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Single-Session Bland Embolisation Followed by Microwave Ablation for Hepatocellular Carcinoma: Chasing Anatomic Resection

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To the Editor,

Although thermal ablation is usually performed as single-therapy, arterial embolisation has been combined with thermal ablation in selected cases of hepatic tumours to increase the chance of local control. We report on the rationale of performing single-session bland arterial embolisation with microspheres followed by microwave ablation (MWA) in two patients diagnosed with hepatocellular carcinoma (HCC).

Patient 1 was a 58-year-old man with HCV infection and a residual HCC who had been treated with MW ablation four months earlier. The residual HCC was located in segment VIII and measured 3.2 cm (Fig. 1A). Patient 2 was a 63-year-old man with chronic hepatitis due to hemochromatosis and a single HCC in segment IVa (3.5 cm in the longest diameter). Both tumours were located within 5 mm of the Glisson capsule. Liver function (Child–Pugh-A) and performance status (ECOG-0) were preserved in both patients. Treatment indications were given after multidisciplinary discussion in the effort to improve local tumour control considering the rapid lesion growth and the sub-diaphragmatic location hampering wide ablation margins. In both patients, sub-segmental trans-arterial bland embolisation (TAE) of the tumour feeding arteries was performed after 4F-femoral access using 1.8 Fr micro-catheter, 0.016″-180 cm guide and 40 μm microspheres (Embozene; Merit Medical Systems, South Jordan, UT, USA) (Fig. 1B) with no chemotherapy drugs, as the aim of the embolisation was exclusively to cause an ischaemic effect in the tumour-bearing liver segment. Cone-beam CT scan was acquired to confirm the extent of the embolisation (Fig. 1C). A 15 cm-MW antenna (Emprint Ablation System, Medtronic, Minneapolis, Minnesota, USA) was then deployed under US- and fluoroscopy-guidance (1d). Ablation was performed at low power (70 W) for 9 min, including 1 min of track ablation. The total duration of the procedure was 90 and 115 min, respectively.

The technical success in both cases was confirmed by the absence of enhancing tumour areas at postoperative 24 h contrast-enhanced CT (Fig. 1E). The AblationFit software (AblationFit, R.A.W. Srl, Milan, Italy) was used to confirm the success of the procedure by showing the peritumoural margins of ablation (Fig. 1F). No perioperative complications were registered and both patients were discharged at day-1. No local recurrences were identified at the last treatment follow-up (10 months and 6 months, respectively).

HCC typically spreads along portal branches and microsatellite nodes can be found in tumour-bearing portal territories. Anatomic resection provides a wedge-shaped surgical piece consisting of a liver segment fed by a specific vascular pedicle, and currently represents the paradigm to achieve oncologic radicality (Fig. 2) [1]. We used 40 μm-microspheres to reach the proximity of the sinusoid space

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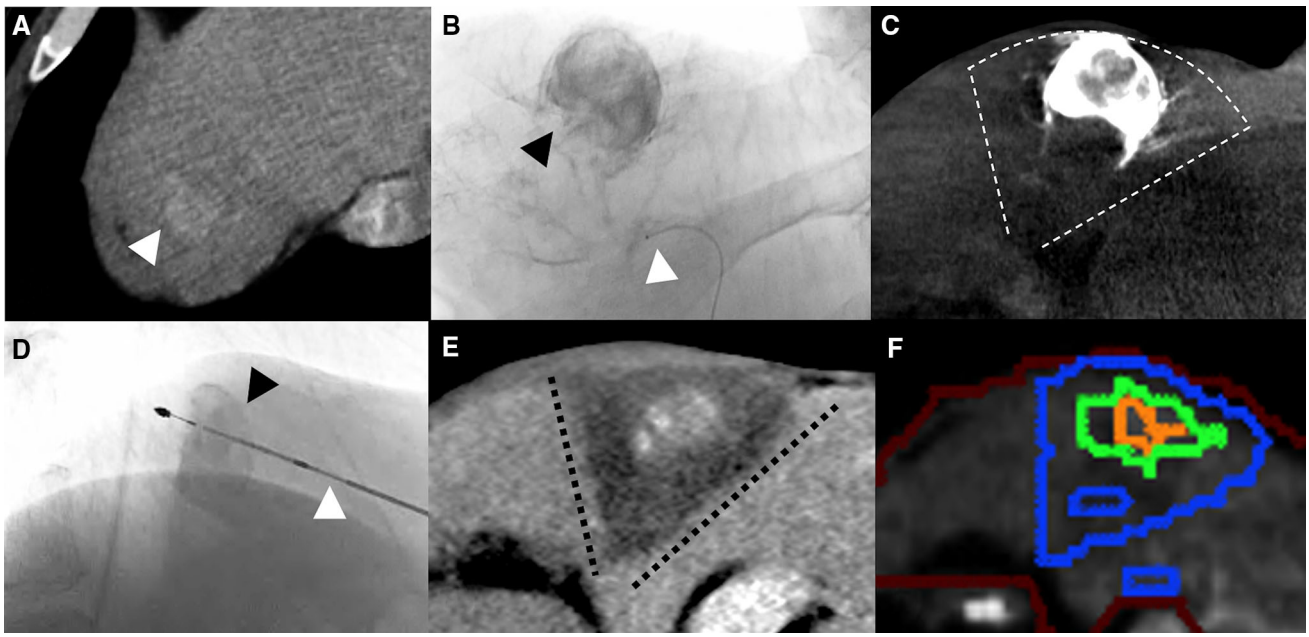

Fig. 1 **A** Pre-procedural contrast-enhanced CT showing a single HCC located in segment VIII; **B** super-selective angiography before embolisation. The tip of the catheter (white arrowhead) is positioned within the lesion's feeding vessel (black arrowhead); **C** post-embolisation CBCT shows radiopaque embolic material within the tumour and around it (white dashed line); **D** fluoroscopy image showing the tumour outlined by the radiopaque material (black arrowhead) and correct positioning of the MW antenna (white arrowhead); **E** 24 h post-procedural contrast-enhanced CT shows a wedge-shaped ablation area (black dashed line) with central hyper-dense area consisting of previously delivered embolic material; **F** peritumoural margins evaluation using dedicated software (orange line indicates the margins of the tumour, green line indicates 10 mm peritumoural margins and blue line indicates the final area of ablation)

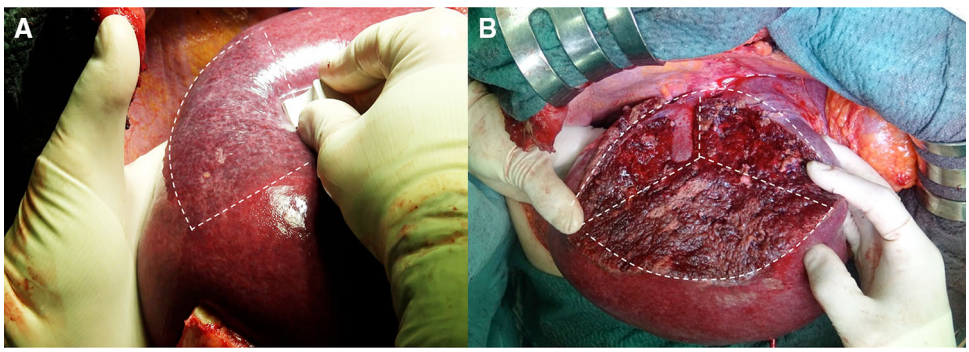

Fig. 2 Example of anatomic (or vascular) resection. **A** Intraprocedural photograph showing the wedge-shaped portal venous stasis (white dashed line) due to compression of the surgical US-probe upon the VIII segment-portal branch; **B** the determination of the segmental margins (white dashed line) allows for an anatomic resection, increasing the chances of oncologic radicality

(5–15 μm) and thus devascularised both arterial and venous territory [2]. After MWA, we observed how the ablated area seemed to follow the vascular territory previously embolised, probably due to the lower heat-sink effect and lower tissue impedance of devascularised liver parenchyma. Such synergic effect may ensure a better coverage of the tumour-feeding vascular territory, with higher chances of covering the tumour volume as well as peritumoural micro-satellites. Only one paper by Thornton LM et al. [3] described MWA following TAE in two different sessions, reporting an increase of the ablation area. No wedge-shaped ablation volume was observed, as the large and variable dimensions of the microspheres used (40–400 μm) did not embolise distally enough [4]. Embolisation should be performed shortly before the ablative procedure to provide a low-impedance devascularised territory, acting as a track for the impending ablation, possibly improving the heat delivery in challenging locations like the liver dome. Moreover, performing the procedure in a single session prevents vascular reorganisation to undermine the effects of the embolisation [5]. We believe such a strategy could also be helpful for borderline tumours of 3 cm, which are expected to grow further before the scheduled intervention.

In conclusion, single-session super-selective TAE with 40 μm-microspheres followed by MWA is feasible and allows for achieving optimal treatment margins, resembling a surgical anatomic resection. Prospective studies are needed to evaluate the long-term efficacy of such an approach and validate the rationale of chasing oncological radicality with combined procedures.

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Compliance with Ethical Standards

Conflict of interest All authors declares that there is no conflict of interest (no disclosures).

Ethical Approval IRB waived this letter to the editor.

Informed Consent All patients involved signed informed consent and agreed to the publication of this manuscript.

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