotube is different in the proximal and distal tracts; proximal nitinol cuts are spaced to provide pushability, while distal nitinol cuts are closer together to ensure flexibility.

The different tips' configurations can be used for selective catheterization of the vessels, particularly in difficult anatomies. In our example, the tiny parasitized artery showed proximal tortuosity; the J-shape microcatheter facilitated its selective catheterization.

In conclusion, the Direxion™ HI-FLO™ microcatheter offers unique features that can be taken advantage of in the diagnostic angiographic work-up of Y-90 RE, enabling high-flow contrast injections and facilitating selective and superselective catheterization of the hepatic arterial branches, even in case of difficult vascular anatomies and small arteries. ■

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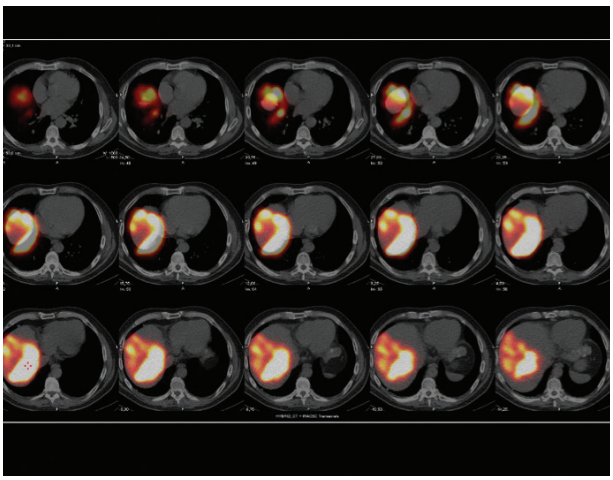

Figure 9. A SPECT-CT scan showing homogenous intratumoral MAA accumulation with no evidence of extrahepatic shunting.

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