Cardiovasc Intervent Radiol (2024) 47:142–145
https://doi.org/10.1007/s00270-023-03615-7

Yttrium-90 Radioembolization of a Large Hepatic Hemangioma

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Received: 29 October 2023 / Accepted: 31 October 2023 / Published online: 27 November 2023

Editor,

Hepatic hemangiomas are common benign lesions that are typically asymptomatic, although pain, bulk symptoms, and consumptive coagulopathy (Kasabach–Merritt Syndrome) can occur in large lesions [1]. While surgical resection has traditionally been considered the definitive treatment option for giant hemangiomas, chemoembolization and thermal ablation have also been reported effective for symptoms control [1–3]. The safety and efficacy of radioembolization for hepatic hemangiomas are unknown. Hemangiomas primarily consist of blood-filled cavities lined by endothelial cells rather than solid tissue and safety as related to potential arteriovenous shunting is uncertain [4]. We describe a case of radioembolization of a 5.1-cm hemangioma that was incidentally treated due to its adjacency to a targeted hepatocellular carcinoma (HCC) with subsequent long-term outcomes at 3-year follow-up.

Institutional board review and approval was not required for this case report. A 60-year-old male with treated hepatitis C was referred for treatment of a 1.4-cm HCC in segment 3 and 1.1-cm HCC in segment 5 (Fig. 1). A 5.1-cm hemangioma with classic imaging findings was present in the left lateral segment adjacent to the segment 3 HCC. The hemangioma was initially detected on abdominal CT 14 years prior, measuring 2.7 cm with steady interim growth. Superselective radioembolization was chosen for optimal response, as ablation was deemed suboptimal because the segment 3 HCC was adjacent to the duodenum.

On planning arteriography and cone-beam CT, the segment 3 artery supplied the entire segment 3 HCC as well as the entire hemangioma (Fig. 2). Technetium-99 macro-aggregated albumin (Tc99-MAA) was administered into the segment 3 artery. Subsequent SPECT demonstrated a hepatopulmonary shunt fraction of 7% with mild focal radiotracer uptake at the segment 3 HCC but without significant uptake at the hemangioma. A modest segmentectomy dose of 180 Gray was chosen for the segment 3 HCC (and the hemangioma) given the small size of the HCC. The measured volume of parenchyma supplied by the segment 3 artery was 180 mL. Using the medical internal radiation dosimetry (MIRD) method, the required activity was 0.73 gigabecquerels (GBq). Radioembolization with a 15Gbq dose vial was performed using yttrium-90 glass microspheres (TheraSphere, Boston Scientific, Marlborough, MA). The patient tolerated the procedure well with an uneventful post-procedural course.

Abdominal MRI scans with contrast were performed every 3 months after radioembolization (Fig. 3), showing complete response of the treated HCC. Expected mild parenchymal hyperenhancement and increasing parenchymal atrophy was noted. The hemangioma gradually decreased in size and volume at all timepoints (Table 1). While the hemangioma initially demonstrated continued enhancement and T2 hyperintensity, at 12 months post-procedure, the hemangioma completely lost its intrinsic T2 hyperintensity but retained some degree of slight heterogeneous enhancement in the venous phase. By around 15 months, the hemangioma had completely involved and was necrotic-appearing. The most recent MRI at 3 years

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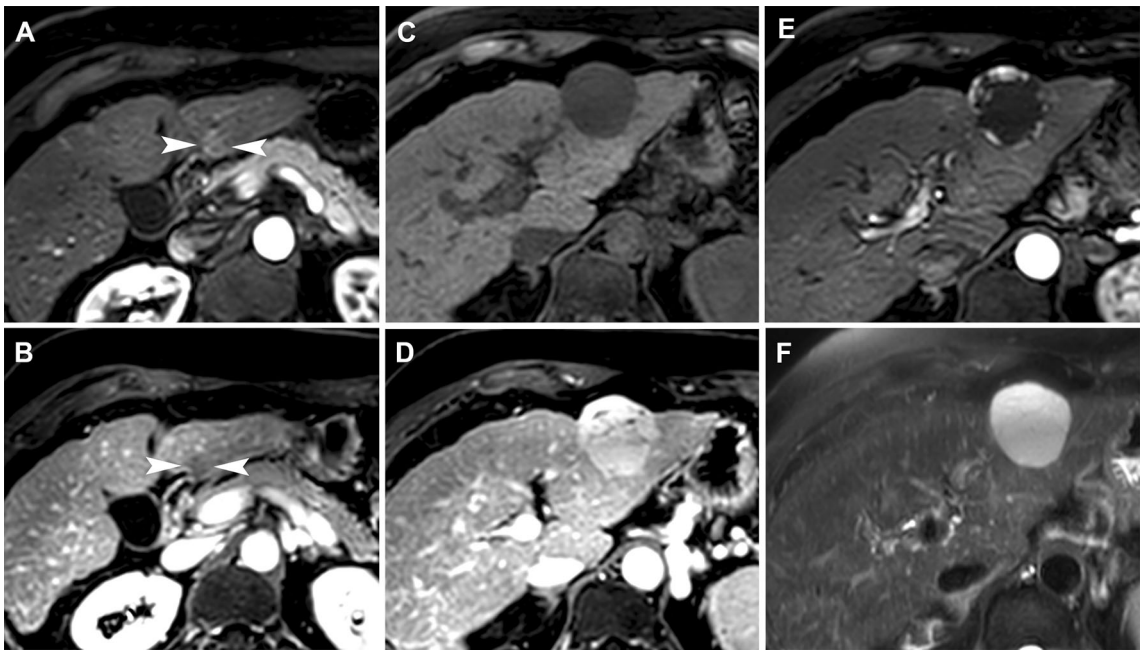

Fig. 1 Contrast enhanced MRI demonstrates a small 1.4-cm lesion (arrowheads) in segment 3 with arterial phase enhancement (**A**) and washout in the venous phase (5 min post-contrast administration) (**B**) consistent with a LI-RADS 5 lesion. Contrast enhanced MRI demonstrates a 5.1-cm lesion with no intrinsic T1 signal on the pre-contrast image (**C**), peripheral nodular enhancement in the arterial phase (**D**), diffuse enhancement in the venous phase (5 min post-contrast administration) (**E**), and vivid homogenous T2 hyperintensity (**F**)

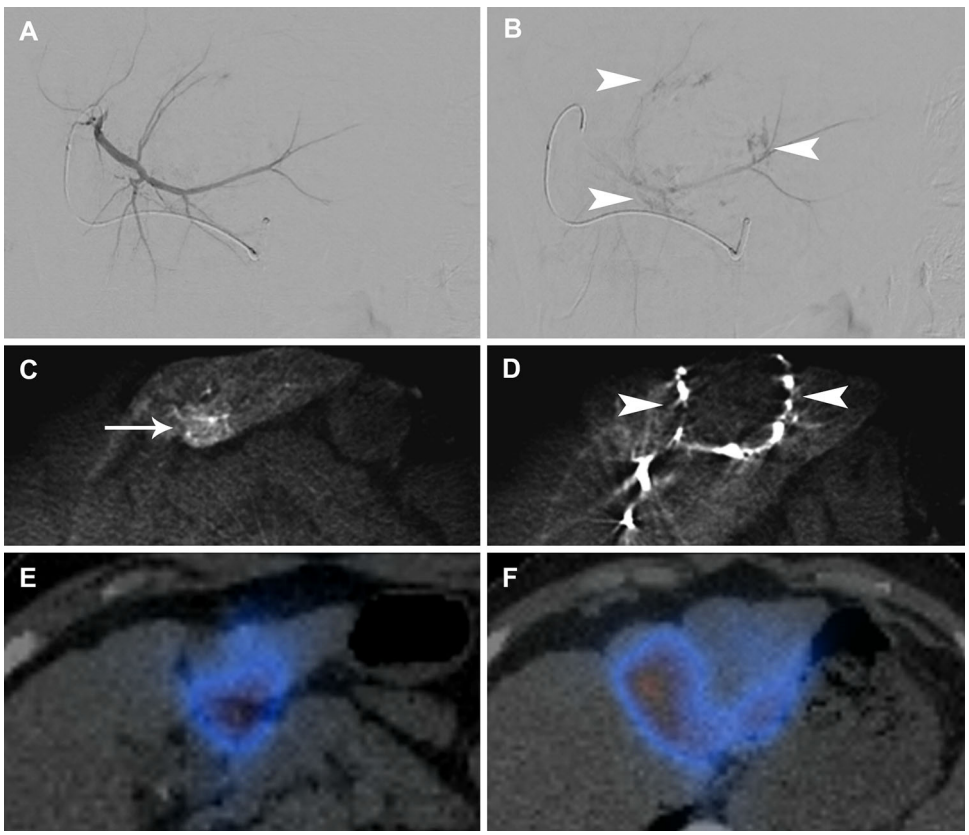

Fig. 2 Angiographic images of the segment 3 artery demonstrates imperceptible hypervascularity of the HCC or hemangioma in the early image arteriogram (**A**) but with pooling at the periphery of the hemangioma (arrowheads) in the late image arteriogram (**B**). Cone-beam CT images from this artery demonstrate hypervascular lesion consistent with the known HCC (arrow) (**C**) as well as contrast pooling in the periphery of the hemangioma (arrowheads) (**D**). SPECT scan after infusion of Tc99 MAA into the left lateral segment artery demonstrates modest radiotracer uptake in the HCC (arrow) (**E**) and minimal if any uptake in the hemangioma (arrowheads) (**F**)

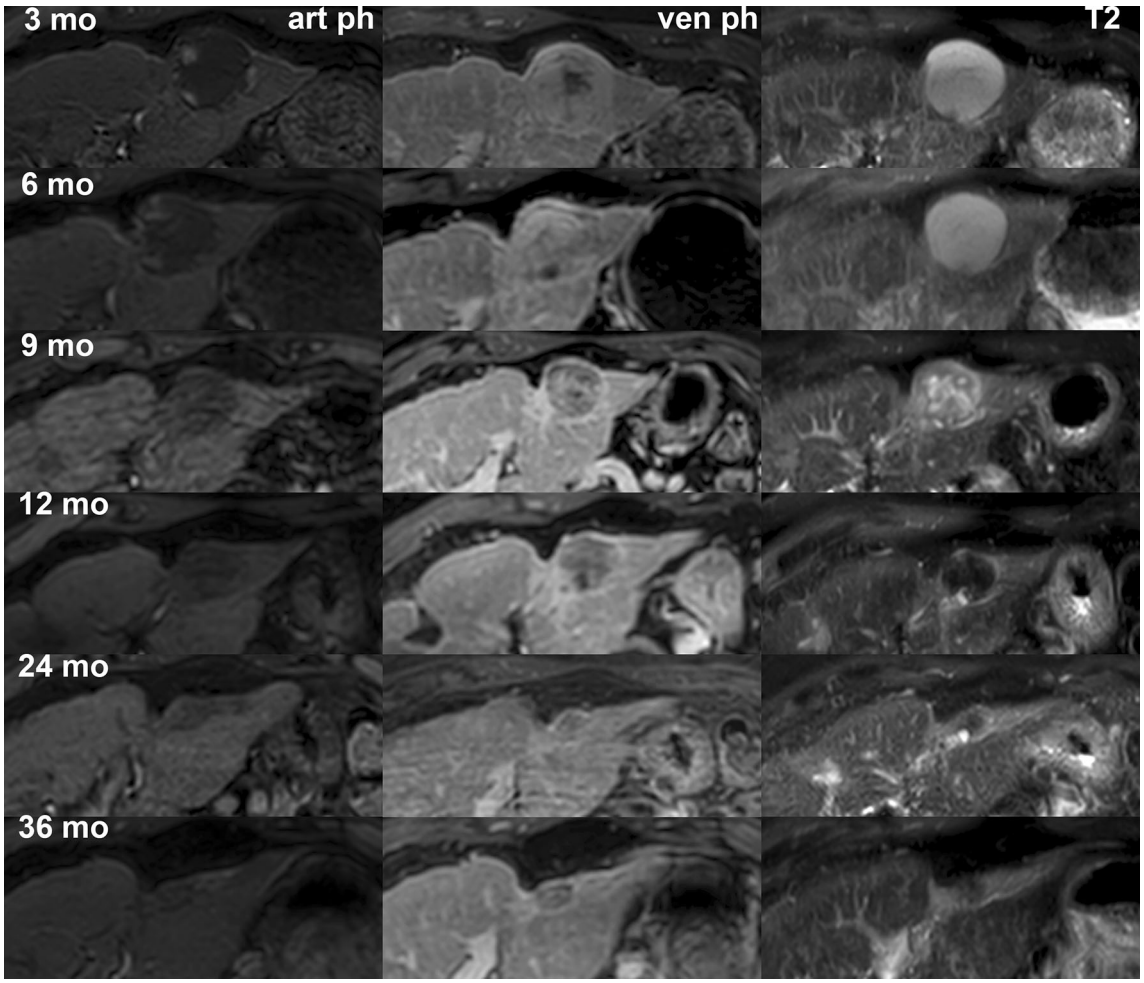

Fig. 3 Post-treatment MRI images at 3, 6, 9, 12, 24, and 36 months in arterial, venous (5 min post-contrast injection) phases demonstrate gradual involution of the hemangioma over 3 years along with atrophy of the treated parenchymal volume

Table 1 Volumetric changes in the hemangioma over time after treatment with radioembolization

Months after radioembolization	Volume (mL)
(Baseline)	51.7
3	50.7
5	38.9
9	25.4
11	11.8
14	4.2
17	2.7
20	3.1
26	2.2
29	1.3
33	1.3
35	1.5
37	1.3

post-radioembolization demonstrated sustained hemangioma involution.

In this presented case, radioembolization induced complete regression of a large hemangioma. The minimal radiotracer uptake on Tc99-MAA SPECT may be because a hemangioma's volume is predominantly blood, with radiotracer uptake only by stroma and endothelial cells. The radiation presumably causes death of the endothelial cells with associated involution of the vascular spaces that comprises its large volume. After TACE for hemangiomas, the incidence of post-embolization syndrome is reported at 33–74% depending on the agent utilized [2], whereas the incidence after radioembolization is extremely low and did not occur in this patient. Given significant associated parenchymal atrophy, radioembolization for hemangiomas may be ideal when treatment can be limited to one lobe or less. The current case suggests that radioembolization

might be an effective and safe treatment option for giant symptomatic hemangiomas.

Acknowledgements None.

Funding This study was not supported by any funding.

Declarations

Conflict of interest CYK: consultant for Boston Scientific, Becton Dickinson, ACI/Humacyte. No other authors declare a conflict of interest.

Ethical Approval For case reports, our institution does not require formal consent or IRB approval.

Consent for Publication Consent for publication was obtained for every individual person's data included in the study.

Informed Consent For case reports, our institution does not require formal consent or IRB approval.

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